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Weather



**AEROSPACE WEATHER OPERATIONS -
PROCESSES AND PROCEDURES**

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This manual implements HQ USAF Program Action Directive (PAD) 97-10, *Reengineered Action for Air Force Weather*; AFD 15-1, *Atmospheric and Space Environmental Support*; AFI 15-128, *Aerospace Weather Operations - Roles and Responsibilities*; and AR 115-10/AFJI 15-157, *Weather Support for the US Army*. It applies to all Air Force personnel and organizations conducting weather operations as defined in the preceding directives. Consult cited policy directives, instructions, manuals, and their supplements for specific policies, procedures, and requirements, as these directives are periodically updated to reflect current support requirements. Check the appropriate Air Force Index to determine currency of cited publications. Send comments, suggested changes, or improvements through channels to HQ AFWA/XOPS, 106 Peacekeeper Dr, Ste 2N3, Offutt AFB NE 68113-4039. Major commands (MAJCOMs), Field Operating Agencies (FOAs), and Direct Reporting Units (DRUs) send one copy of supplements to HQ AFWA/XOPS and one copy to HQ USAF/XOWP, 1490 Air Force Pentagon, Washington DC 20330-1490 for coordination. Other commands send one copy of supplements to the next higher headquarters for coordination. Maintain and dispose of all records created as a result of prescribed processes in accordance with AFMAN 37-139, *Records Disposition Schedule*.

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

This revision updates the mandatory processes and procedures pertaining to reengineered weather operations. It reflects the changes mandated by the Air Force Weather Product Standardization Board (WPSB). Several items were removed from this manual that are now included in the recently published Air Force Manual (AFMAN) 15-135, *Combat Weather Team Operations*, such as guidance on the Mission Execution Forecast (MEF) Process. This manual incorporates weather modification procedures contained in

AFI 15-107, *Weather Modification*; and Support Assistance Request (SAR) procedures contained in AFI 15-118, *Requesting Specialized Weather Support*. AFIs 15-107 and 15-118 will be rescinded when this manual is published. **Chapter 10**, Training, is completely new. Other new items include procedures on the Strategic Level Threat Assessment products, TAF amendment criteria, procedures for releasing Air Force Weather (AFW) data and software, formatting guidance for Controlling MEFs (CMEFs) and Military Operating Area Forecasts (MOAFs), and Operational Weather Squadron (OWS) production and mission assumption priorities. Procedures on the FMQ-18(V) were added. Numerous administrative changes were made and some existing information was rearranged and incorporated into the appropriate chapters of the manual.

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Chapter 1

INTRODUCTION

1.1. Purpose . This manual provides Air Force Weather personnel and organizations guidance on how to accomplish their roles and responsibilities as described in AFI 15-128, *Aerospace Weather Operations - Roles and Responsibilities* and AR 115-10/AFJI 15-157, *Weather Support for the US Army*. It also prescribes mandatory processes and procedures for aerospace weather operations. Effective use of the guidance and procedures in this manual will enhance the quality, timeliness, and relevance of aerospace weather information, products, and services.

1.1.1. Utilization of AFW Manpower . AFW personnel perform a critical peacetime and wartime flight safety, resource protection, and mission support function. Weather personnel performing mission-essential tasks (i.e., observing/"eyes forward," MEF support, OWS production, MISSION-WATCH, etc.) as determined by the AFW unit leadership will remain in their workcenter or designated work location (i.e., flying squadrons, etc.) to maintain proper support to installation and area of responsibility (AOR) assets. They should not be assigned or tasked to perform non-weather duties conflicting with their assigned responsibilities. Weather personnel should not be designated as augmentees for other base/post functions during wartime, contingencies, or exercises.

1.2. Levels of Military Operations and Air Force Weather Structure. AFW has a three-tiered structure consisting of strategic, operational, and tactical levels of military operations. The three-tiered structure is the foundation of the forecast funnel.

1.3. The Forecast Funnel. The forecast funnel is a conceptual model depicting the hierarchy and relationship among different AFW organizations, aerospace weather operations, processes, scales in weather features, and levels of military operations. The forecast funnel focuses on AFW core process competencies (i.e., *collect, analyze, forecast, tailor/warfighter application, and disseminate*) performed at strategic weather centers, OWSs, and Combat Weather Teams (CWTs). **Figure 1.1.** illustrates these concepts. Two major processes are used within the forecast funnel to provide support.

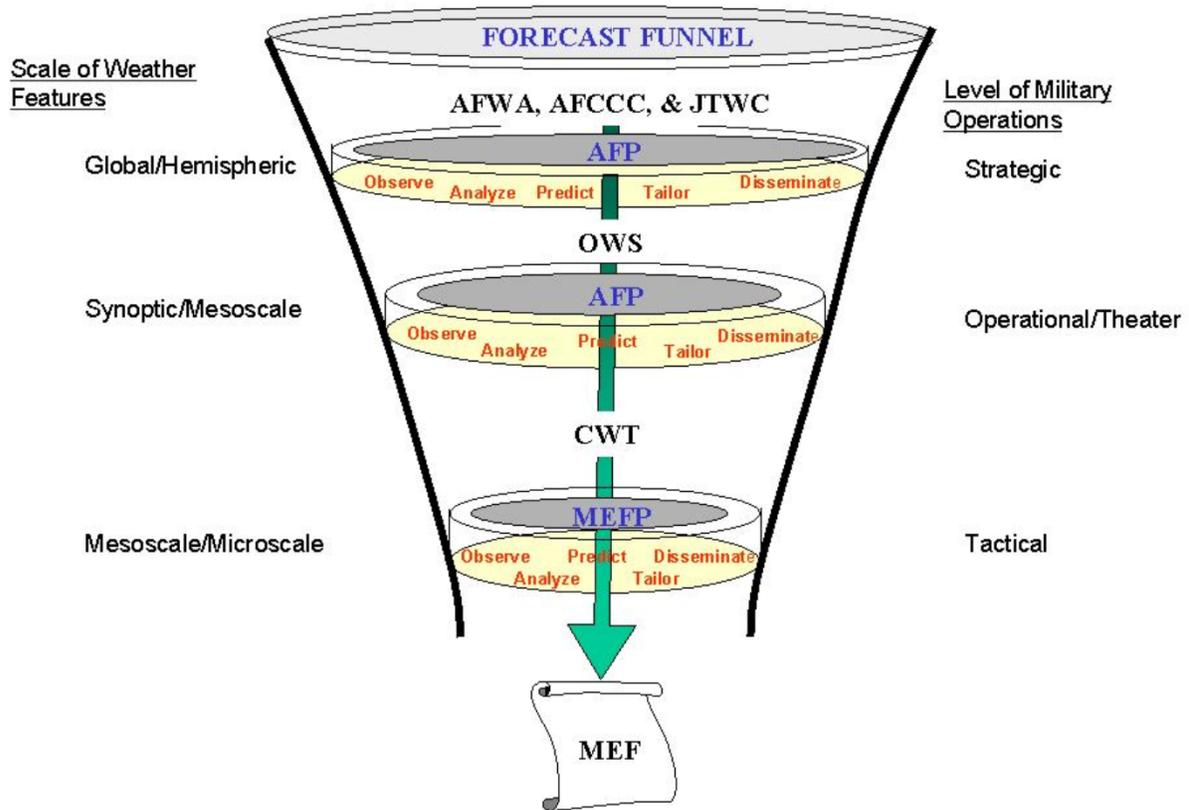
1.3.1. The Analysis and Forecast Process (AFP) drives weather operations at the strategic and operational levels. The process focuses on analyzing data, forecasting conditions, and producing products.

1.3.2. The Mission Execution Forecast Process (MEFP) drives weather operations at the tactical level. The MEFP focuses on producing a mission execution forecast for the warfighter.

1.3.3. The CWT depicted at the tactical level, is a generic term that denotes weather units, teams or individuals creating MEFs. The CWT is most frequently the Weather Flight/Detachment (WF/Det) (in-garrison weather unit) or deployed weather personnel from the WF/Det. However, both strategic weather centers and OWSs are required to produce some MEFs and must function as a CWT in such instances. For example, an OWS producing a flight weather briefing (i.e., MEF) for a transient aircrew is functioning as a CWT and uses the MEFP. Therefore, the term CWT in AFW publications refers to WF/Dets, deployed personnel, and the sections of a strategic weather center or OWS making a MEF. It is understood that the USAF and US Army use the terms Flights and Detachments, respectively, to designate units. This document will use the term CWT throughout to better describe function versus organization. For detailed information on CWT operations, refer to AFMAN 15-135, *Combat*

Weather Team Operations. CWTs, and AFW units performing CWT functions, will follow the guidance in AFMAN 15-135, along with that in this manual.

Figure 1.1. The Forecast Funnel



1.4. Scales of Weather Features. The concept of scale of weather features is important in the AFP and MEFP. Scale differentiation allows weather personnel to define both the size and duration of weather features relative to the type of military operation supported. Each level of AFW is responsible for providing weather information to a specific scale of weather as defined in the forecast funnel. **Table 1.1.** defines the typical scales of weather features used in AFW.

Table 1.1. Definitions of Scales of Weather Features.

Scale	General Size of Weather Feature	Lifespan of Weather Feature	Examples of Weather Features	Military AORs
Global & Macroscale	Thousands of kilometers	Weeks to months	Global circulation patterns	Worldwide
Synoptic	Several hundred to several thousand kilometers	2-11 days	Migratory pressure systems, tropical cyclones, jet stream, frontal systems	CINC's AOR – Theater

Scale	General Size of Weather Feature	Lifespan of Weather Feature	Examples of Weather Features	Military AORs
Mesoscale	Few to several hundred kilometers	1/2 hr - 2 days	Thunderstorm complexes, land-sea breezes, low-level jets	Theater - Area of Operations
Microscale	Less than 2 kilometers	< 1/2 hr	Clouds, tornadoes, dust devils	Target Area

1.5. Regions of Aerospace Weather. Aerospace weather refers to weather phenomena found in the lower atmosphere (referred to as terrestrial weather) and the upper atmosphere to the sun (referred to as space weather). These two broad categories of weather are divided into regions. Terrestrial weather refers to weather phenomena occurring in the troposphere (surface to approximately 50,000 ft or 10 km) and the stratosphere (10 km to 50 km above the earth's surface). Space weather is divided into four regions as shown in [Table 1.2](#).

Table 1.2. Definitions of Regions of Space Weather.

Region	Location or Size of Region	Timescales of Features Important to AFW	Examples of Space Weather Features	Importance to Military Operations
Solar	Sun's atmosphere (photosphere, chromosphere & corona).	<ul style="list-style-type: none"> - 11 year solar cycle. - 27 day rotation cycle of active regions & sunspots. - Days to weeks for active regions. - Minutes to hours for flares and radio burst. 	Sunspots, Flares, Coronal Holes, Filaments, Prominences, Coronal X-Ray Emissions, Particle (proton and electron) Ejections, Radio Bursts.	Source of energy that drives space weather phenomena.

Region	Location or Size of Region	Timescales of Features Important to AFW	Examples of Space Weather Features	Importance to Military Operations
Interplanetary Space	Between sun's corona and earth's magnetosphere.	<ul style="list-style-type: none"> - 8 minutes for radiation to reach earth. - 15 minutes to few hours for high-energy particles to reach earth. - 1 to 3 days for low to medium energy particles to reach earth. 	Solar Wind, Interplanetary Magnetic Field (IMF), Solar Particles.	Region dominated by the solar wind that impacts the earth's magnetic field.
Magnetosphere	Measured along earth-sun line: 10 times radius of earth (10 Re) toward the sun & 1000 Re behind the earth.	<ul style="list-style-type: none"> - Minutes to months. 	Radiation Belts, Electrical Currents, Earth's Magnetic Field (geomagnetic field), Geomagnetic storms.	Region of most satellite orbits, affects radio propagation.
Ionosphere	50 km - 1000 km +.	<ul style="list-style-type: none"> - Seasonal & daily variations. - Minutes to days. - Dramatic variations resulting from increased solar activity. 	Ionized Layer (D- E- F1, & F-2 Regions), Aurora, Ionospheric Disturbances.	Region affects radio propagation, satellite comm, GPS receivers, missile warning, space surveillance and space track radars.

Chapter 2

ANALYSIS AND FORECAST PROCESSES (AFP)

2.1. General. The AFP systematically guides weather personnel through a logical series of steps leading to an understanding of the current and future state of the aerospace environment.

2.1.1. Strategic weather centers and OWSs collect observations and employ analysis and forecast processes within the forecast funnel to provide timely, accurate, and relevant forecast products, gridded data fields, and support. CWTs use the AFP to assess the current aerospace weather conditions and to obtain forecast products for the MEFP.

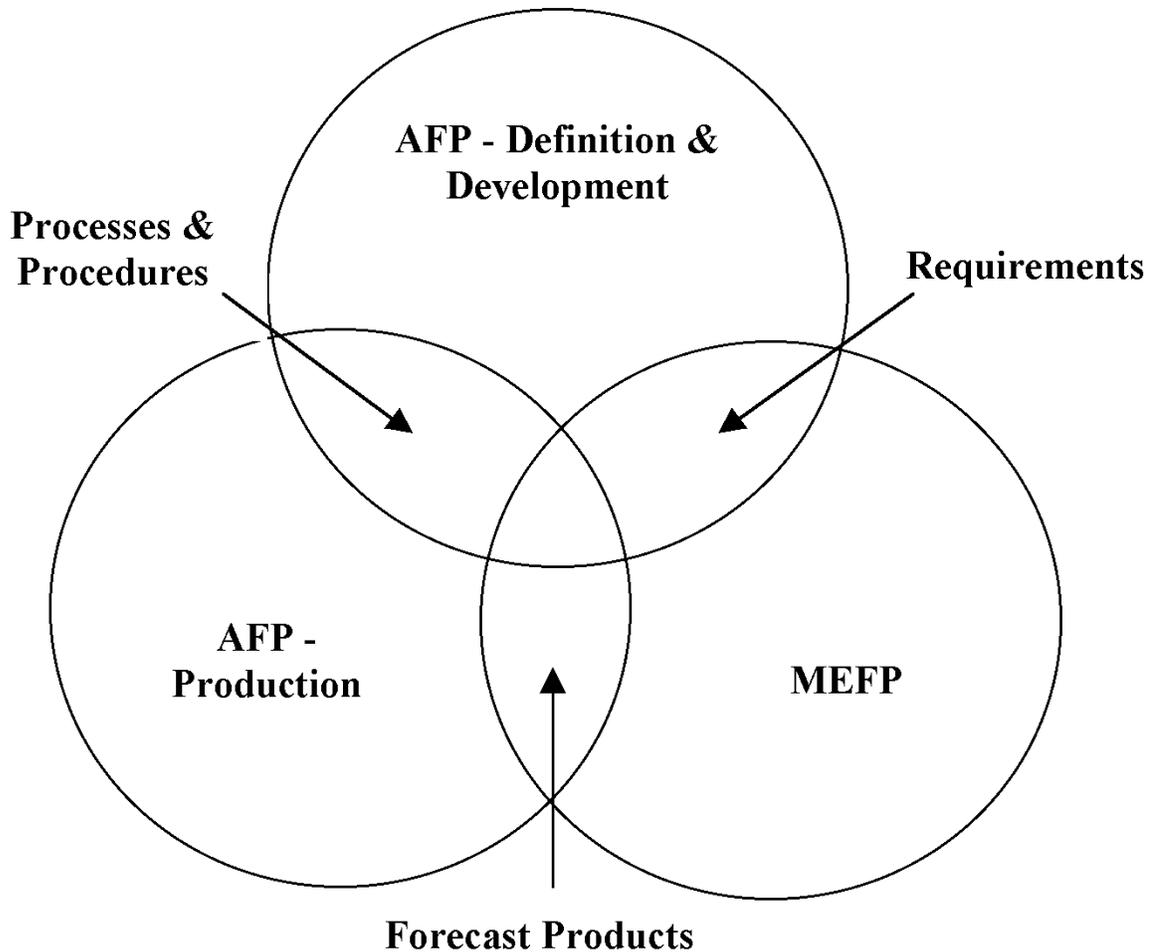
2.1.2. AFP must be focused on the aerospace weather elements and identification of potential impacts needed to support military operations.

2.1.3. The same processes and procedures are used in-garrison as when deployed to support war, contingency, exercise, or military operations other than war.

2.2. Description of AFP. The AFP has two components. The first component, AFP - Definition and Development, is a staff function that defines and develops processes and procedures for the production component of the AFP (AFP - Production). The AFP - Production component is primarily a weather operations center function that analyzes data, makes forecasts, and generates products and data bases to support military operations.

2.3. AFP and MEFP Relationship. The AFP and MEFP are not independent processes. A strategic weather center or an OWS uses the AFP to create forecast products and provide aerospace weather support in its AOR. A CWT uses the MEFP to translate forecast products developed during the AFP into mission-specific forecasts. Therefore, AFP supplies CWT products required for the MEFP, which is described in detail in AFMAN 15-135, *Combat Weather Team Operations*. **Figure 2.1.** shows how the two parts of the AFP relate to the MEFP.

Figure 2.1. Relationship Between AFP and MEFP.



2.3.1. The first interaction between the AFP and MEFP occurs when the CWT uses the MEFP to pass requirements for new products, forecasts, data, or support to the OWS and strategic weather centers. Staffs at these weather units use the AFP - Definition and Development process to define existing products or develop new products and procedures to meet the CWT's requirements.

2.3.2. The OWS and strategic weather center production work centers use the processes and procedures from the AFP - Definition and Development phase to generate products and data needed by the CWT. Additionally, there is direct feedback between the MEFP and AFP - Production process through frequent communication between the CWT and the OWS and strategic weather centers.

2.4. AFP – Definition and Development. This component requires strategic weather center, OWS, and CWT staffs to employ a systematic series of steps to effectively manage aerospace weather operations necessary to meet mission requirements. The 5-step AFP - Definition and Development component is a staff function performed at all levels within the "forecast funnel." The process is depicted in [Figure 2.2.](#) and applies to both terrestrial and space weather.

Figure 2.2. AFP - Definition and Development.

Step 1	Gather and document requirements from supported AFW unit. Consider operational capabilities and limitations of both the supplying and supported AFW unit.
Step 2	Evaluate available data, forecast models, existing products, and analysis techniques. Do existing data sources, products and techniques satisfy new requirements?
Step 3	Develop or modify processes and procedures needed to perform space scale, hemispheric scale, synoptic scale, and mesoscale analyses and forecasts.
Step 4	Determine what new products, forecasts, and services are needed. Develop new product and dissemination procedures.
Step 5	Develop forecast verification procedures to measure product accuracy, timeliness, and relevance with respect to mission requirements.
Begin Again at Step 1 and Repeat Process.	

2.4.1. Step 1: Gather and document requirements for products, forecast services and product dissemination. Requirements for new products or forecasts are typically routed through or generated from a supported unit's CWT. The strategic weather center, OWS, or CWT staff performs the following tasks in this step:

2.4.1.1. Gather and understand the mission requirements and types of terrestrial and space weather products and information required.

2.4.1.2. During the review of requirements, assess the unit's operational capabilities and limitations to ensure the unit is capable of meeting its mission requirements. Resolve limitations locally or submit the limitations to MAJCOM or higher headquarters to be worked.

2.4.2. Step 2: Evaluate existing data, forecast models, products, and techniques. The strategic weather center, OWS, or CWT staff must complete the following tasks:

2.4.2.1. Determine if existing data sources and analysis and forecast techniques can be used.

2.4.2.2. Identify new data sources and techniques. Evaluate potential sources of real-time and forecast data available to determine which are the most timely, accurate, and relevant to mission requirements.

2.4.3. Step 3: Develop or modify existing processes and procedures needed to perform analyses, to make forecasts, or to generate products. The staff must:

2.4.3.1. Continually review and refine procedures to identify weather regimes. In addition, they should evaluate times when the patterns do not match previously identified regimes to determine if new procedures are needed.

2.4.3.2. Develop, document, and effectively integrate procedures, forecast techniques, and training into the AFP production process.

2.4.3.3. Identify and document known strengths and weaknesses of the available terrestrial and space weather forecast models.

2.4.3.4. Evaluate a new or updated Numerical Weather Prediction (NWP) model's timeliness, accuracy, and relevance. Determine if processes and procedures must be changed.

2.4.3.5. Provide technical leadership. The staff must place emphasis on the science of meteorology by reinforcing the value of sound analysis and forecast procedures during weather discussions, seminars, studies, etc. Additionally, they must periodically review products and procedures as new data types, equipment capabilities, etc., become available.

2.4.3.6. Draw on expertise and information available from key agencies, the technical library, and unit experience to strengthen the analysis and forecast capability.

2.4.4. Step 4: Determine what new products, forecasts, and support are needed. The staff must:

2.4.4.1. Develop new processes, procedures, products, and dissemination methods, as required.

2.4.4.2. Identify and document who receives the various products. Determine when, how, and how often such products are generated.

2.4.5. Step 5: Develop forecast verification procedures to measure product accuracy, timeliness, and relevance with respect to mission requirements. The staff must:

2.4.5.1. Develop and use procedures to monitor the technical health and continuous improvement of the production operations workcenters.

2.4.5.2. Evaluate the technical quality of the weather products and ensure these deliverables meet mission requirements. This step provides important feedback on what procedures, techniques, communications, etc., work well and which need to be improved or removed. It also can identify the need for additional training for an individual or on a unit-level basis.

2.4.5.3. Documentation of technical evaluations can be accomplished in a variety of ways. However, emphasis will be placed on quantifying forecast products in terms of accuracy, timeliness, and relevance with respect to mission requirements. Data collection and evaluation procedures will be developed to facilitate the production and presentation of metrics, which show technical health relative to a standard and/or goal. In addition, AFW standard technical measurement and evaluation tools will be employed as part of technical verification and oversight.

2.5. AFP – Production. The AFP - Production component consists of a systematic, standardized series of steps weather personnel at strategic weather centers and OWSs complete during the daily production cycle of weather products and information. These products are focused on specific operational requirements as determined in the AFP - Definition and Development component or as otherwise identified in the course of daily operations. **Figure 2.3.** shows the five core processes in the AFP - Production cycle with references to locate the associated procedures.

Figure 2.3. AFP - Production Cycle.

Step 1	Analysis Process (Para 2.5.1.)
Step 2	Forecast Process (Para 2.5.2.)
Step 3	Product Generation Process (Para 2.5.3.)
Step 4	Disseminating Weather Products (Para 2.5.4.)
Step 5	METWATCHING and Amending AFWA/OWS FITL Products (Para 2.5.5.)
Begin Again at Step 1 and Repeat Process.	

2.5.1. Analysis Process. The analysis process is a methodical study of observed, measured, and computed data to understand the current state of the atmosphere and space environment. The process is performed for each region and scale of aerospace weather. The procedures for analyzing data will vary from visually inspecting data to marking charts to highlighting special features. Three general principles apply to all types of weather and space environment analyses. These are *scale, quality of data, and depiction*.

2.5.1.1. General Principles of Analysis.

2.5.1.1.1. Scale. Perform the analysis over the correct display area based on the type or scale of analysis. For example, a mesoscale analysis should not be performed over a global area.

2.5.1.1.2. Quality of Data. Examine and eliminate erroneous or suspect data. The best way to test the quality of data and the starting point of any analysis, is to initialize the product. Initialize all products using METSAT imagery, current upper air (UA) analysis (if applicable), RADAR products, observations, etc.

2.5.1.1.3. Depiction. Use standardized and accepted representations, symbols, and representative values in accordance with (IAW) **Attachment 3**. Draw, highlight, or isopleth significant weather features. Limit the number of features displayed on a single product to promote readability.

2.5.1.2. Standard Representation . Strategic weather centers, OWSs, and CWTs during the AFP and MEFP will use standard World Meteorological Organization (WMO)/Military Standard

(MIL-STD) meteorological symbols, line types, color representations, symbology, and isopleths. Document deviations due to system capabilities/limitations and legibility in the AFP/MEFP.

2.5.1.2.1. All AFW graphic products will have standard map backgrounds. The backgrounds will have a light blue shade for water and light brown for land. Geopolitical borders will be outlined in black. Terrain features will be minimal. Scales and projections will be representative to the respective AOR. There will be a black and white option for low bandwidth and printing.

2.5.1.2.2. **Attachment 3** contains the standard weather depictions, symbology, and isopleths used in AFW. Commonly used weather symbology also is defined in MIL-STD-2525B, *Common Warfighting Symbology*.

2.5.1.2.3. Depict severe weather analyses IAW AWS TR-200, *Notes on Analysis and Severe-Storm Forecasting Procedures for the Air Force Global Weather Central*, and AFGWC/TN-79/002, *Training Guide for Severe Weather Forecasters*.

2.5.1.3. Surface Analysis. Surface weather observations are analyzed to locate, identify, and track weather features observed from the earth's surface. At a minimum, these products will be prepared to reflect the 00Z and 12Z Coordinated Universal Time (UTC) database.

2.5.1.3.1. AFWA surface weather analyses will depict frontal positions, location of pressure systems centers, and areas of precipitation including types of precipitation on the synoptic scale for the entire globe.

2.5.1.3.2. OWS surface weather analyses will depict, at a minimum, the following features: frontal positions, isobars at 4 millibar (mb) intervals, locations of pressure system centers, and areas of precipitation to include type and intensity of precipitation for its AOR. These analyses will be made available to all CWTs supporting military operations in the AOR.

2.5.1.3.2.1. The analysis will focus on areas with routine US military operations taking place. AFWA or other weather services' synoptic-scale surface analysis or automated analyses can be used over oceans and areas with low US military activity.

2.5.1.3.3. In tropical regions of an AOR, streamlines may be used in place of isobars and circulation centers instead of pressure centers.

2.5.1.3.4. Weather analyses must maintain continuity of major weather features over their lifecycles and must be horizontally and vertically consistent with other weather data (e.g., upper air, satellite, and radar).

2.5.1.3.5. In the MEFP, CWTs visually integrate real-time surface weather observations, radar, satellite imagery, and data from other sources with AFWA and OWS surface analyses to locate and understand the movement and development of surface weather features.

2.5.1.4. Upper Air Analysis . Upper air data, including radiosonde observations, aircraft reports, Army ARTYMET soundings, and numerical weather model initialization fields, are analyzed to locate, identify, and track weather features above the earth's surface up to approximately 50,000 feet.

2.5.1.4.1. AFWA Upper Air Analysis Package. Depicts major weather systems and the large-scale circulation pattern for the global or hemispheric scale.

2.5.1.4.1.1. AFWA Hemispheric Long Wave Analysis. Depicts the 500 millibar (mb) long wave pattern, with a representative height contour and is marked to show 24-hour continuity of the long wave pattern.

2.5.1.4.1.2. AFWA Standard Upper Air Analysis. Depicts 00Z and 12Z (UTC) data cycle global- or hemispheric-scale weather features at 200 or 300, 500, and 850 or 925 mb pressure levels with appropriate height contours for the level and season, thickness levels, and jet stream positions on 300 mb charts. The set of analyses may be automated consisting of the verified initialization fields for numerical weather models.

2.5.1.4.1.3. AFWA Severe Weather Analysis. AFWA will perform and provide a separate severe weather analysis, as described in paragraph 2.5.1.6., for the Continental United States (CONUS). AFWA will also generate automated Strategic Level Threat Assessment (SLTA) products globally.

2.5.1.4.2. OWS Standard Upper Air Analysis. Depicts 00Z and 12Z data cycle synoptic to mesoscale weather features at 200 or 300, 500, 700, and 850 or 925 mb level charts (except where field elevation is above mandatory pressure level). Other pressure levels may be analyzed based on seasonal weather patterns and customer requirements.

2.5.1.4.2.1. OWS upper air analysis locates, identifies, and tracks synoptic and mesoscale weather features in its AOR. The set of analyses may be the initialization fields from numerical weather models, if they have been verified accurately and meet the spatial resolution (meso or microscale) required to support CWT operations.

2.5.1.4.2.2. Weather analyses must maintain continuity of major weather features over the features lifecycle. Weather features must maintain vertical and horizontal consistency with other weather data (e.g., other pressure levels, satellite imagery, weather radar). The charts must also maintain continuity at sufficient intervals to determine significant changes in weather systems. **Table 2.1.** contains the standard OWS upper air analysis requirements. Deviations from **Table 2.1.** because of season or geographic location (i.e., tropics versus mid-latitude) will be explained and documented in analysis procedures of the AFP.

Table 2.1. Minimum OWS Standard Upper Air Analysis.

Chart	Analyzed Parameters
<p>200 or 300 mb</p>	<ul style="list-style-type: none"> - Height contours using a base value of 9000 meters using a 120-meter interval. - High and low height centers. - Isotachs starting at 50 knots using interval of 20 knots to define jet streams (≥ 50 kts). Highlight axes of maximum wind flow ≥ 50 kts, label all speed maximas. - Areas of diffluence and confluence. - Streamlines and circulation centers may be used in lieu of height contours and height centers, especially in tropical regions.

Chart	Analyzed Parameters
500 mb	<ul style="list-style-type: none"> - Height contours using a base value of 5400 meters using a 60-meter interval. - High and low height centers. - Short-wave troughs & ridges. - Isotherms at 5°C intervals (or as required by season). - Mid-level jet (≥ 50 knots). - Moisture areas with dew point depressions (DPD) of $\leq 5^\circ\text{C}$.
700 mb	<ul style="list-style-type: none"> - Height contours using a base value of 3000 meters using a 30-meter interval. - High and low height centers. - Short-wave troughs and ridges. - Isotherms at 5°C intervals (or as required by season). - Moisture areas with DPD $\leq 5^\circ\text{C}$.
850 or 925 mb	<ul style="list-style-type: none"> - Height contours using a base value of 1500 meters (750 for 925 mb) using a 30-meter interval (or as required by season). - High and low height centers. - Short-wave troughs and ridges. - Fronts aloft. - Isotherms at 5°C intervals (or as required by season). - Highlight 0°C isotherm in blue (if applicable). - Moisture areas with DPD $\leq 5^\circ\text{C}$. - Streamlines and circulation centers may be used in lieu of height contours and height centers, especially in tropical regions. - Low-level jet (winds ≥ 30 kts).

2.5.1.4.3. In the MEFP, CWT personnel will visually integrate real-time pilot reports, radar, satellite imagery, and local data, along with AFWA and OWS upper air analyses to determine the location, movement, and development of weather features.

2.5.1.5. Standard Analysis of Upper Air Soundings (SKEW-T Charts). AFW units will make maximum use of existing upper air sounding plots and analyses already available in its AOR or use automated tools to plot and analyze raw radiosonde data. Graphical displays will include temperature and dew point vertical profiles, wind directions and speeds at mandatory reporting levels, tropopause height, and additional derived parameters (e.g., height of the freezing level, height and speed of the maximum wind, Lifted Condensation Level and Lifted Index).

2.5.1.5.1. AFWA provides an interactive application on the Joint Air Force and Army Weather Information Network (JAAWIN) to build METEOGRAMS and SKEW-Ts using the Integrated METEOGRAM and SKEW-T (IMaST) for locations around the world.

2.5.1.5.2. OWSs provide access to SKEW-T data/diagrams and forecast SKEW-T diagrams for upper air observation sites in their respective AORs.

2.5.1.5.3. In the MEFP, CWTs will review the available SKEW-T diagrams to understand the vertical structure of the atmosphere.

2.5.1.6. Severe Weather Analysis. This type of analysis identifies weather features and conditions that may lead to the development of severe weather as defined in AFI 10-229, *Responding to Severe Weather Events*.

2.5.1.6.1. AFWA's severe weather analysis package will contain 200, 300, 500, 700, 850, and 925 mb level charts and a surface chart (except where field elevation is above mandatory pressure levels) for the CONUS only. The analysis package will be done for the 00Z and 12Z (UTC) data cycles. **Table 2.2.** contains the standard severe weather analysis requirements.

Table 2.2. AFWA Standard Severe Weather Upper Air Analysis.

Chart	Analyzed Parameters
<p>200/ 300 mb</p>	<ul style="list-style-type: none"> - Flow streamlines. - Isotachs in red every 20 knots starting with 50 knots. - Axes of maximum wind flow ≥ 50 kts, label all speed maximas. - Diffluent regions and areas of speed divergence (≥ 30 kts/90 nm). - Height falls (300mb only) using same procedures as 500 mb. - Warm and cold pockets. - Circulation centers (cyclones C, anticyclones A).
<p>500 mb</p>	<ul style="list-style-type: none"> - 60-meter contours, use 5400m as baseline. - Axes of maximum wind flow ≥ 30 kts or greater (≥ 40 kts in winter), label all speed maximas. - Height centers and central values. - 12 hr height falls every 30m. If the center exceeds 180m, draw height fall isopleths every 60m. Label center with an X and the maximum value. - Diffluent regions and areas of speed divergence (≥ 30 kts/90 NM.). - Isotherms every 2°C. - Moisture areas of DPD $\leq 6^\circ\text{C}$. - Thermal (cold) troughs and warm/cold pockets.

Chart	Analyzed Parameters
700 mb	<ul style="list-style-type: none"> - Flow streamlines. - Axes of maximum wind flow ≥ 30 kts, label all speed maximas. - Isotherms ≥ 6 °C at 2-degree intervals, highlight 0°C isotherm in blue (if applicable). - Moisture areas of DPD ≤ 6°C. - Circulation centers (cyclones C, anticyclones A). - Dry air intrusions, dry air (10°C degrees drier) intruding into a significant moisture field (DPD < 6°C).
850/ 925 mb	<ul style="list-style-type: none"> - Streamlines and depict axes of confluent winds. - Axes of maximum wind flow: ≥ 25 kts, label all speed maximas. - Isotherms every 2 °C, highlight 0°C isotherm in blue if applicable). - Thermal ridges and warm/cold pockets. - Isodrosotherms every 2°C for values of ≥ 10°C at 925mb and ≥ 6°C at 850mb. - Axes of maximum dew points. - Moisture areas (outside of 6°C isodrosotherms) for areas of DPD ≤ 6 °C. - Circulation centers (cyclones C, anticyclones A). - Dry air intrusions (see 700 mb), Do not depict dry intrusions immediately upwind of a moisture axis.
Surface	<ul style="list-style-type: none"> - Fronts, troughs, and confluent zones. Track fronts until no longer discernable. - Pressure centers and central value. - Dry lines, meso-highs, outflow boundaries, squall lines. - Moisture ridges and axes of maximum moisture advection. - Thermal ridges. - Isallobars and highlight anallobars (pressure rises) and katallobars (pressure falls). - Tropical depressions, tropical storms and cyclones (typhoons), as required.

2.5.1.6.2. All CONUS OWSs will use AFWA's severe weather analysis package for the CONUS. CONUS OWSs and CWTs will only produce regional and local severe weather products.

2.5.1.6.3. OWSs outside CONUS (OCONUS) and OWSs with OCONUS AORs will perform region-tailored severe weather analyses needed to provide resource protection to supported units. **Table 2.2.** should be used as a guide, but specific analysis parameters and thresholds will depend on the region. OWS' severe weather analysis may be combined with the standard upper air analysis to avoid duplication of effort and enhance the ability to overlay respective fields.

2.5.1.6.4. The following documents provide "best practices" for severe weather analysis techniques: *Thunderstorm Indices*, Air Weather Service Meteorological Enhancement Team Pamphlet; AFWA TN-98/002, *Meteorological Techniques*; AWS TR-200, *Notes on Analysis and Severe-Storm Forecasting Procedures for the Air Force Global Weather Central*; and AFGWC/TN-79/002, *Training Guide for Severe Weather Forecasters*.

2.5.1.7. Meteorological Satellite (METSAT) Imagery and Satellite Data Analysis. This analysis identifies weather systems from cloud patterns and measurement of radiative properties of clouds. It also directly and remotely measures the space environment.

2.5.1.7.1. AFWA uses infrared (IR), visible, and microwave METSAT imagery to initialize/verify numerical models and to determine the position and intensity of tropical cyclones.

2.5.1.7.1.1. AFWA/SPACEWOC will analyze data from space environmental sensors on METSAT and other satellites to assess and monitor current conditions in the solar and near earth space environment. Space weather features analyzed are listed in **Table 2.3**.

Table 2.3. Space Weather Features Analyzed from Satellite Data.

<p>Solar:</p> <ul style="list-style-type: none"> - Coronal Mass Ejections (CME). - Coronal Holes. - Plages, active regions, and sunspots. - Solar Flares (Solar x-ray emissions). - Prominences and Filaments. 	<p>Magnetosphere:</p> <ul style="list-style-type: none"> - Geomagnetic field: strength and directional components. - Energetic particle counts.
<p>Interplanetary Space (e.g., L-1 orbit between earth and sun):</p> <ul style="list-style-type: none"> - Solar wind: speed, density, and temperature. - Interplanetary Magnetic Field: strength and directional components. 	<p>Ionosphere:</p> <ul style="list-style-type: none"> - Aurora: position and intensity. - Scintillation. - Total Electron Counts (TEC).

2.5.1.7.2. Each OWS will analyze water vapor METSAT imagery to determine the location, movement, and development of weather systems within its AOR. As a minimum, analyze and label the 00Z and 12Z METSAT water vapor imagery for upper level jet streams and vorticity maximas. OWSs may include this product as a feature of their 200/300 mb analysis. This product will be used for model verification and the starting point at the top of the forecast funnel.

2.5.1.7.2.1. Each OWS will provide a satellite image that depicts surface features to include fronts, pressure centers, and tropical cyclone positions minimally at 00Z and 12Z.

2.5.1.8. Weather Radar Analysis . This identifies precipitation patterns, movement, and intensity by monitoring reflectivity and Doppler velocity products.

2.5.1.8.1. AFWA CONUS Severe Forecast Operations (CSFO) uses enhanced dial-up radar displays to visually monitor movement and to interrogate the development, intensities, types, and trends of weather features (mainly thunderstorms) having the potential for the occurrence

of weather warning and advisory criteria. The CSFO also uses radar data to develop the CONUS MWA products.

2.5.1.8.2. OWSs use weather radar data to visually monitor and interrogate radar products to determine intensities, types, movement of weather features and the potential for weather watch, warning, or advisory criteria as outlined in **Chapter 3**. When OWS personnel detect a possible radar signature indicating severe weather (e.g., tornadoes, comma clouds, storm rotation, low-level wind shear), they will notify the supported units affected as soon as possible.

2.5.1.9. Analysis of Numerical Weather Prediction (NWP) Models.

2.5.1.9.1. NWP model analysis requires effective initialization and verification prior to application for forecast products. Weather personnel must evaluate data on the synoptic scale or the mesoscale, depending on the scale of the model and support requirements in the AOR. The intent of this step is to assess the accuracy of the model of consistency and make necessary adjustments applied in the AFP.

2.5.1.9.2. AFWA Model Output. AFWA posts or disseminates post-processed NWP model output for regions around the world at least twice per day.

2.5.1.9.2.1. AFWA's model output are machine-generated products in the form of visualizations or data fields focused on the mesoscale and synoptic scale.

2.5.1.9.2.2. The AFWA staff will present recommendations for weather parameter values and color schemes of their visualizations to the Weather Product Standardization Board (WPSB).

2.5.1.9.2.3. OWSs and CWTs will send requests to change existing or add new NWP output products through their chain of command to the AFWA Requirements Branch (XOR).

2.5.1.9.2.4. AFWA routinely analyzes output from the mesoscale model and computes the model's performance (e.g., bias) to adjust the model.

2.5.1.9.3. AFWA Space Operations Center (SPACEWOC) Model Output. SPACEWOC provides output from space weather models that specify current state (called Specification Models) or forecast the future state (called Forecast Models) of the space environment.

2.5.1.9.3.1. The AFWA staff will present recommendations for space weather parameter values and color schemes of their visualizations to the WPSB.

2.5.1.9.3.2. Send requests to change existing or add new output products from space weather models to the AFWA/XOR.

2.5.1.9.4. OWS Standard Forecast Model Package. OWSs will select and analyze a "model of consistency" for the supported AOR. OWSs will develop procedures for analyzing the model of consistency depending on the forecast regimes, the AOR, etc. Procedures will include how to maintain continuity of significant weather features at intervals determined by the OWS technical staff.

2.5.1.9.4.1. Produce forecast model products at 12-hour intervals starting at the base hour (e.g., 00Z or 12Z) through the 72-hour point for parameters listed in **Table 2.4**. OWSs may automate all upper air criteria except 500 millibar (mb) troughs and ridges. OWSs will only produce features that can be automated for 200/300, 700, 850, and 925 mbs. All sur-

face parameters except fronts and troughs may be automated. Local procedures will define specific parameters analyzed based on weather regime and model output available. OWSs may analyze either the 300 mb *or* 200 mb package, and either the 850 mb *or* 925 mb package depending on location, regime, etc. OWSs with tropical AORs may adjust analysis procedures as appropriate for the location (e.g., use streamlines).

Table 2.4. Typical Weather Features Analyzed in Model Output.

Chart	Parameters
300 or 200 mb Package	<ul style="list-style-type: none"> - Height contours and isotachs (same as Table 2.1.). - Areas of diffluence and confluence.
500 mb Package	<ul style="list-style-type: none"> - Height contours and temperatures (same as Table 2.1.). - Seasonal representative contour, maintain continuity to determine significant weather changes. - High and low height centers. - Short-wave troughs and ridges. - Vorticity isopleths. - Significant areas of RH (e.g., area of 50%/70%/90%).
700 mb Package	<ul style="list-style-type: none"> - Height contours and temperatures (same as Table 2.1.). - High and low height centers, and troughs and ridges. - Identify significant areas of RH. - Contour vertical velocity values of > +3 microbars/sec. - Quantitative Precipitation Forecast (QPF) output 0.25 inches (or as required).
850 mb Package	<ul style="list-style-type: none"> - Height contours and temperatures (same as Table 2.1.). - High and low height centers. - Significant areas of RH. - Isotachs. - 0°C isotherm in blue (if applicable).
925 mb Package	<ul style="list-style-type: none"> - Height contours and temperatures (same as Table 2.1.). - Areas of convergence and divergence. - Significant areas of RH (e.g., area of 50/70%/90% RH). - High and low centers.
Surface Package	<ul style="list-style-type: none"> - Isobars at 4 mb intervals. - Fronts, troughs, pressure centers and tropical cyclones. - Areas of precipitation.

2.5.1.9.4.2. The OWS determines the numerical weather model that most accurately forecasts the weather conditions in its AOR and provides the information to AFWA. This model becomes the model of consistency. Parameters listed in [Table 2.1.](#), [Table 2.2.](#), and [Table 2.4.](#) should be used to select the model of consistency and to assist in modifying timing and strength of features on available model outputs.

2.5.1.9.4.3. Ensure the model is verified, initialized, and checked for trends as soon as possible after data receipt. The procedures are a continuous process and must be performed for each run of the model.

2.5.1.9.4.3.1. Verify the current model's performance by comparing positions of significant features from the 12- or 24-hour forecast chart to satellite imagery and other real-time data from the same time. Look for discrepancies (i.e., too fast, too slow, too weak, too strong). The OWS will identify which weather features to track and will maintain continuity from one forecast period to the next.

2.5.1.9.4.3.2. The 00-hour forecast positions from the new model output are initialized by comparing significant features to satellite, upper air, and other analysis data for the same time. For example, initialize the 500 mb vorticity product by comparing major short-wave troughs to satellite imagery near the same time and the 500 mb analysis. If the model's initial placement of significant features agrees with the real-time data, the rest of the model run may be used with a higher degree of confidence, but still may require adjustments. If significant features do not agree with the 00-hour forecast, then obvious adjustments will have to be made, and the model run may be suspect.

2.5.1.9.4.4. Each OWS will provide a model discussion to include verification of the current run, initialization of the new model, and necessary adjustments.

2.5.1.9.4.5. Suggested references on model initialization include T-TWO #18, *Analysis, Initialization, and Model (AIM) Run*; *COMET Forecast Process*; *COMET Numerical Weather Prediction*; and AWS/TN-88/001, *Satellite Imagery Interpretation for Forecasters*.

2.5.1.10. Weather Regimes. Identify the synoptic and mesoscale weather regimes. The OWS will use local procedures, checklists, and tools to determine the weather regimes found in the AOR. Knowledge of the regimes will be used in the forecast process. The AFWA Qualification Training Package (QTP) on Synoptic Meteorology Regimes is an excellent source of information for determining weather regimes.

2.5.1.11. Space Environment. Weather personnel will use products from the strategic center to obtain an awareness of the current state of the space environment.

2.5.2. Forecast Process. The forecast process guides weather personnel in developing a prediction of the future state of the aerospace environment from 1 hour out to several months.

2.5.2.1. Local Procedures and Checklists. Local procedures and checklists will assist weather personnel in using the appropriate techniques and tools for the type of forecast and weather regime. Some commonly used techniques and tools include continuity and persistence, climatology, Numerical Weather Prediction (NWP) models, forecast techniques, rules of thumb, worksheets, and Forecast Reference Notebooks (FRNs).

2.5.2.2. Continuity and Persistence. Continuity and persistence is one of the best forecast technique for short-term forecasts (first 6 hours). The forecaster uses analysis products (e.g., surface analysis, upper air and sounding data, radar data, satellite imagery) to identify trends in movement, intensity, pattern of sensible weather (e.g., lows, high, fronts, precipitation, jet streams). These trends are extrapolated outward into the future. The forecaster must decide if continuity and persistence are applicable based on the weather regime, and other tools and techniques (e.g., conditional climatology table, rules of thumb, model output). AFWA TN-98/002, *Meteorological Techniques*, provides additional details.

2.5.2.3. Climatology. Climatological data can define extremes or typical trends based on long-term data (e.g., stratified-wind conditional climatological tables and modeled diurnal curves). Climatology should be used with other forecast tools and techniques.

2.5.2.4. Numerical Weather Prediction (NWP) Models . NWP models are excellent forecast tools and provide the interactive databases needed to generate initial weather effects tactical decision aids, which forecasters should verify and adjust (if necessary) before giving to the customer.

2.5.2.4.1. Synoptic models (e.g., NOGAPS, MRF, UKMO, AVIATION, ECMWF) are generally used for 1-10 day forecasts or synoptic-scale products.

2.5.2.4.2. Mesoscale models (e.g., MM5, RUC, ETA, BFM, COAMPS, JMA, and LAM) are generally used for forecasts for a few hours to 3 days or mesoscale products.

2.5.2.4.3. AFWA TN-98/002, *Meteorological Techniques*, describes the best forecast practices for using NWP products.

2.5.2.5. Forecast Techniques and Rules of Thumb. AFW units will use proven forecast techniques and rules of thumb to forecast weather conditions.

2.5.2.5.1. Forecast Techniques. All AFW units will determine which forecast techniques and tools work the best to forecast the weather in their AOR. Units will document, maintain, and use the appropriate forecast techniques and tools to develop forecasts and products for weather regimes in the AOR.

2.5.2.5.1.1. Forecast technique/training documents, such as AFWA QTPs, Technical Notes (TN), Technical Reports (TR), Forecast Memorandums (FM), and For Your Information (FYI) provide AFW-approved best forecast practices for forecasting a variety of weather and space environmental conditions. The Air Force Weather Technical Library (AFWTL) and AFWA's Technical Training Branch (DNTT) maintain these documents, many of which are on-line. Other military and civilian operational forecast centers also publish forecast technique documents.

2.5.2.5.2. Forecast Rules of Thumb (ROT). ROTs are locally developed forecasting procedures. All AFW units will use rules of thumb to identify weather and space environmental regimes and make applicable forecasts. Before a forecast rule of thumb can be used alone in the forecast process, it must be developed, verified, and documented.

2.5.2.5.2.1. ROT Development. Draft initial ROT procedures describing when to use the ROT, parameters and key thresholds to examine, and the resulting forecast.

2.5.2.5.2.2. ROT Verification. Use the ROT with other forecast tools and techniques for one season or for more than 30 events to determine validity and value of the ROT. If the

ROT is valid in most cases and adds value, then integrate the ROT into the AFP. If the ROT is not valid, discard the ROT or modify and re-verify it.

2.5.2.5.2.3. ROT Documentation. Document ROTs in the Forecast Reference Notebook (FRN) and integrate them into standing operating procedures, forecast worksheets/checklists, etc., as applicable.

2.5.2.5.2.4. Crossfeed new ROTs that may be useful to others through the MAJCOM for further crossfeed to AFWA/DNT.

2.5.2.6. Forecast Worksheets/Checklists. Weather personnel use worksheets and checklists to logically and consistently work through the forecast process. Worksheets and checklists also document the reasoning used to develop the forecast.

2.5.2.6.1. Strategic weather centers and OWSs will develop worksheets or checklists to guide weather personnel in performing specific functions within the operations, and to aid in the development of forecaster-in-the-loop (FITL) products (i.e., theater hazards, surface products, Military Weather Advisories, space weather forecasts, etc.), and other forecast products. Use the following guidelines to develop worksheets/checklists:

2.5.2.6.1.1. Design to help forecast specific terrestrial, space, and ground mission-limiting thresholds.

2.5.2.6.1.2. Integrate the tools (e.g., products, key parameters, forecast techniques, and ROTs) for different seasons, regimes, and atmospheric patterns in order to lead the weather technician to a logical and consistent meteorological forecast.

2.5.2.6.1.3. Can be hardcopy, softcopy, computer-aided, or web-based technology.

2.5.2.6.2. Each OWS will develop appropriate worksheets, checklists, or suitable alternate products to assist in forecasting the weather conditions and parameters needed to produce Aerodrome Forecasts (TAFs); Weather Watches, Warnings, Advisories; MOAFs; and other forecast products.

2.5.2.6.3. Each CWT will develop MEFP worksheets/checklists IAW Chapter 3, AFMAN 15-135, *Combat Weather Team Operations*.

2.5.2.6.4. AWS/TR-97/001, *Preparation of Terminal Aerodrome Forecast Worksheets*, provides guidance on developing worksheets to help produce TAFs.

2.5.2.7. Forecast Reviews and Studies. Forecast reviews and studies are completed to improve the unit's forecast capability and process. All AFW units must develop a process that meets this intent. The process must be documented, consistent, and lead to positive results.

2.5.2.7.1. Forecast reviews must be short (typically three pages or less), simple to complete, and focused on a specific part of the forecast process. The forecast review briefly outlines the tools and reasoning used to make the forecast or product and describes what could be done to improve or reinforce the AFP.

2.5.2.7.2. Each AFW unit determines what forecasts or products typically will be examined for potential review. The unit leadership will assess the need for reviews and assign those reviews. Generally the following areas are used to determine if a review is required:

2.5.2.7.2.1. Processes and Procedures. Are the processes and procedures adequate, clearly stated, and executable? Possible action: Modify local processes and procedures or implement new technology.

2.5.2.7.2.2. Technical. Was sound technical reasoning used? Were appropriate analysis and forecast processes, forecast techniques and tools, and ROTs applied? Was the missed forecast significant to supporting military operations? Was an extraordinary weather event accurately forecast? Possible action: Individual or team making the forecast or product is assigned to accomplish and present a forecast review.

2.5.2.7.2.3. Training. Could the individual or unit benefit from a review? Possible action: Individual, team, or entire unit provided with additional training.

2.5.2.7.3. Forecast studies are a more detailed and longer term analysis of a specific event, type of phenomenon, or forecast challenge. Forecast studies may lead to new forecast techniques and tool, or ROTs.

2.5.2.7.3.1. AFW units will crossfeed significant forecast reviews and studies to their MAJCOM for further crossfeed to AFWA/DNT.

2.5.2.7.3.2. The following references provide guidance for accomplishing high-quality forecast reviews and studies: FYI #24, *A Layman's Guide To Developing A Forecast Study*; AWS/TN-79/002, *Forecast Reviews and Case Studies*; AWS/FM-86/001, *Creating Instant Experience/How to Make a Forecast Study*; and 2WW/FM-86/003, *Forecast Reviews*.

2.5.2.8. Forecast Reference Notebooks (FRNs). The FRN provides AFW personnel with information on the local area climatology, forecast techniques, forecast regimes, etc. All levels within the forecast funnel will integrate FRN information into the AFP and MEFP.

2.5.2.8.1. Strategic centers will develop or acquire FRNs for routinely supported locations, as required.

2.5.2.8.2. OWSs will develop and maintain paper or electronic FRNs, at minimum, for each supported CWT in their AOR. They will also develop and maintain FRNs for other military air and ground locations (as required) for which they have a recurring forecast responsibility in their AOR.

2.5.2.8.2.1. FRNs will, as a minimum, contain the site's location and operational areas, area topography, local effects, the location of meteorological sensors and limitations (e.g., sensor blockage), local climatology, forecast regimes, proven forecast techniques/tools, and ROTs. It will also contain the information on the supported weapon systems, their weather sensitivities, and critical mission-limiting weather thresholds of supported units at that location and other routinely used locations (i.e., frequently used ranges, LZs, DZs, training areas).

2.5.2.8.3. The CWT will provide the OWS suggested updates to weather sections as required, changes in airfield equipment, weapon systems assigned and their sensitivities, and any local changes that may have an affect on forecasts created for the CWT.

2.5.2.8.4. AFW units will review the FRNs seasonally for forecast application updates. They will also ensure unit personnel review applicable FRNs at least seasonally.

2.5.2.8.5. The following documents may assist in the development of FRNs: 7WW/FM-90/003, *Terminal Forecast Reference Notebook*, and 2WW/FM-86-001, *Terminal Forecast Reference Notebook*.

2.5.2.9. Space Weather Forecasts. OWSs and CWTs do not produce space weather forecasts. However, personnel at all levels of AFW must understand and apply space weather forecasts prepared by the strategic center to the supported units' operations.

2.5.3. Product Generation Process. This process converts forecast conditions into specific forecast products. The products may be for a specific point or for a large region. Formats of the products also vary from alphanumeric text bulletins to simple hand drawn graphical presentations to automated visualizations. The product generation process varies from unit to unit. AFWA, AFWA/SPACEWOC, and OWSs will have an established production cycle. CWTs and AFCCC may generate products for supported units as required.

2.5.3.1. Specialized or new climatological, terrestrial weather, or space environmental products or services can be requested by submitting a Support Assistance Request (SAR). See paragraph 2.9. for SAR procedures.

2.5.3.2. AFWA Products. The AFWA production center generates a variety of alphanumeric text bulletins, forecaster-in-the-loop (FITL) products, and automated visualizations.

2.5.3.2.1. AFWA Text Bulletins. AFWA will produce bulletins to support specific missions or types of missions. If bulletins contain coded information, AFWA will make the code breakdown readily available. All AFWA-produced bulletins will be ICAO/WMO compliant. AFWA will also make alphanumeric text bulletins (e.g., observations, TAFs, discussions) from other weather organizations available on its web page. For a complete listing of all AFWA bulletins and alphanumeric products, refer to the product catalog on JAAWIN.

2.5.3.2.2. AFWA FITL Products. AFWA (when functioning as an OWS) will develop standardized two- and three-dimensional mesoscale forecast products needed to support military operations in its AOR as depicted in **Figure 1.9.** of AFI 15-128, *Aerospace Weather Operations - Roles and Responsibilities*. For its AOR, AFWA will generate products listed in **Table 2.9.** following procedures outlined in paragraph 2.5.3.5.3. AFWA will also generate the CONUS MWA described in **Table 2.5.** based on the AFWA severe weather analysis products.

2.5.3.2.2.1. AFWA will also produce a suite of products to include upper- and lower- level icing and turbulence, and surface pressure, fronts, and weather depictions IAW **Table 2.9.** These products will integrate OWS-produced charts to maximize horizontal and vertical consistency for CONUS and high-use military operating areas (e.g., major strategic airlift routes) that encompass two or more OWS AORs. This product suite will be dynamically updated (i.e., amended) IAW **Table 2.14.** OWS and AFWA graphic production personnel will coordinate with each other to ensure product accuracy and consistency is maintained at all times. Refer to the product catalog on JAAWIN for a complete listing and description of all AFWA FITL products.

2.5.3.2.2.2. Category II (CAT II) criteria for aircraft turbulence, and icing and turbulence types and intensity definitions are provided in AFWA TN-98/002, *Meteorological Techniques*. Icing and turbulence type and intensity definitions are also provided in the DoD Flight Information Handbook. **NOTE:** Do not use FAA aircraft categories for turbulence forecasts. These are based on weight and are not the same as aircraft turbulence categories.

Table 2.5. AFWA CONUS Military Weather Advisory (MWA).

Products	Weather Parameters	Threshold Values	Map Depictions
MWA (3X daily)	- Tornadoes	- Tornado	- All depictions as defined in Attachment 3 .
MWA Outlook Convective & Nonconvective (once daily)	- Thunderstorms	- Severe thunderstorms (hail $\geq 3/4$ " and/or winds ≥ 50 kts) - Moderate thunderstorms (hail $1/2$ " - $5/8$ " and/or gusts 35-49 kts) - General thunderstorms (hail $< 1/2$ " and wind gusts < 35 kts)	
MWA Weekend Outlook Thurs & Fri, Tornadoes and Severe Thunderstorms only (48/72/96 hour)	- Non-convective Winds	- Surface winds ≥ 35 kts, not associated with thunderstorms	
	- Precipitation	- Heavy rain (≥ 2 " in ≤ 12 hrs) - Heavy snow (≥ 2 " in ≤ 12 hrs) - Freezing precipitation - Blizzard	

2.5.3.2.3. AFWA Automated Products. AFWA will produce or make available numerous sets of automated products and visualizations from NWP models. These include meteograms and global, hemispheric, and regional NWP map displays and graphics from other weather organizations. Automated products are not amended. For a complete listing of all AFWA automated products, refer to the product catalog on JAAWIN.

2.5.3.2.3.1. As part of the automated product suite, AFWA will produce model-based Strategic Level Threat Assessment (SLTA) products from the Mesoscale Model Version 5 (MM5), Aviation Model (AVN), and the Medium Range Forecast (MRF) model. There will be two types of SLTA products. One type will depict surface hazards (similar to the AFWA MWA) and the other will depict upper-air hazards above 10,000 feet (i.e., thunderstorms, icing, and turbulence). There will also be two scales of SLTA products. The AVN- and MRF-based SLTA products will be in hemispheric scale for both the Northern and Southern Hemisphere, and the MM5-based SLTA products will in the synoptic scale for the CONUS, Europe, Southwest Asia, and Pacific theaters. AFWA will host the SLTAs on JAAWIN. See [Table 2.6](#). for the breakdown of scale, valid periods, and parameters on the SLTA products.

Table 2.6. AFWA Strategic Level Threat Assessment Products.

Products	Weather Parameters	Threshold Values	Map Depictions
MM5-Based Surface Every 3 hours from 00-72 Hours (45 KM Window) Every 3 hours from 06 to 48 hours (15km Window)	<ul style="list-style-type: none"> - Severe Thunderstorms - Freezing Rain - Snow - General Thunderstorms - Rain - Surface Winds 	<ul style="list-style-type: none"> - Hail $\geq 3/4$" and/or winds ≥ 50 kts - Same - ≥ 1 inch in 3 hours - Hail $< 3/4$" and wind gusts < 50 kts - $\geq 1/2$ inch in 3 hours - ≥ 30 kts 	Solid Blue Solid Red Solid Grey Solid Orange Solid Green Black Contour
MM5-Based Upper Air Every 3 hours from 00-72 Hours (45 KM Window) Every 3 hours from 06 to 48 hours (15KM Window)	<ul style="list-style-type: none"> - Thunderstorms - Icing - Turbulence - Overlapping Icing and Turbulence 	<ul style="list-style-type: none"> - Any convection activity - Moderate or greater above 10,000 feet MSL - Moderate or greater above 10,000 feet MSL - Areas of both moderate or greater icing and turbulence 	Solid Orange Solid Brown Solid Blue Solid Green
AVN-Based Surface Every 6 hours from 06-120 Hours (Hemispheric Scale)	<ul style="list-style-type: none"> - General Thunderstorms - Freezing Rain - Snow - Rain - Surface Winds 	<ul style="list-style-type: none"> - Any convection activity - Same - ≥ 1 inch in 6 hours - ≥ 1 inch in 6 hours - ≥ 30 kts 	Solid Orange Solid Red Solid Grey Solid Green Black Contour
AVN-Based Upper Air Every 6 hours from 06-120 Hours (Hemispheric Scale)	Same as MM5-Based Upper Air Product	Same as MM5-Based Upper Air Product	Same as MM5-Based Upper Air Product
MRF-Based Surface Every 12 hours from 00-384 Hours (Hemispheric Scale)	<ul style="list-style-type: none"> - General Thunderstorms - Freezing Rain - Snow - Rain - Surface Winds 	<ul style="list-style-type: none"> - Any convection activity - Same - ≥ 2 inch in 12 hours - ≥ 2 inch in 12 hours - ≥ 30 kts 	Solid Orange Solid Red Solid Grey Solid Green Black Contour
MRF-Based Upper Air Every 12 hours from 00-384 Hours (Hemispheric Scale)	Same as MM5-Based Upper Air Product	Same as MM5-Based Upper Air Product	Same as MM5-Based Upper Air Product

2.5.3.2.4. AFWA text bulletins and the products listed in [Table 2.5.](#), [Table 2.6.](#), and [Table 2.9.](#) are standardized products under WPSB control. Products under WPSB control will not

change content or format without approval through the WPSB management process described later in this chapter.

2.5.3.2.5. Model Data Output. This process converts model data output into gridded databases and fields for a specific point or a large region for Tactical Decision Aids (TDA), Command & Control (C2), and Common Operating Picture (COP) applications.

2.5.3.3. Solar and Space Environment Products and Forecasts. AFWA/SPACEWOC and the National Oceanographic and Atmospheric Administration (NOAA) Space Environmental Center (SEC) issue joint discussions and forecast bulletins for solar activity, earth's magnetic field, and the near-earth space environment. For a complete listing of all solar, magnetospheric, ionospheric, geomagnetic bulletins and alphanumeric products refer to the catalog on JAAWIN.

2.5.3.3.1. Solar Forecasts. AFWA/SPACEWOC will issue 3-day forecasts providing the following solar events: probability of occurrence of C-, M- & X- class solar flares and solar proton events during the 24-hour period, daily values of F10.7 cm radio flux, sunspot number, and overall solar activity (quiet, active, and very active).

2.5.3.3.2. Geomagnetic. AFWA/SPACEWOC will issue 3-day forecasts providing the 24-hour averaged planetary amplitude (geomagnetic) index - called A_p , the probability of occurrence of active geomagnetic conditions ($A_p = 15 - 29$), minor geomagnetic storms ($A_p = 30 - 49$) and major - severe geomagnetic storms ($A_p \geq 50$) for mid-latitude (20 - 50 degrees geomagnetic latitude) and polar (above 50 degrees geomagnetic latitude) regions.

2.5.3.3.3. Ionospheric. AFWA/SPACEWOC will issue daily forecasts describing the regional radio propagation conditions for High Frequency (HF) and Ultra High Frequency (UHF). It also provides specific point-to-point radio propagation forecasts and scintillation forecast upon request.

2.5.3.4. Climatology. Climatological and statistical information on seasonal, monthly, and diurnal variations in local weather patterns and tracks can greatly assist the AFP. A comprehensive array of climatological products and services are available from Air Force Combat Climatology Center (AFCCC). See AFCCC's web page for instructions for requesting products and services.

2.5.3.4.1. Surface Observation Climatic Summary (SOCS). CWTs will maintain a current copy of the Surface Observation Climatic Summary (SOCS) and other climatological products, as required for their location. Units must keep the local climatology records up to date by developing procedures to record the occurrence of new extreme values (e.g., wind speed, maximum and minimum temperatures). Request updated versions of station climatology if the existing copy is more than 10 years old or the station has a year where numerous records were broken.

2.5.3.4.2. Conditional Climatology (CC). Use of conditional climatology data greatly enhances the success rate of TAFs and MEFs. AFW units will maintain CC data for all TAF installations as well as any range, military operating area, or other supported facility or operating area as available from AFCCC. **NOTE:** CC data can only be constructed if a sufficient record of weather observations exists for that location. CC data will be considered for each TAF or MEF produced and documented on supporting developmental worksheets/checklists, as required. CC data will be maintained or readily available at locations providing OWS back-up support.

2.5.3.4.2.1. Wind-Stratified Conditional Climatological (WSCC) tables provide percent occurrence of cloud ceiling and visibility categories stratified for wind direction for periods out to 48 hours. AFW units should maintain WSCC tables, as required.

2.5.3.4.3. Modeled Diurnal/Annual Curves (MODCURVES). Units may use the electronic MODCURVES program along with standard CC Tables. MODCURVES displays the diurnal or annual changes of the following weather variables: temperature, dewpoint, relative humidity, altimeter setting, and pressure altitude.

2.5.3.4.4. Modeled Ceiling and Visibility (MODCV). Units may use the electronic MODCV program along with standard CC Tables. MODCV is an interactive program that calculates and displays conditional and unconditional probabilities of category values of ceiling, visibility, and joint ceiling and visibility. MODCV displays the category probabilities in tables or single- and multiple-hour bar charts.

2.5.3.5. OWS Products. OWSs will develop standardized two- and three-dimensional mesoscale forecast products needed to support military operations in its AOR. These products will be a mixture of alphanumeric bulletins, FITL graphics, and automated visualizations. OWSs will have the capability to take post-processed model output data provided by AFWA and use indigenous sources to develop products and visualizations. Additionally, the OWS will post and/or disseminate space weather products for the AOR. A complete list of all routine OWS products will be displayed on the OWS home page.

2.5.3.5.1. OWS Text Bulletins. Each OWS will produce alphanumeric bulletins that are relevant to supporting military operations within their AORs. All OWS-produced bulletins will be ICAO/WMO compliant. If bulletins are not in a common format, the OWS will provide a legend or code breakdown on the bulletin, its web page, or in other documents (e.g., Memorandum of Agreement [MOA]).

2.5.3.5.2. Aerodrome Forecast (TAF). OWSs and a few designated weather units are responsible for producing, disseminating, and amending TAFs for Active Duty USAF and USA airfields within their AORs. If the US National Weather Service (NWS) or another weather service issues a TAF for an airfield and that TAF meets the supported units' requirements, the OWS will not be required to issue a separate TAF. The TAF product is a forecast containing the cloud cover, cloud heights, and visibility for general flight rule conditions (IAW AFI 11-202, Volume 3, *General Flight Rules*; and AR 95-1, *Flight Regulations*), as well as wind, altimeter, and other weather parameters needed to support landing and takeoff of aircraft. TAFs will be encoded IAW AFMAN 15-124, *Meteorological Codes*.

2.5.3.5.2.1. Standard AFW TAFs will be valid for 24 hours IAW AFMAN 15-124.

2.5.3.5.2.2. TAFs are issued every 8 hours, within 15 minutes after file time during forecast service hours, except as noted below. The OWS staff will coordinate with the supported CWT to determine TAF issue times based on CWT requirements and production cycle capacity.

2.5.3.5.2.3. OWSs issuing a TAF for limited-duty (non-24-hour) CWTs must use one of the following remarks. The type and level of forecast support provided to limited-duty locations will be coordinated with supported customers and documented in the local WSD and the OWS-CWT formal agreement. See AFMAN 15-124 for remarks coding instructions.

2.5.3.5.2.3.1. LAST NO AMDS AFT YYGG NEXT YYGG. The airfield is closed and the local customer does not require a TAF. TAFs for limited operation airfields will be available 3 hours prior to the beginning of airfield operating hours. **NOTE:** TAFs will remain available as long as the installation control tower remains open.

2.5.3.5.2.3.2. LIMITED METWATCH YYGG TIL YYGG. The TAF continues and is amended for, at minimum, all weather warning criteria. OWSs may amend for other criteria within their capability as agreed upon with the CWT. The remark is used when the airfield is closed and the OWS continues TAF support, or when operational situations necessitate. OWS will also use this remark when automated sensor data is available, but not for all amendment criteria and conditions.

2.5.3.5.2.3.3. AUTOMATED SENSOR METWATCH YYGG TIL YYGG. The TAF continues and is amended for ALL amendment criteria and conditions based on data from an automated surface observation system (not supplemented by weather personnel). The remark is used when the airfield is closed and the OWS continues TAF support, or when operational situations necessitate. OWSs will not use this remark if an outage prevents display of ANY sensor data used to METWATCH amendment criteria and conditions.

2.5.3.5.2.4. Disseminate all TAFs (including amendments and corrections) via the AFW standard dissemination system into the Automated Weather Network (AWN).

2.5.3.5.2.5. Specification Criteria. TAFs (scheduled or amended) will specify time of occurrence to the nearest hour (and/or minute as appropriate), the duration, and intensity of the minimum criteria in **Table 2.7**. OWSs (and other TAF producing units as applicable) may specify additional criteria in TAFs based on local customer requirements.

2.5.3.5.2.5.1. TAFs for locations with helicopter operations will also specify **700 & 500 feet** ceiling heights, and **1 mile** visibility and field minimums **less than 1/2 mile**.

2.5.3.5.2.6. TAF Amendment Criteria/Conditions. OWSs and designated weather units will ensure TAFs are representative of expected or actual conditions. The OWS will amend the TAF for amendment criteria and conditions listed in **Table 2.7** and **Table 2.8**. MAJ-COMs and OWSs may add amendment thresholds for their unique customer support requirements. However, OWSs should refrain from amending for mission-limiting weather criteria that are better supported by the local CWT in MEFs to their customers.

Table 2.7. Standard AFW TAF Amendment Criteria.

Forecast Element/ Occurrence	Standard AFW TAF Amendment Criteria	
Ceiling and/or Visibility observed or later expected to decrease to less than, or if below, increase to equal or exceed:	Category	Limits
	D	≥ 3,000 feet/4800 meters (3 miles)
	C	< 3,000/4800 and ≥ 1,000 feet/3200 meters (2 miles)
	B	< 1,000/3200 and ≥ 200/0800 meters (1/2 mile)
	A	< 200/0800 meters (1/2 mile)
Surface Winds:	<p>The difference between the predominant wind speed and the forecast wind speed is ≥ 10 knots and/or the difference between the observed gust is ≥ 10 knots from the forecast gust. For example, a forecast of 23018G25KT must be amended if observed predominant wind speed is 28 knots or more, or if the observed gusts are 35 knots or higher. Similarly, amend the TAF if predominate winds are 8 knots or less, or gusts are 15 knots or less.</p> <p>Direction change > 30 degrees when the predominant wind speed or gusts are expected to be over 15 knots.</p>	
Icing , not associated with thunderstorms, from the surface to 10,000 feet AGL:	The beginning or ending of icing first meets, exceeds, or decreases below moderate or greater thresholds and was not specified in the forecast.	
Turbulence (for Cat II aircraft), not associated with thunderstorms, from the surface to 10,000 feet AGL:	The beginning or ending of turbulence first meets, exceeds, or decreases below moderate or greater thresholds and was not specified in the forecast.	
Forecast Weather Warning criteria and/or TAF Amendable Weather Advisory criteria – including non-convective low-level winds shear:	<p>Occur, or are expected to occur, during the forecast period, but were not specified in the forecast.</p> <p>Were specified in the forecast, but are no longer occurring or expected to occur during the forecast period.</p>	
Thunderstorms:	- Incorrect by forecasted start or end time.	
Other:	- As required by the installation Weather Support Document.	

Table 2.8. TAF Amendment Conditions.

- Anytime an unforecast change occurs or is expected to occur, is expected to last at least 30 minutes, and is not forecast by the next whole hour from the time of occurrence (e.g., if the time is 2147Z, the next whole hour is 2200Z, not 2300Z.).
- Anytime a forecast condition does not occur by the specified hour and is not expected to occur within the next 30 minutes. For example, a BECMG 2122 group would require an amendment if the forecast change occurred before 2101Z or after 2229Z. If a 2-hour BECMG group is used (e.g., BECMG 2022), and the change occurred anytime in the 2000 hour (e.g., 2015), an amendment WOULD BE necessary at 2100, not 2200, because it is the next whole hour.
- Anytime a temporary (TEMPO) group becomes predominant or is not expected to occur.
- Anytime in the interest of safety, efficiency of aircraft operations, flight planning, operational control, or in-flight assistance to aircraft to ensure the forecast is representative of actual or forecast conditions.
NOTE: Local amendments do not need to be transmitted longline unless they meet USAF standard amendment conditions and criteria.

2.5.3.5.2.7. While supporting local flight operations, the CWT will also monitor the weather conditions at the airfield and act as the OWS' "eyes forward."

2.5.3.5.3. OWS Forecaster-in-the-Loop (FITL) Products. OWS weather personnel adjust machine-derived products (e.g., model output) to create FITL products. All OWSs will generate products listed in [Table 2.9](#). OWSs supporting OCONUS AORs will generate Military Weather Advisory (MWA) products as described in [Table 2.10](#). for the EUCOM, PACOM, CENTCOM, and SOUTHCOM theaters. OCONUS OWSs may need to adjust the standard criteria and threshold values to meet theater requirements.

2.5.3.5.3.1. OWSs will produce products for the entire AOR that are used by AFWA to develop the integrated products for CONUS and high-use military operating areas encompassing two or more OWS AORs as referenced in paragraph 2.5.3.2.2.1.

2.5.3.5.3.2. OWSs are not required to produce standardized products (except for those in paragraph 2.5.3.2.2.1.) over regions not routinely used by the US military. Customers operating in areas where standardized products are not available can request them from the theater OWS by using the SAR procedures in paragraph 2.9., or by defining the products in a Joint Operations Letter of Instruction.

2.5.3.5.3.3. The OWS will operate on a once-per-day production cycle beginning with the 00Z OWS "model of consistency" output. The products listed in [Table 2.9](#). will be available to customers NLT 09Z valid for the 12, 18, 24, 30, 36, and 48 forecast hours. The OWS will use the 12Z model of consistency output to amend products as required.

2.5.3.5.3.4. The OWS thunderstorm, icing, and turbulence products will be Time-Phased (TP) identifying areas of forecast features for 3 hours before and 3 hours after the central hour. For example, the 12Z icing product would identify forecast icing areas from 09-15Z, and the 18Z product from 15- 21Z.

2.5.3.5.3.4.1. OWSs will produce the TP turbulence forecasts as two separate products, with low-level (LL) forecasts from the surface to 10,000 feet on one chart, and upper-level (UL) forecasts from above 10,000 feet to 50,000 feet on another chart.

Turbulence areas on the LL products that extend beyond 10,000 feet will be forecast to the top of the layer and be consistent with areas on the UL products.

2.5.3.5.3.4.2. All forecast heights on OWS thunderstorm, icing, turbulence, and cloud products will be depicted as above Mean Sea Level (MSL). OWSs will take into account the general terrain heights throughout the AOR to prevent forecasting MSL bases below the general heights. This does not include the small-scale changes in terrain heights (e.g., mountain peaks and valleys), which will be integrated into the local MEF.

2.5.3.5.3.5. The OWS horizontal weather depiction (HWD); surface pressure, fronts, and weather forecast; and cloud products will Point-in-Time (PIT) identifying forecast features valid at the time of the product (e.g., 12Z).

2.5.3.5.3.5.1. All forecast heights on OWS HWD products will be depicted as Above Ground Level (AGL).

2.5.3.5.3.6. All areas will be as refined as feasible without overly cluttering the chart. The products will be amended IAW [Table 2.14](#).

Table 2.9. AFWA/OWS Flight Weather Products.

Products	Weather Parameters	Threshold Values	Map Depictions
Theater Icing Forecast—TP (12/18/24/30/36/48)	- Mesoscale icing (outside thunderstorms). Rime, Clear (CLR) mixed (MXD) icing (surface - 50,000 feet MSL to the nearest 1000 feet).	- Light (LGT). - Moderate (MDT). - Severe (SVR). - Height of Freezing Level.	- As defined in Attachment 3 .
Theater Turbulence Forecast—TP (12/18/24/30/36/48)	- Mesoscale turbulence (outside thunderstorms). Mechanical, Mountain Wave (MTN WV), Clear Air (CAT) turbulence (surface - 10,000 feet & above 10,000 feet - 50,000 feet MSL to the nearest 1000 feet).	- Light (LGT). - Moderate (MDT). - Severe (SVR). - Extreme (EXTRM).	- As defined in Attachment 3 . <i>NOTE:</i> The 11th and 25th OWS do not forecast light turbulence and may adjust to AGL heights in their AORs due to terrain.

Products	Weather Parameters	Threshold Values		Map Depictions
Theater Thunderstorm Forecast—TP (12/18/24/30/36/48)	- Theater-scale convective activity.	Coverage & TAA ISOLD: 1 - 24 % FEW: 25 - 49 % SCT: 50 - 74 % NMRS: > 74 %	Blocks on DD Form 175-1 1 - 2 % 3 - 15 % 16 - 45 % > 45 %	- Thunderstorm symbol, maximum tops (MSL), and amount of coverage (ISOLD, FEW, SCT, NMRS).
Horizontal Weather Depiction (HWD)—PIT (12/18//24/30/36/48)	- Ceiling and Visibility.	Areas: - < 3000/5 (USAF alternate airfield required). - < 1500/3 (USAF fixed-wing IFR). AGL.		- As defined in Attachment 3 .
Theater Surface Pressure, Fronts, and Weather Forecast—PIT (12/18/24/30/36/48)	- Mesoscale surface pressure centers and values, fronts, troughs. - Sensible weather. - Tropical cyclone positions (as required, from official hurricane forecast centers).	- As displayed. Fronts maintained as long as air mass discontinuity exists.		- As defined in Attachment 3 .
Theater Cloud Forecast—PIT (12/18/24/36/48)	- Mesoscale cloud ceilings (low, middle, and high clouds between 5,000 and Tropopause (about 55,000 ft MSL)).	- Broken (BKN) or Overcast (OVC) cloud cover.		- As defined in Attachment 3 .

Table 2.10. OWS MWA Product for OCONUS.

Product	Weather Parameters	Threshold Values	Map Depiction
Military Weather Advisory/MWA (2X daily)	- Same as Table 2.5.	- Same as Table 2.5.	- Same as Table 2.5.

2.5.3.5.3.7. During the initial product production, OWSs will collaborate and strive to mesh the borders of their AOR to ensure areas of forecast mission-limiting parameters crossing the AOR mesh with the areas of the bordering OWSs. Specifically, areas of thunderstorms and moderate or greater turbulence and icing will be meshed to greatest extent possible. Time permitting, OWSs should attempt to mesh frontal position and associated weather, and areas on HWD products.

2.5.3.5.3.7.1. OWSs will collaborate and mesh the areas of mission-limiting criteria during major exercises, contingencies, and actual military operations; and when amending products.

2.5.3.5.3.7.2. If significant disagreement exists on the threshold value of hazardous weather between AORs, the OWS with the most severe threshold will take precedence.

2.5.3.5.4. OWS Automated Products. Each OWS will produce or make available automated products and visualizations developed from NWP data. OWSs will generate automated products based on the operational requirements of customers in the AOR and the OWS production system capability. To conserve resources, OWS should not generate/duplicate model products that AFWA routinely generates as part of its standard model product suites. OWSs should leverage these products from AFWA.

2.5.3.5.4.1. OWS automated products are regional or theater depictions generated routinely or seasonally to support requirements in their AOR. [Table 2.11.](#) provides the minimum products with weather parameters and threshold values each OWS produces through the 72 hour point.

Table 2.11. OWS Automated Products.

Weather Parameters	Minimum Threshold Values
Surface Wind Speed	10 knot intervals beginning at 5 knots. Highlight 13, 17, and 50 knots.
Surface Temperature	Every 10° F. Highlight the 32° isotherm.
Wind Chill Temperature	Beginning at 0° F, every 10° F below that value. <i>NOTE:</i> The 11 OWS adjusts thresholds accordingly for Alaska.
Thermal Heat Indices	Every 5° F and up beginning at 85° F. <i>NOTE:</i> OWSs will clearly mark the type of index created (e.g., Fighter Index of Thermal Stress).

2.5.3.5.5. OWS Product Control. Products listed in [Table 2.9.](#) through [Table 2.11.](#) are standardized products under the WPSB control. Products under WPSB control cannot change content or format without approval through the WPSB Process described later in this chapter.

2.5.3.5.6. Military Operating Area Forecasts (MOAFs). MOAFs are alphanumeric products produced by OWSs (and other AFW units as required) that provide weather data needed in a CMEF and the CWT's MEFP. OWSs may supplement MOAFs with graphics products, as required. OWSs will produce MOAFs using worksheets or checklists as directed in paragraph [2.5.2.6.2.](#)

2.5.3.5.6.1. OWSs may routinely issue MOAFs for high-use military operating areas (e.g., AR, DZ, LZ, training areas, etc.), or issue upon request by the lead weather unit for multi-unit missions (see [Chapter 5](#)). OWSs may also issue MOAFs for a specific mission or operation as coordinated by the supported CWT. [Table 2.12.](#) defines the standard weather parameters included in MOAFs. Additional weather parameters and different thresholds can be used to support specific operations as specified by the customer and coordinated by the CWT, or the lead weather unit (if applicable). [Attachment 9](#) contains example formats of individual types of MOAFs. The relationship between MOAFs and MEFs is further described in Chapter 4 of AFMAN 15-135.

2.5.3.5.6.2. Unless otherwise specified by the customer, MOAFs for point-specific locations where aircraft conduct operations in close proximity to the ground (i.e., DZs, LZs, FARRRPs, low-altitude orbits, ground training ranges, VFR military training routes (VR), and slow-speed low-altitude training routes (SR), etc.) will depict forecast heights as Above Ground Level (AGL). This rule does not apply to IFR Military Training Routes (IR).

2.5.3.5.6.3. MOAFs for higher-altitude flying areas (i.e., ARs, high-altitude orbits, ACM/Ts, etc.) and IFR Military Training Routes (IR) will depict forecast heights as above MSL. **NOTE:** OWSs will clearly identify AGL and MSL heights on MOAFs to avoid mistakes in interpretation.

Table 2.12. Standard Weather Parameters Included in a MOAF.

Higher-Altitude MOAFs	Standard Weather Parameters
Aerial Refueling (AR) Tracks, High-Altitude Orbits, Air Combat Maneuver/Training (ACM/T) Areas, IFR Military Training Routes (IR)	<ul style="list-style-type: none"> - Degree of cloud cover, and heights of cloud bases and tops of layers (as specified by the customer). - In-flight visibility (AR), and other MOAFs, as required. - Turbulence (CAT II) & Icing (moderate or greater). - Thunderstorm coverage and MAX tops (as described in Table 2.9). - Include winds and temperatures, as required (as specified by the customer). - Minimum altimeter for duration of mission (as required).
Lower-Altitude MOAF	Standard Weather Parameters
Drop Zones (DZ), Landing Zones (LZ), VFR Military Training Routes (VR), Slow-Speed Low-Altitude Training Routes (SR), Forward Area Refueling, Rearming & Refitting Points (FARRRPs), Training Ranges (e.g., Nellis Range, Eglin Range, National Training Cen- ter at Ft Irwin, etc.), Extraction Zones (EZ), Target Areas, Low-Altitude Orbits	<ul style="list-style-type: none"> - Degree of cloud cover, and heights of cloud bases and tops of layers (as specified by the customer). - Surface visibility, as required. - Surface weather. - DZ winds and temperatures at the surface, 200, 500, 700, 1000, 1,500, 2,000, and 3,000 or a specified drop altitude (AGL). Include wind and temperature forecasts for additional altitudes as required, and as specified by the customer for other MOAFs. - Turbulence (CAT II) & Icing (light or greater). - Thunderstorm coverage and MAX tops (as described in Table 2.9). - Minimum altimeter for duration of mission (as required). - MAX/MIN temperature F° or C° (as required). - LLWS (as required).

NOTE:

1. Route, Orbit, ACM/T MOAFs. Provide forecasts for weather parameters at the route/orbit altitude for the duration of the mission. Provide forecasts for weather parameters within **25 miles** either side of the planned route/orbit, and **within 5,000 feet** above and below the route/orbit (or as specified by the customer for VR/IR missions).
2. AR MOAFs. Provide forecasts for weather parameters within **25 miles** either side of the AR track and **within 5,000 feet** above and below the AR track. Provide forecasts for weather parameters valid for **30 minutes before** entering the AR track to **1 hour after** exiting.
3. LZ MOAFs. Prepare LZ MOAFs for the specific location in TAF format, or as required by the customer. Valid time will be **1 hour before** and **1 hour after** period of the mission.
4. EZ MOAFs. Prepare EZ MOAFs for the specific location in TAF or DZ format, depending on the extraction altitude and customer requirements. Valid time will be **1 hour before** and **1 hour after** period of the mission.
5. Format MOAFs for Target Areas, FARRRPs, Combat Maneuver Areas, Instrument/Low Level Routes, Tactical Ranges, and Gunnery Ranges as required by the customer. Valid time will be **1 hour before** and **1 hour after** period of the mission.

2.5.3.5.7. MOAF Amendments. OWSs will amend MOAFs for the criteria listed in **Table 2.13**, as defined by the supported customer and coordinated by the CWT, or the lead weather unit for multi-unit missions.

Table 2.13. MOAF Amendment Criteria.

1. For all MOAFs, incorrect forecast of the mission-limiting standard parameters list in **Table 2.12**, as defined by the supported customer and coordinated by the CWT, or the lead weather unit (if applicable).
2. Vertical extent incorrectly forecast within **5,000 feet** above and below all higher-altitude MOAFs.
3. Horizontal extent incorrectly forecast within **25 miles** either side of all higher-altitude MOAFs.
4. Representativeness for all MOAFs.

2.5.3.5.8. Other OWS Products. OWSs may produce additional products to meet requirements from CWTs based on specific operational necessities or unique weather regimes in their AOR. Customers can request specific products from the theater OWS by following the SAR procedures in paragraph **2.9**.

2.5.3.5.8.1. When requesting MEF-type products from an OWS, the requestor will provide security guidance and all 12-step MEFP information relevant to the request. For detailed information on the MEFP, refer to AFMAN 15-135, *Combat Weather Team Operations*.

2.5.3.5.9. Leveraging Products. OWSs will leverage unique products available from other DoD agencies. For example, the Navy produces worldwide oceanographic products. OWSs supporting CWTs that need such specific products will provide appropriate links on their web page to the products.

2.5.3.6. Long Range Outlooks.

2.5.3.6.1. AFWA produces visualization products for numerous weather parameters based on several forecast models. The products are valid at various increments from the 00-hour period to 15 days depending on the model used. The products are generated from the latest model run of the specific model from which they are built. Routinely generated AFWA visualizations are available on JAAWIN under "Model Charts." AFW units may request specific model visualizations by submitting a SAR following procedures in paragraph 2.9.

2.5.3.6.1.1. AFWA/SPACEWOC issues several extended outlook products on a daily basis. The first product contains 27-day predictions of the daily F10.7 cm radio flux and 90-day mean of F10.7 cm flux. The second product contains a 45-day prediction of the F10.7 cm radio flux and the Ap Geomagnetic Index. AFWA/SPACEWOC, in coordination with the National Atmospheric and Oceanic Administration's (NOAA) Space Environmental Center (SEC), provides DoD organization outlooks on the 11-year solar cycle.

2.5.3.6.2. AFCCC provides long range outlooks for any location in the world for the period 10 days to 12 months, upon request from supported units. Outlooks covering specific mission parameters (e.g., cloud ceiling and visibility, precipitation, temperature) are based on NWP output, statistical analysis, climatology, and atmospheric and oceanic general circulation patterns (e.g., El-Nino pattern). Request support from AFCCC using procedures in paragraph 2.9.

2.5.4. Disseminating Weather Products.

2.5.4.1. AFWA will post products listed in [Table 2.5.](#), [Table 2.6.](#), and [Table 2.9.](#), including long-range outlooks, surface, upper air and CONUS severe weather analyses, space weather analysis and forecasts, and other forecast products on its web pages (e.g., JAAWIN and JAAWIN-S) on Non-Classified Internet Protocol Router Network (NIPRNET) and Secure Internet Protocol Router Network (SIPRNET). AFWA will transmit those products and data requiring assured delivery through a variety of avenues including common user communication and satellite communication networks (e.g., Very Small Aperture Terminal [VSAT]). AFWA will distribute/deliver alphanumeric data and redistribute OWS data (as required) to appropriate CWT clients.

2.5.4.1.1. AFWA will ensure, as a minimum, the products listed in [Table 2.2.](#), [Table 2.5.](#), [Table 2.6.](#), [Table 2.9.](#), and worldwide TAFs and observations are available as required.

2.5.4.1.2. AFWA will provide post-processed NWP output data to OWSs.

2.5.4.2. OWSs will post products listed in [Table 2.9.](#) through [Table 2.12.](#), including surface analyses, upper air analyses, model of consistency package, METSAT analyses, outlooks, forecast discussions and other forecast products on its NIPRNET and SIPRNET and on its home page. OWSs will also transmit required products and data via common-user communication and satellite communication networks (e.g., VSAT), as required to support operations in its AOR.

2.5.4.2.1. OWSs will disseminate weather watches, warnings, and advisories (as described in [Chapter 3](#)) using N-TFS/AMIS or a similar dissemination system, as required. OWSs will post a summary of current OWS-issued watches, warnings, and advisories to its NIPRNET/SIPRNET and home page. They will disseminate Aerodrome Forecasts to supported units using N-TFS/AMIS.

2.5.4.3. CWTs may post MEFs and other aerospace weather information on a local web page in accordance with guidance from the local installation web master and published AFW guidance.

2.5.5. METWATCHING and Amending AFWA/OWS FITL Products. Standardized flight hazard, surface weather products, and MWAs will be METWATCHED and amended for the criteria listed in **Table 2.14**. **NOTE:** Other parameters may be amended as necessary per coordination with supported customers and AFWA.

Table 2.14. Amendment Criteria for AFWA/OWS FITL Products.

1. Thresholds listed in **Table 2.5**, and **Table 2.9**, incorrectly forecast.
2. Vertical extent incorrectly forecast by 2000 ft.
3. Horizontal extent incorrectly forecast by 90 nautical miles.
4. Representativeness.

2.5.6. Retention and Disposition of Forecast Products. All AFW units will establish processes to effectively retain and dispose of weather information, analysis, and forecast products. AFMAN 37-139, *Records Disposition Schedule*, 15-series Tables contain the policies, procedures, and technical guidance governing the retention of aerospace environmental products.

2.6. Lead Meteorologist. The lead meteorologist is the person responsible for leading weather support operations during the work shift.

2.6.1. Strategic weather centers and OWS production or operations centers will develop procedures for the lead meteorologist to review products and perform quick-look technical verification of products to assess the accuracy of products issued during the work shift.

2.6.2. AFWA has a lead meteorologist for the following functional areas:

2.6.2.1. The AFWA chief forecaster oversees all production at AFWA, performs model evaluation, quality controls all FITL products, and ensures horizontal consistency between products within each section.

2.6.2.2. CSFO's lead meteorologist is responsible for the team performing severe weather analysis, maintaining nationwide meteorological watch, and generating severe weather forecast products (e.g., MWAs).

2.6.2.3. The Special Support Operations Branch (SSOB) lead meteorologist is responsible for the team providing support to Special Operations Forces and contingency operations.

2.6.2.4. The AFWA/SPACEWOC shift leader is responsible for all space weather forecasts, products, and warnings issued during the shift.

2.6.3. The OWS lead meteorologist determines the synoptic situation for the day, identifies the regional forecast problems, and conducts weather discussions with shift forecasters to coordinate daily forecast reasoning, product development, and other assigned duties.

2.6.4. At the CWT, the senior CWT member serves as or designates a lead meteorologist for the shift or day. This person ensures the latest observations, warnings, watches, advisories, and forecasts are available to all weather team members. The CWT lead meteorologist is the single point of contact ensuring communication between the OWS and the CWT is effective and not redundant. The lead meteorologist ensures a team member augments the automated weather observing equipment or takes manual observations IAW AFMAN 15-111, *Surface Weather Observations*. He or she will also ensure

the appropriate number of CWT members are assigned to provide MEFs and briefings, support the Supervisors of Flying, and complete other weather support duties as required.

2.7. Meteorological Discussions and Shift Change Briefings.

2.7.1. Meteorological Discussions. Meteorological discussions are essential to ensure personnel have a common understanding of the current and forecast conditions, to reduce time CWTs spend on gaining situational awareness, and to pass on forecast reasoning.

2.7.1.1. The AFWA CSFO will conduct a severe weather teleconference at least once per day to discuss the severe weather analysis, the potential for severe weather, and the current/forecast MWA. The time and phone number for the teleconference will be posted on JAAWIN. Additionally, a text bulletin discussing the reasoning and potential for severe weather will be posted on JAAWIN.

2.7.1.1.1. AFWA NWP Model Evaluation. AFWA will evaluate the forecast performance of the various NWP models used by AFWA and AFW units (e.g., MM5, AVN, ETA, NOGAPS, MRF) against observations, satellite data, or any other source of ground truth. AFWA will generate performance statistics and will make this information available on JAAWIN. AFWA will also perform real-time verification of MM5 and provide users graphical information on JAAWIN illustrating how well the current and previous model runs are performing. AFWA will also generate strengths and weaknesses of MM5 and tips for use and make these data available on JAAWIN.

2.7.1.1.2. AFWA/SPACEWOC will work with SEC to issue discussion bulletins that explain significant events and trends in solar activity (i.e., solar flares, coronal mass ejections) space weather (solar wind conditions), and geomagnetic activity.

2.7.1.2. OWSs will develop standardized regional analysis/forecast meteorological discussion products and make these discussions and upper-air analyses packages available to supported CWTs in advance of any scheduled verbal meteorological discussion. Discussion of mission changes and critical weather elements will be conducted over secure communications as necessary. As a minimum, OWS meteorological discussion products will include a description of the items listed in [Table 2.15](#). The amount of detail discussed will depend on the situation.

Table 2.15. Minimum Items Included in OWS Discussions.

<ul style="list-style-type: none"> - Current upper air pattern. - Hazardous weather in the AOR to include severe weather, turbulence, icing, precipitation, winds, low ceilings/visibilities, and other items deemed significant to the OWS forecaster. - Current regimes and air mass. - Space weather (if relevant to daily operations). 	<ul style="list-style-type: none"> - Model of consistency and performance. - Initialization/verification. - Significant synoptic and regional weather features. - Significant weather features in current meteorological satellite imagery. - Pertinent OWS operations information (e.g., scheduled outages and product availability), if applicable.
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2.7.1.2.1. OWS - CWT meteorological discussions will be conducted with supported CWTs as necessary. The OWS will coordinate the format, frequency, and means of discussions with CWTs in its AOR.

2.7.1.3. CWTs will use meteorological discussion information provided by the OWS to aid in the MEF process. In addition, CWTs will conduct internal meteorological discussions as required, and may contact the supporting OWS at their discretion to discuss meteorological situations. CWT leaders will develop procedures for conducting meteorological discussions.

2.7.2. Shift Change Briefings. Shift change briefings will be conducted to pass meteorological and operational information from the off-going personnel to the on-coming personnel. Workcenter leaders will develop procedures outlining these briefings and ensure that all available weather personnel attend. **Attachment 2** contains a meteorological discussion/shift change briefing guide.

2.8. OWS Product/Mission Assumption Priorities. **Table 2.16.** outlines the functional priorities OWSs will follow as they begin producing products and assuming the support responsibilities for CWTs in their AOR.

Table 2.16. Product/Mission Assumption Priorities.

OWS Function	Components
1. Site Support	Watch/Warning/Advisory TAFs
2. Aircrew Support	Flight Weather MEFs CMEFs
3. Regional Products	Hazard Products and OCONUS MWAs Discussion Bulletins MOAFs Mission Planning Products

2.9. Requesting Specialized Weather Support.

2.9.1. AFW units and other supported customers will use a Support Assistance Request (SAR) when requesting specialized terrestrial, space, or climatological support from the AFW strategic centers (i.e., AFWA, AFCCC), or specialized theater-level support from servicing OWSs for their respective AOR.

2.9.1.1. To determine the servicing OWS in an AOR, refer to Air Force Visual Aid 15-2 (CONUS) and 15-3 (OCONUS) by selecting the "Crossfeeds" link on the AFWA Field Support Division (AFWA/XOP) web page currently at: <https://wwwmil.offutt.af.mil/afwadnt>. **NOTE:** The AFVAs and the XOP web page address are subject to change.

2.9.2. AFW units will ensure supported USAF customers, other US Military Services, and US DoD or Government Agencies are knowledgeable of the SAR process. Units will direct agencies needing specialized support to the appropriate strategic center or OWS and guide them through the SAR process to make their request.

2.9.3. AFW units or other agencies may submit SARs for recurring, infrequent, or one-time support. If the SAR is for support that must be delivered under strict time constraints (e.g., contingencies or exercises), submit it with sufficient time to allow the strategic center or OWS to work the request effectively. For recurring support, units may develop a "pre-positioned" SAR with the appropriate strategic center or OWS that can be activated short-notice by telephone, fax, or e-mail.

2.9.4. Construct SARs following the example in **Attachment 10**. Select one of the following categories to identify the type of mission needing specialized support.

2.9.4.1. *Category A*. Combat mission or contingency support.

2.9.4.2. *Category B*. Exercise support.

2.9.4.3. *Category C*. Peacetime support.

2.9.5. Submit requests for unclassified support directly to the appropriate strategic center or OWS using the SAR function at the "Field Support" link on JAAWIN, or directly from the OWS home page. JAAWIN is currently at: https://weather.afwa.af.mil/cgi-bin/nfgwc.cgi?h_index.txt); however, the address is subject to change. Units may also submit requests for unclassified support via telephone, fax, or e-mail.

2.9.5.1. Submit requests for classified support using the SAR function on JAAWIN-S or the classified OWS home page on SIPRNET. Units may also submit requests for classified support via secure telephone, fax, or e-mail.

2.9.6. If there is a problem in providing the support, the strategic center or OWS will contact the requestor to clarify the requirement and to discuss alternatives, if required.

2.9.7. AFW units will encourage agencies submitting a SAR to provide feedback on the quality, effectiveness, and value of support directly to the appropriate strategic center or OWS.

2.10. Weather Product Standardization Process. The Weather Product Standardization Board (WPSB) process ensures supported units have access to a common set of products that provide similar format content and presentation across AORs.

2.10.1. The WPSB selects, approves changes, and documents standardized weather products and AFW web pages. The WPSB does this through the following tasks:

2.10.1.1. Establishes standardized information displayed such as colors for landmass, water, and political boundaries used for specific visualizations.

2.10.1.2. Limits the number of products under control to only those products that must be meshed at AFWA and routinely used by supported units where non-standardized products may cause confusion (e.g., different formats of flight products for CONUS AORs).

2.10.1.3. Defines the standard, structure, and content for NIPRNET/SIPRNET home pages produced by the OWS for weather and operational customers.

2.10.2. The WPSB will meet at least every October and March. This meeting may be done via a teleconference, if issues before the WPSB can be discussed adequately in this forum. The WPSB chair may call more frequent meetings.

2.10.3. HQ USAF/XOWP serves as the WPSB and IMETS Software Configuration Control Board Chairperson. One representative from AFWA, AFWA/SPACEWOC, all OWSs, and each MAJCOM owning an OWS will serve as a member of the WPSB. The WPSB chair may invite other individuals to the meeting, as required.

2.10.3.1. The Director of Weather is the final decision authority on identifying the products placed under control, approving changes and granting waivers for deviations to products under WPSB control.

2.10.3.2. WPSB members will present candidate products for standardization, proposed changes and request for waivers from their units. They will review all issues brought before the WPSB. They will provide comments, impacts to their unit, and recommendations to the WPSB chair. WPSB members must be familiar with the operations of the units they represent.

2.10.3.3. Invited guests to the WPSB meeting will provide special technical advice to the WPSB chair.

2.10.4. One month prior to the WPSB meeting, members must send proposals to the WPSB chair identifying candidate products for board control, changes to existing products or requests for waivers. The chair sends the proposals to all other members for review.

2.10.4.1. Proposals for candidate products must include an example of the product and reason for placing the product under control.

2.10.4.2. Proposal for changes must include an example of the change, reason for the change and benefit of the change.

2.10.4.3. Requests for waivers must include an example of the waiver, reason for the request, and the impact if the request is rejected.

Chapter 3

METEOROLOGICAL WATCH AND RESOURCE PROTECTION PROCESSES

3.1. Meteorological Watch(METWATCH) Process. Certain aerospace weather conditions endanger life or property, pose a safety hazard, or adversely impact mission operations. After supported agencies specify their mission-limiting weather parameters, strategic weather centers, OWSs, and CWTs perform various types of METWATCH for these conditions and provide information, products, and services to supported agencies when adverse conditions are observed or forecast to occur. For detailed CWT resource protection procedures, refer to AFMAN 15-135.

3.1.1. Definition of METWATCH and MISSIONWATCH.

3.1.1.1. METWATCH . The purpose of the METWATCH is to provide a controlled and organized approach for weather personnel to maintain situational awareness of the current/future meteorological situation within a designated area(s). A METWATCH will focus on detecting unforecast changes in the weather. These changes include incorrect timing, location, or forecast values (e.g., ceiling too high or low). Upon detecting the unforecast change, weather personnel will notify all supported units and begin the process to amend the forecast product.

3.1.1.1.1. AFWA/SPACEWOC performs a type of METWATCH by monitoring observations from various regions in the space environment. The purpose and actions taken during this METWATCH are the same as described above.

3.1.1.2. MISSIONWATCH . MISSIONWATCH is the process of monitoring aerospace weather during a specific mission (e.g., ground, air, or space). It focuses on mission-limiting meteorological impacts to ongoing military operations.

3.1.2. METWATCH Procedures . AFW units performing METWATCH must develop procedures for the following tasks:

3.1.2.1. Identify all geographic areas, information, products, and services requiring METWATCH.

3.1.2.2. Define the minimum set of air and ground mission-limiting weather parameters to METWATCH.

3.1.2.3. Establish the frequency and duration for which air and ground mission-limiting parameters will be checked.

3.1.2.4. Outline the actions to be taken when forecast conditions change during the METWATCH. Specify what units are contacted with the primary and back-up methods of contact (e.g., telephone, e-mail, phone patch).

3.1.3. MISSIONWATCH Procedures. Weather units issuing MEFs will develop procedures to perform MISSIONWATCH during the entire mission.

3.1.3.1. Define mission critical parameters to METWATCH. OWSs maintain the Operations Weather Limiters Network (OWL NET) on their web sites. OWL NET provides a searchable database of documented thresholds and sensitivities for weapons systems, aircraft, and military operations. All AFW units should use OWL NET as a baseline and adjust thresholds as needed per documented customer requirements.

3.1.3.2. Define who will contact the mission director or commander and the method of contact if significant changes occur or the MEF must be amended.

3.1.4. METWATCH and MISSIONWATCH Tools.

3.1.4.1. Meteorological Satellite (METSAT) and other Satellite Data. AFW unit procedures will identify the appropriate types of METSAT imagery (i.e., IR, VIS, WV, microwave) and satellite data (space environmental sensors) used to perform the MET/MISSIONWATCH functions.

3.1.4.2. Weather RADAR. AFW units will integrate radar-derived products into their MET/MISSIONWATCH procedures.

3.1.4.3. Real-Time Surface and Upper Air Data. MET/MISSIONWATCH procedures will specify what data sources are used to monitor the weather. For example, specify the alphanumeric products to monitor upstream conditions, such as peak wind remarks, pressure falling rapidly, PIREPs/AIREPs, and Significant Meteorological Information (SIGMETs).

3.1.4.4. Other Technology. Incorporate the latest available technology into the unit's MET/MISSIONWATCH procedures (e.g., tower cameras, on-line weather resources, lightning detection data, MESONET data, and indigenous products).

3.1.4.5. Other Data Sources. Obtain new data sources useful to the MET/MISSIONWATCH and define how that data can add value or effect change when the mission is in progress.

3.2. Resource Protection (Weather Watches, Warnings, and Advisories) Process.

3.2.1. Specific Resource Protection Roles and Responsibilities. Resource protection is a three-tiered structure with AFWA, OWSs, and CWTs all playing significant and interactive roles. **Figure 3.1.** illustrates the specific functions performed and products provided by each tier in the resource protection process.

Figure 3.1. Three-Tiered Weather Resource Protection Process.

AFWA Provides:	
	MWA (CONUS). Severe Weather Analysis Package/Teleconference. Strategic Level Threat Assessments. Back-Up to the NWS Storm Prediction Center (SPC) & Aviation Weather Center (AWC).
OWS Provides:	
	MWA (OCONUS). Regional Severe Weather Products. Discussions Detailing Severe Weather in AOR. Weather Watches, WWs, & Forecast WAs for Active Duty USAF & Army Locations. Severe Weather Reports to AFWA.
CWT Provides:	
	Tailored Support for Customers. WVs/WAs – For Observed Criteria. WVs – For Immediate Protection. "Eyes Forward" Support for OWS. Severe Weather Reports to OWS.

3.2.2. Definitions.

3.2.2.1. Weather Watch (Watch). A special notice to supported agencies alerting them of the potential for weather conditions of intensity to pose a hazard to life or property. The weather watch can be thought of as a "heads up" that agencies need to consider making plans to take required protective actions should an actual weather warning be issued later.

3.2.2.2. Weather Warning (WW). A special notice to supported agencies giving them advance notification (with sufficient time for protective actions) of weather conditions, of intensity to pose a hazard to life or property, expected to directly affect a designated geographic area or an area defined within a set nautical mile distance of a designated location.

3.2.2.3. Observed Weather Warning (OWW). A special notice to supported agencies giving them notification that weather conditions of intensity to pose a hazard to life or property are occurring within a designated geographic area or within a set nautical mile distance of a designated location. An observed weather warning is issued on the first occurrence of the designated criteria. An observed weather warning is used when agencies do not require advanced notification prior to the onset of the weather conditions.

3.2.2.4. Forecast Weather Advisory (FWA). A special notice to supported agencies giving them advance notification (with sufficient time for protective actions) of mission-limiting, non-severe weather conditions expected to directly affect a designated geographic area or an area within a set nautical mile distance of a designated location.

3.2.2.5. Observed Weather Advisory (OWA). A special notice provided to supported agencies notifying them that non-severe weather conditions which could affect their operations are occurring within a designated geographic area or within a set nautical mile distance of a designated location. An observed weather advisory is issued on the first occurrence of the designated criteria. An observed weather advisory is used when agencies do not require advanced notification prior to the onset of the weather conditions.

3.2.2.6. Military Weather Advisory (MWA). A graphical forecast product produced by AFWA CSFO and OWSs with an OCONUS AOR depicting the potential for weather meeting specific criteria. Forecast areas are color-coded depicting the worst conditions expected during the valid period. The MWA is intended primarily for use as a guidance tool and briefing aid.

3.2.2.7. Issue Time. The time an agency is notified of a watch, warning, or advisory via the designated primary notification method. Notification can be accomplished via a weather dissemination system, phone call, fax, e-mail, e-mail pager, etc. If notified via the N-TFS, the issue time is the time the watch, warning, or advisory was transmitted. When more than one agency is notified, the issue time is the time the last agency is notified. Follow-up notifications made in addition to the primary notification method (e.g., courtesy phone call after N-TFS dissemination) are not considered when determining issue time.

3.2.2.8. Valid Time (VT). The time in which a weather watch, warning, or advisory is in effect. The start time of the VT is when the phenomenon is expected to first occur. The end time of the VT is when the phenomenon is expected to cease and no longer occur.

3.2.2.9. Desired Lead-Time (DLT). The amount of advance notice an agency requires prior to the onset of a particular weather phenomenon. The desired lead-time for observed weather warnings/advisories for lightning and all observed weather advisories is always assumed to be zero.

3.2.2.10. Actual Lead-Time (ALT). The elapsed time between the issue time of a watch, warning, or advisory and the first occurrence of the forecast event.

3.2.2.11. Positive Lead-Time (PLT). A WATCH, WW, or FWA issued before specified criteria occurs, and the specified criteria is expected to reoccur (persist). PLT equals the elapsed time between the issue time and the first occurrence of the WATCH, WW, or FWA.

3.2.2.12. Negative Lead-Time (NLT). A WATCH, WW, or FWA issued after specified criteria has already occurred, and the specified criteria is expected to reoccur (persist). NLT equals the elapsed time between the first occurrence and the issue time of the WATCH, WW, or FWA.

3.2.2.13. Timing Error. The algebraic difference between the forecast time of occurrence and the actual time of occurrence. The timing error is positive (plus) if the event occurred later than the forecast time of first occurrence and is negative (minus) if it occurred earlier than the forecast time of first occurrence.

3.2.2.14. Missed WW or FWA. When specified WW or FWA criteria occur but a WW or FWA is not issued during the entire event.

3.2.2.15. False Alarm. When a WW or FWA is issued and the specified criteria does not occur during the specified valid time.

3.2.2.16. Severe Weather Action Procedures (SWAP). Procedures used by a weather unit to respond to a severe weather event including notifying and potentially recalling a person(s) or real-locating resources from other tasks to provide focused support during a severe weather event.

3.2.2.17. Severe Weather Action Team (SWAT). Weather personnel tasked to implement the SWAP. The SWAT may be several people or a single individual depending on the situation and the resources available.

3.2.2.18. Potential. Conditions indicate a given aerospace weather phenomena is capable of development within a finite amount of time.

3.2.3. General Rules for Issuing Watches, WWs, and WAs.

3.2.3.1. An OWS may issue a Watch, a lightning Watch, a WW, and one or more FWAs valid for the same time (e.g., a WW for 55-knot winds, and WAs for 36-knot crosswinds and -20 degree wind chill) for a location. Do not issue a warning and advisory for different thresholds of the same phenomenon valid for overlapping times. For example:

A WW for 40-knot convective winds and a WA for 25-knot nonconvective winds. In this situation, if the 40-knot winds diminish but 25-knots winds are forecast to continue, issue a WA for the 25-knot winds effective the same time the WW expires or is canceled.

3.2.3.2. No lead-time is required for a FWA that replaces the WW. This FWA is considered as meeting the DLT. The important point is to ensure there is no break in coverage. If a break in coverage occurs, then the new FWA needs to be issued with a DLT.

3.2.3.2.1. WWs and FWAs may be issued with the intention of superseding (replacing) an existing WW or FWA at a specified time. For example, a FWA for gust 25 - 34 knots is in effect. It becomes apparent that the winds will equal/exceed 35 knots. A WW for 35 - 49 knots must be issued in time to meet the WW DLT (90 minutes). The WW for 35 - 49 knots will contain a line stating when the FWA will be superseded. For example, THIS WARNING WILL SUPERSEDE ADVISORY # XX-XXX AT 20/1500Z (20/1100L). If a break in coverage occurs, then the WW needs to be issued with a DLT.

3.2.3.2.2. The Watch, WW, or FWA text will contain remarks clarifying the effect it will have on an existing WATCH, WW, or FWA. For example, THIS WARNING IMMEDIATELY SUPERSEDES WARNING # XX-XXX, THIS WARNING WILL SUPERSEDE WATCH # XX-XXX AT 01/1200Z (01/0800L).

3.2.3.3. In all cases, WWs, FWA, and OWAs must maintain product consistency with other forecast products. For example, if a WW is issued for wind 35 knots or greater, the TAF, MEFs/Flight Weather MEFs, and other products for that location and valid time must either forecast predominant and/or gusts \geq 35 knots to reflect the WW winds. Products will be amended, corrected, or revised to ensure categorical and horizontal consistency.

3.2.3.4. OWSs will work with each CWT in their AORs to document the Watch, WW, and WA criteria and specific details of the dissemination and notification process, including back-up procedures, in a formal agreement. CWTs will ensure this information is documented in the installation Weather Support Documents (WSD), along with any deviations from the standard set of Watch and WW criteria.

3.2.3.5. OWSs will disseminate Watches, WWs, and WAs directly to the CWT and all other agencies on the installation's dissemination network. OWSs will work with their supporting communications agencies, CWTs, and MAJCOM or higher headquarters to establish the process and procedures to route Watches, WWs, and WAs into the CWT's dissemination system for further distribution to the installation's command and control infrastructure (e.g., command post).

3.2.3.5.1. OWSs will also work with CWT staffs to develop procedures to ensure key local operation and command and control units receive OWS-issued Watches, WWs, and FWAs until a system is in place that provides the OWS with an automatic confirmation of receipt. This will normally be a follow-up call to the key agencies. Units issuing a Watch or WW should make no more than three confirmation calls to confirm receipt of the Watch or WW.

3.2.4. Weather Watch and WW Process. The Watch and WW process has a three-tiered structure (AFWA, OWS, and CWT) in the CONUS. OCONUS locations use a two-tiered (OWS and CWT) structure. Each tier provides support and receives support from the other tiers.

3.2.4.1. AFWA provides CONUS OWSs severe weather analysis packages, CONUS MWA charts and discussions, teleconferences, SLTA products, and various NWP severe weather data products through the AFP. Weather units in the CONUS will use these products in their AFP, MEFP, and SWAP.

3.2.4.2. OWSs and a few designated weather units issue Watches and WWs for forecast phenomena to all active duty USAF & Army installations and deployed operating locations in their AORs. CWTs will issue WWs for observed phenomena (i.e., lightning) during duty hours. During non-duty hours, the supporting OWS will issue observed warnings where possible and as capability exists. AFW units issue Watches and WWs using the standard set of criteria listed in [Table 3.1](#).

Table 3.1. Standard Weather Watch/Warning Criteria.

1. Tornadoes (OPREP-3)
2. High Winds (≥ 50 knots, or <u>locally established severe criteria</u>). (OPREP-3)
3. Winds (≥ 35 and < 50 knots).
4. Hail ($\geq 3/4$ inch diameter, or <u>locally established severe criteria</u>). (OPREP-3)
5. Hail ($\geq 1/2$ inch diameter, but $< 3/4$ inch).
6. Heavy Rain/Snow (≥ 2 inches in 12 hours or <u>locally established criteria</u>). (See NOTE)
7. Freezing Precipitation (any intensity).
8. Blizzard Conditions: Duration of ≥ 3 hours, sustained winds or gusts ≥ 30 knots, considerable falling and/or blowing snow, with prevailing visibility frequently $\leq 1/4$ mile/0400 meters (all criteria must be met).
9. Sandstorm: Strong winds carrying sand particles from the surface to no more than fifty feet above the surface, prevailing visibility $\leq 5/8$ ths to $6/16$ ths statute miles (1000 to 0600 meters), with prevailing visibility $< 5/16$ ths statute miles (0500 meters) the storm is considered a heavy sandstorm.
10. Lightning Within 5 Nautical Miles: (Implements AFOSH Standards 91-66, <i>General Industrial Operations</i> , and 91-100, <i>Aircraft Flight Line – Ground Operations and Activities</i>).

NOTE: AFW units will coordinate and establish the actual values and timing for accumulative-type Watches/WWs according to supported agency requirements. For example, an agency may require a warning for 4-inch precipitation accumulation in 12 hours rather than 2 inches; or 2 inches in 6 hours, etc. For Heavy Rain and Snow Watches and WWs, forecast the actual amount of expected accumulation and its duration versus simply repeating the criteria.

3.2.4.2.1. CONUS OWSs will use applicable analysis and forecast products from AFWA along with analysis and forecast products from their own AFP to issue Watches, WWs, and FWAs.

3.2.4.2.2. Standard lead-times for Watches and WWs are indicated in **Table 3.2**. Installation commanders may adjust these lead-times based on mission, requirements, etc.

Table 3.2. Standard Desired Lead-Times for Weather Watches and Warnings.

Weather Phenomena	Desired Lead-Time of Watch	Desired Lead-Time of Warning
Tornado	- As potential warrants.	- 30 minutes prior to occurrence.
High Winds (≥ 50 knots or local criteria)	- 4 hours prior to potential occurrence.	- 2 hours prior to occurrence.
Winds (≥ 35 - < 49 knots)	- Not required.	- 90 minutes prior to occurrence.

Weather Phenomena	Desired Lead-Time of Watch	Desired Lead-Time of Warning
Hail ($\geq 3/4$ " diameter or local criteria)	- 4 hours prior to potential occurrence.	- 2 hours prior to occurrence.
Hail ($\geq 1/2$ " but $< 3/4$ " diameter)	- As potential warrants.	- 90 minutes prior to occurrence.
Heavy Rain or Snow (≥ 2 " in 12 hours or local criteria)	- As potential warrants.	- 90 minutes prior to start of event.
Freezing Precipitation	- As potential warrants.	- 90 minutes prior to occurrence.
Blizzard Conditions	- As potential warrants.	- 90 minutes prior to occurrence.
Sandstorm	- As potential warrants.	- 90 minutes prior to occurrence.
Lightning Within 5 Nautical Miles	- 30 minutes prior to start of thunderstorm.	- None. CWT issues when lightning is observed within 5nm. - OWS issues when CWT is closed and capability exists.

3.2.4.2.3. [Table 3.3.](#) contains the rules used to issue Watches and WWs.

Table 3.3. Rules for Issuing Weather Watches and Warnings.

1. A Watch never takes the place of a Warning. AFW units will issue warnings, as required, regardless of whether or not a watch had previously been issued.
2. AFW units issue Watches and WVs for installations and areas (e.g., training area, missile complex, and drop zone) as required. Watches and WVs cover separate and distinct areas normally no larger than **5 nautical miles** (nm) radius (except for Lightning warnings that have a minimum radius of 5 nm). However, Watches and WVs for Military Operating Areas (e.g., training areas, ranges, and missile complexes) may cover large areas. Units will document these areas in the WSD and OWS-CWT formal agreements.
3. Only one Watch or WV will be in effect at one time for any given location (e.g., airfield, range).
 - If a Watch or WV is issued for one criterion and it later becomes necessary to issue a Watch or WV for another criterion, then a new Watch or WV will be issued to include both criteria forecast to affect that location.
 - **Exception:** The lightning Watch and WV for observed lightning will be issued separately from, and can be issued concurrent with, a Watch or WV issued for all other criteria.
4. Each Watch and WV will be issued for a specific location. It is considered an entity and supersedes any previously issued Watch or WV for that location.
5. A separate valid time will be specified for each criterion.
 - **Exception:** A valid time is not used in an observed lightning. In place of valid time, the following statement is used: "*Valid until further notice.*"
 - All times used in a Watch or WV will be expressed in UTC.
6. A forecast WV is not required if there is an unforecast single occurrence that has stopped and is not expected to recur.

3.2.4.2.4. The text of a Watch and WV must be brief and clearly describe the weather conditions in terms non-weather personnel can understand. **Table 3.4.** defines the information required in the text of a Watch and WV. **Table 3.5.** shows examples of Watches and WVs. Specific language of a Watch or WV may vary depending on situation and supported units needs.

Table 3.4. Mandatory Information in a Weather Watch and Warning.

<p>1. Watch or WW Number (determined locally). For example, Weather Watch #06-001, or Sample AFB Weather Warning # 06-013).</p> <p>2. Location (installation or area) for which Watch or WW is valid.</p> <p>3. Specific conditions forecast, (e.g., specify maximum forecast wind speed, total precipitation amount).</p> <p>4. Explanation of how the new watches/WWs affect previously issued Watch or WW, for example:</p> <p>a) SUPERSEDES WEATHER WATCH # 04-008.</p> <p>b) Case with issuing a lightning warning while another warning is in effect: WEATHER WARNING # 08-003 REMAINS IN EFFECT.</p>

Table 3.5. Examples of Weather Watches and Warnings.

<p>WEATHER WATCH # 04-A08. Valid 04/0400Z to 04/0600Z The potential exists for tornado development at Ft Sample AIN. A warning will be issued later if required.</p>
<p>WEATHER WARNING # 04-A09. Valid 04/0410Z to 04/0430Z Tornado within 5 nm of Ft Sample AIN. Weather Watch # 04-A08 remains in effect.</p>
<p>WEATHER WATCH # 06-A09. Valid 06/1200Z to 06/1600Z The potential exists for severe thunderstorm development at Sample AFB. Winds of 50 knots or greater and/or hail of 3/4 inch or greater accompanying severe thunderstorms. A warning will be issued later, if required.</p>
<p>WEATHER WARNING # 06-A10. Valid 06/1400Z to 06/1500Z Severe Thunderstorms with wind gusts to 65 knots and 1-inch hail at Sample AFB. Weather Watch # 06-A09 remains in effect.</p>
<p>WEATHER WATCH #06-A11. Valid 06/1400Z to 14/1600Z The potential exists for lightning at Sample AFB. A warning will be issued later if required.</p>
<p>WEATHER WARNING # 06-A12. Valid until further notice Lightning within 5 nm of Sample AFB. Weather Watches # 6-A09 and 06-A11 and Weather Warning # 06-A10 remain in effect.</p>

WEATHER WATCH # 01-B02.

Valid 13/1200Z to 14/0600Z

The potential exists for blizzard conditions at Sample Missile Complex. Winds 35 to 45 knots with heavy snow causing visibility of 1/4 mile or less, potential accumulation of 8-10 inches. A warning will be issued later, if required.

NOTE: The actual watch/warning numbering scheme is determined locally by the AFW unit leadership. The number values portrayed in this chapter are for example purposes only.

3.2.4.2.5. OWSs will METWATCH all locations and areas for which it issues Watches and WWs. The OWS amends, extends, or cancels Watches and WWs using the rules listed in [Table 3.6](#).

Table 3.6. Rules for Amending, Extending, and Canceling Weather Watches and Warnings.

1. When a Watch/WW no longer adequately describes the phenomenon's potential or onset, amend the notice by issuing a completely new Watch or WW with a new number.
2. Watches/WWs may be extended provided the extension is issued prior to the expiration of the original notice and nothing changes except the duration. Established DLTs are not applicable for extensions and downgrades.
3. Clearly state how the amended or extended Watch or WW affects any previously issued notice.
4. Cancel Watches/WWs when previously forecast/observed conditions are no longer occurring and are not expected to recur.
5. Lightning Watches are canceled only when the potential for lightning within the **next 30 minutes** is no longer forecast. Do not cancel if there is potential for another thunderstorm **within 30 minutes**.
6. Cancel WWs for **OBSERVED LIGHTNING** when thunderstorms have passed beyond the area covered by the warning. For lightning warning cancellations, include a statement indicating its affect on any previously issued warnings, such as "WEATHER WARNING # XX-XXX remains in effect."

NOTE: The CWT, or OWS when the CWT is off duty, will cancel the lightning warning.

3.2.4.3. CWTs are responsible for coordinating supported units' Watch and WW requirements, and for coordinating resource protection requirements with the supporting OWS before deploying or immediately upon arrival into another AOR during exercises and contingencies, military operations other than war, or war.

3.2.4.4. As part of the "Resource Protection Team," CWTs will provide real-time information (eyes forward) to the OWS and pass severe weather reports to the supporting OWS. The CWTs will also use OWS-issued Watches and WWs in the MEFP, as well as for updating supported units

on what impact the weather may have on the installation and operations. See **Chapter 7** of AFMAN 15-135 for specific CWT resource protection procedures.

3.2.5. Weather Advisory (WA) Process .

3.2.5.1. OWSs issue FWAs and OWAs during special situations. The specific criteria and desired lead-times for FWAs will depend on requirements forwarded by CWTs operating in its AOR.

3.2.5.1.1. OWAs are issued from the OWS when the CWT does not have someone on duty and the OWS has the resources and capability to issue the OWA. For example, an OWS cannot issue an OWA for crosswinds if there are no wind measurements available from the site.

3.2.5.1.2. The OWS staff will work with the CWTs in its AOR to satisfy supported units' requirements within existing OWS capabilities. When several units require WAs for similar criteria, the OWS may consolidate advisories to the extent possible without compromising the requirements of individual agencies.

3.2.5.1.3. The text of a WA must be brief and clearly describe the weather conditions in terms non-weather personnel can understand. **Table 3.7.** defines the information required in the text of a FWA. The specific format of the FWA will be coordinated between the supporting OWS and the supported unit. The format will be documented in the appropriate WSD.

3.2.5.1.4. A FWA may contain more than one phenomenon, but each phenomenon requires its own DLT and must be individually verified. A FWA is not required if there is an unforecast single occurrence that has stopped and is not expected to recur.

3.2.5.1.5. More than one WA may be in effect at the same time for the same location, but only one WA will be in effect for a particular phenomenon.

Table 3.7. Mandatory Information in a Weather Advisory.

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| <ol style="list-style-type: none"> 1. Weather Advisory Number (determined locally). For example, Sample AFB WA #06-001. 2. Valid time of WA. 3. Location (installation or area) for which WA is valid. 4. Specific conditions forecast, (e.g., specify maximum forecast wind speed). 5. Explanation of how the new WA affects a previously issued WA. For example, SUPERSEDES WEATHER ADVISORY #07-010. |
|--|

NOTE: The actual weather advisory numbering scheme is determined locally by the AFW unit leadership. The number values portrayed in this chapter are for example purposes only.

3.2.5.1.6. When a FWA no longer adequately describes a phenomenon or its onset, amend the advisory by issuing a completely new WA under a new number. When a new advisory is issued, clearly state its affect on any previously issued advisory in the text, for example, "SUPERSEDES ADVISORY 11-A14" or "SUPERSEDES WARNING 08-A02." Desired lead-time is not computed when a FWA is issued to supersede a less severe condition.

3.2.5.1.7. Extend FWAs only if the duration changes and the extension is issued prior to the expiration of the original advisory.

3.2.5.1.8. OWSs will continue to disseminate WAs to the supported CWT customers operating in the AOR when the CWT is not on duty.

3.2.6. Documentation of Weather Watches, Warnings, and Advisories.

3.2.6.1. Weather units issuing a WATCH or WW will use AF Form 3807, *Watch/Warning Notification and Verification* or an approved automated form to record notification and verification information. **Attachment 4** contains instructions for completing the AF Form 3807.

3.2.6.2. Weather units issuing a FWA will use AF Form 3806, *Weather Watch Advisory Log* or approved automated form to record notification and verification information. **Attachment 5** contains instructions for completing the AF Form 3806.

3.2.7. Verification of Weather Watches, WWs, and FWAs. Verification is performed within the weather unit to measure capability and to identify procedural or training deficiencies. MAJCOMs or higher headquarters may request WATCH, WW, and FWA verification information.

3.2.7.1. Verify all forecast WWs and FWAs objectively or subjectively, as required. Each phenomenon will be verified separately when a forecast WWs or FWAs contains multiple phenomena.

3.2.7.1.1. Objective verification is the process of determining the time of first occurrence, computing the actual lead-time and calculating the timing error based on measurements from weather equipment (i.e., wind sensor, radar, ceilometer, lightning detection, rain gauge, etc.), or on information from an official observation. AFW units may objectively verify WWs for information received from credible, official sources within the area of the WW, such as off duty weather personnel, military/state police, NWS certified spotters, local news media, etc.

3.2.7.1.1.1. Complete objective verification on all forecast WWs. **EXCEPTION:** WWs for heavy precipitation (rain/snow) may be verified subjectively. If verifying heavy precipitation WWs objectively, the amount of forecast precipitation must occur within the valid period of the warning, regardless of the amount received before or after the warning was issued. **NOTE:** Objective verification for winds greater than or equal to 50 knots or hail greater than or equal to 3/4 inch (or the substituted local severe weather thresholds where different) is based on reported or observed occurrences within the forecast area, or **10 nautical miles**, whichever is larger. Objective verification for other forecast criteria is based on occurrence within the area covered by the warning as defined in the WSD.

3.2.7.1.2. Subjective verification is a review of the WW or FWA, along with other weather products and information, to determine its meteorological soundness.

3.2.7.1.2.1. If required, use subjective verification for heavy precipitation WWs. An example of subjective verification of a heavy precipitation WW could be reports of flooding with visible damage within the area covered by the warning indicating heavy precipitation occurred but was not measured at the location of the official airfield observation.

3.2.7.1.2.2. Verify all FWAs either objectively or subjectively as determined by unit leadership. For FWAs containing multiple phenomena, verify each phenomenon separately. Examples of subjective verification include those phenomena that require pilot reports to verify, such as low-level wind shear, turbulence, and icing.

3.2.7.1.2.3. For heavy precipitation WWs and forecast WAs verified subjectively, units leaders must carefully analyze the data to determine if, in fact, the event actually occurred, or if the data is just sound justification for a good WW or FWA that did not verify. In situations where units use subjective verification, they must also take responsibility for a missed occurrence if these phenomena are reported with no WW or FWA issued.

3.2.7.1.3. Verification is not required for downgrades that have already verified with no break in coverage and extensions. Although the extension requires no verification, the original WW or WA may.

3.2.7.2. Compute actual lead-times for amendments that "upgrade" previously issued WWs or FWAs using the DLT of the upgraded criteria.

3.2.8. Weather Watch, WW, and FWA Justification. Justify all weather watches, forecast WWs, and FWAs by including sound meteorological reasoning (e.g., attached data, written synopsis) on the applicable form.

3.2.9. Severe Weather Action Procedures (SWAP). AFW units with resource protection responsibility will develop SWAP to ensure sufficient personnel are available during potential/actual severe weather events or during meteorological/operational events critical to mission success. The staff will form a small group called the SWAT or identify a single individual dedicated to assess the severe weather threat and work the event.

3.2.9.1. AFWA SWAP. AFWA will use SWAP during all severe weather events. AFWA's SWAP will ensure the CSFO lead meteorologist is available to discuss the severe weather situation with OWS forecast teams. SWAP will also realign or recall personnel to cover increased workload, if required.

3.2.9.2. Installation SWAP. OWSs and CWTs, in conjunction with the CWT's supported customers, will define the SWAP program for the installation. The CWT's supported customers determine the operational impact and desired courses of action for standard severe weather criteria (i.e., lightning within 5 nautical miles, high winds ≥ 50 knots, $\geq 3/4$ inch hail, tornadoes, freezing rain, excessive snow/rain, and blizzards). The CWT will also coordinate augmentation/manual observing procedures with supported customers and the OWS. The customer, as owner of the Operational Risk Management process, can tailor this criteria and associated actions taken for each threshold.

3.2.9.2.1. The installation's SWAP and established rules of engagement will be documented in the local WSD (or similar document) and the OWS-CWT MOA (or equivalent documents). See [Chapter 11](#) for detailed guidance on preparing formal agreements. At a minimum:

3.2.9.2.1.1. The documents will outline specific procedures to implement for each severe weather condition of concern to the customer(s).

3.2.9.2.1.2. The documents will state when the SWAP is implemented for each condition, what actions the OWS-CWT team will perform during each event, and the post-event procedures. The documents will also define how the severe weather conditions limit the operations of primary CWT customers and the courses of action the customers take for each event (e.g., hanger/evacuate aircraft, prepare for snow plowing, form disaster response team, etc.) OWS and CWT team members must understand how each severe weather event impacts supported customers and how the team can best add value during the event.

3.2.9.2.1.3. In the event of unforeseen circumstances, such as a communications line failure, a critical equipment outage at either the OWS or CWT, etc., CWTs will, by documented agreement, be required to implement the SWAP at the weather station (or other agreed upon location) at the OWS' request. The OWS, as the agency ultimately responsible for forecast watch/warning support, will have this prerogative in the interest of installation resource protection and flight safety.

3.2.9.2.1.4. The documents will contain up-to-date watch/warning notification procedures, and CWT standby/recall procedures and contact lists. Documentation will also reflect the process used to keep this information current and updated at all times.

3.2.9.2.2. Although the OWSs have the overall responsibility for resource protection (i.e., Watches, WWs, and FWAs) at active duty USAF and Army installations, it is the OWS-CWT "team" that provides the most effective resource protection. CWTs and OWSs must work as a team during severe weather events.

3.2.9.2.2.1. If a CWT is not on duty and does not implement SWAP, augmenting or taking manual observations is not required. However, if the CWT implements the SWAP for tornadoes, high winds, or large hail, personnel will augment the automated observations or take, disseminate, and record observations manually IAW AFMAN 15-111. Safety of flight is of paramount concern and augmentation/manual observations will ensure all aspects of severe weather are fully identified, reported, and recorded.

3.2.9.2.3. The CONUS OWS SWAP will include participating in the AFWA CSFO daily severe weather telecon (as appropriate) and passing severe weather reports to AFWA.

3.2.9.2.4. OWSs and CWTs will jointly conduct and document a semi-annual exercise of the coordinated SWAP. An actual event meets the intent of an exercise.

3.2.10. Technical Proficiency. AFW units must ensure weather personnel remain proficient in severe weather techniques, such as radar storm interrogation, severe weather analysis, performing MET-WATCH for severe weather, etc.

3.2.10.1. The following documents provide guidance on severe weather analysis and techniques: AFWA TN—98/002, *Meteorological Techniques*; AWS/FM—92/001, *A New Severe Thunderstorm Identification Technique*; AWS/FM—92/003, *Verification of a Severe Thunderstorm Identification Technique*; and AWS/FM-600-Series, *Severe Convective Weather*.

3.2.11. Severe Weather Reporting.

3.2.11.1. The CONUS OWSs will pass AFWA CSFO severe weather reports that are normally not available through standard observations. These include reports from sources within the AOR, such as local law enforcement and emergency management agencies, local news media, and from supported CWTs. Time permitting, OWSs should pass these reports to AFWA immediately or as soon after the event as possible so AFWA can use the reports in the post-analysis and verification, and the product amendment processes.

3.2.11.2. CWTs will report severe weather events IAW Chapter 7 of AFMAN 15-135.

3.2.12. Tropical Cyclone Procedures. The Tropical Prediction Center (Miami, FL), the Central Pacific Hurricane Center (Honolulu, HI), and the Joint Typhoon Warning Center (Pearl Harbor, HI) issue official tropical cyclone forecasts and related information for tropical cyclones of depression,

storm, or hurricane/typhoon intensity. These forecasts are issued in the form of marine and public advisories. Tropical cyclone forecasts include information describing initial and forecast locations, movement, intensity, and horizontal dimensions of significant winds and waves about the tropical cyclones. These forecasts are available on-line at each agency's home page. AFW units will fully exploit these on-line forecast resources to support their customers.

3.2.12.1. The National Hurricane Operations Plan clarifies terms and establishes policies, procedures, and responsibilities in the Atlantic and the Eastern and Central Pacific westward to 180 degrees west. PACAF 15-102, *Tropical Cyclone Reconnaissance* provides information for the Pacific Ocean westward from 180 degrees west and the Indian Ocean. AFW units will assist supported commands not included in the above or similar command publications (e.g., US Forces Korea) in developing appropriate policies, responsibilities, and procedures.

3.2.12.1.1. All AFW units will use the tropical cyclone forecasts issued by the designated tropical cyclone centers.

3.2.12.1.2. AFW units will not deviate from the official forecast position, track, movement, maximum wind speed, or intensity trend.

3.2.12.1.3. All AFW units must ensure their supported units are notified and understand that 48-hour and 72-hour outlooks contain a high degree of uncertainty, are for planning purposes only, and are subject to change. This notification must include the forecast error probability statements included in discussion bulletins or on the forecast products.

3.2.12.2. OWSs will perform the METWATCH and serve as the liaison between the Tropical Forecast Centers and the CWTs.

3.2.12.2.1. The OWS will use the wind forecasts from the tropical cyclone bulletins and tailor the forecasts for terrain effects to issue TAFs, MOAFs, Watches, WWs, and FWAs.

3.2.12.2.2. OWSs must ensure the release of official tropical cyclone forecasts to the general public is performed in accordance with the policies and procedures specified by the theater Commander in Chief (CINC) (or appropriate level command agency) regarding the release of information to non-military organizations.

3.2.13. Space Weather Products. AFWA prepares many space weather analyses, forecasts, alerts, and warnings (see [Table 3.8.](#)) that are used to provide resource protection for valuable satellite assets. The products are built around the following six mission areas that can be adversely affected by space weather: communications (both high frequency over-the-horizon communications and satellite communications), navigation using the Global Positioning System (GPS), satellite operations (command/control and launching of satellites), space tracking (performed by ground-based radars), high-altitude human flight (U-2s and Space Shuttle), and intelligence collection.

3.2.13.1. While personnel at the OWS or CWT levels will not have the capabilities to produce these products, they must be aware of their existence and use these products in support of their customers as needed. Dissemination to customers is accomplished through the Automated Weather Network (AWN) and Defense Message System (DMS).

Table 3.8. Space Weather Analyses, Forecast, Alerts, and Warnings.

Mission Area	AFWA Product	Description
High-Frequency (HF) Communications and other applications using over-the-horizon HF radio waves	Regional ionospheric analyses; issued four times daily on JAAWIN/ JAAWIN-S.	Identifies locations where space weather conditions have caused degradation in HF communications and other HF applications.
	Regional ionospheric forecasts; issued four times daily on JAAWIN/ JAAWIN-S.	Identifies locations where space weather conditions are expected to degrade HF communications and other HF applications.
	Point-to-point forecasts of useable HF frequencies; issued on JAAWIN/ JAAWIN-S upon request of customer/user.	Identifies maximum and minimum useable HF frequencies for customer-specific transmitter and receiver locations based on expected ionospheric conditions.
	Point-to-regional HF illumination maps; issued every hour on JAAWIN-S for selected global locations.	Identifies areas where user-defined HF signals from a user-defined point location are most likely to have greatest strength.
	Short Wave Fading Advisory; issued via AWN, fax, phone, and e-mail when a space weather disturbance suddenly degrades HF conditions.	Identifies the HF frequency ranges and locations that are affected by an observed sudden disturbance and then forecasts the duration and magnitude of that degradation.
	Polar Cap Absorption Advisory; issued via AWN, fax, phone, and e-mail when HF conditions have been severely degraded primarily at high latitudes due to a space weather disturbance.	Identifies HF frequency ranges and locations affected by an observed sudden disturbance and forecasts duration and magnitude of that degradation.
Ultra High-Frequency Satellite Communications (UHF SATCOM)	Regional 6-hr ionospheric analyses; issued four times daily on JAAWIN.	Identifies locations where space weather conditions may have caused degradation in UHF SATCOM.
	Regional 6-hr ionospheric forecasts; issued four times daily on JAAWIN.	Identifies locations where space weather conditions are expected to degrade UHF SATCOM.
	Regional nowcasts of ionospheric conditions; issued for selected global regions every 30 minutes on JAAWIN-S.	Identifies locations where space weather conditions are currently capable of degrading certain UHF SATCOM users.

Mission Area	AFWA Product	Description
UHF SATCOM and Super High-Frequency (SHF) SATCOM	Solar radio wave burst warning; issued via the AWN, fax, telephone, and e-mail when the Sun emits a severe burst of radio wave energy.	Identifies UHF and/or SHF SATCOM frequency ranges affected by an observed burst of radio wave energy capable of causing interference; includes burst strengths and frequencies.
GPS Navigation	Regional nowcasts of single-frequency GPS accuracy; issued every hour on JAAWIN-S.	Identifies estimates of current single-frequency GPS accuracy based on calculations that take into account the ionospheric-induced errors.
Satellite Operations	Hourly magnetometer analyses—Ap Index; issued every hour via the AWN and JAAWIN.	Quantifies the level of disturbance in the electrical current network of the ionosphere and magnetosphere; identifies potential for electrical charging/discharging as well as for satellite drag.
	Geomagnetic storm advisory/warning; issued via the AWN, fax, telephone, and e-mail when the hourly Ap and/or 24-hourly Ap index reaches or is expected to reach significant levels.	Identifies the expectation or the observation that the electrical current network of the ionosphere and magnetosphere has reached significantly disturbed levels; identifies potential for electrical charging/discharging as well as for satellite drag; includes forecast of storm strength and duration.
	Energetic Proton Flux Advisory; issued via the AWN, fax, telephone, and e-mail when high-energy proton fluxes at geostationary orbit are expected to reach significant levels.	Identifies the expectation for satellites to be bombarded with high-energy protons; includes a forecast of proton flux strength and duration; identifies potential for anomalous behavior in satellites due to proton bombardment.
	Energetic Proton Flux Warning; issued via the AWN, fax, telephone, and e-mail when high-energy proton fluxes at geostationary orbit have reached significant levels.	Identifies observed conditions that may lead to anomalous behavior of satellites caused by the bombardment of high-energy protons; includes current and forecasted proton flux strength and forecasted duration.
	Internal Electrical Charging Advisory; issued via the AWN, fax, telephone, and e-mail when high-energy electron fluxes at geostationary orbit reach significant levels.	Identifies observed conditions that may lead to anomalous behavior of satellites caused by internal charging/discharging due to a satellite being bombarded by high-energy electrons.

Mission Area	AFWA Product	Description
Space Tracking	Solar radio wave burst warning; issued via the AWN, fax, telephone, and e-mail when the Sun emits a severe burst of radio wave energy.	Identifies observed conditions that may lead to interference on ground-based space tracking radars using UHF-SHF frequencies; includes specific frequencies and strengths of radio energy burst.
	Auroral radar clutter analyses; issued hourly via JAAWIN-S.	Identifies locations and strengths of potential interference to ground-based space radars caused by electron precipitation (auroral electrons).
	Hourly magnetometer analyses--Ap Index; issued every hour via the AWN and JAAWIN.	Quantifies the level of disturbance in the electrical current network of the ionosphere and magnetosphere; identifies potential for increased drag to cause objects in space to change orbital profile.
	Advisory/Warning of Geomagnetic Storming; issued via the AWN, fax, telephone, e-mail when the hourly Ap and/or 24-hourly Ap index reaches or is expected to reach significant levels.	Identifies the expectation or the observation that the electrical current network of the ionosphere and magnetosphere has reached significantly disturbed levels; identifies potential for increased drag to cause objects in space to change orbital profile; includes forecasts of strength and duration.
High Altitude Flight (U-2, Space Station & Space Shuttle)	Radiation Dosage Analyses; issued twice per day via JAAWIN based on cosmic radiation measurements.	Quantifies the global level of radiation dosage at high altitudes based on background cosmic radiation.
	Energetic Proton Flux Advisory; issued via the AWN, fax, telephone, and e-mail when high-energy proton fluxes at geostationary orbit are expected to reach significant levels.	Identifies the expectation for radiation dosages due to high energy protons at high altitudes to exceed significant levels; includes a forecast of proton flux strength and duration.
	Energetic Proton Flux Warning;(issued via the AWN, fax, telephone, and e-mail when high-energy proton fluxes at geostationary orbit have reached significant levels.	Identifies observed high-altitude radiation dosage conditions that have exceeded significant levels; includes current and forecasted proton flux strength and forecasted duration.

Mission Area	AFWA Product	Description
Intelligence Collection	Various classified products as well as unclassified products shown above.	The ability to collect intelligence information can be affected by space weather conditions. For example, the ability to intercept HF signals is affected by space weather. Furthermore, the ability to use ground-based and/or space-based intelligence collection assets to gather data may be prevented or inhibited, or it may be facilitated, depending on space weather conditions. Likewise, the ability of an adversary to conduct operations may be impacted due to space weather.

Chapter 4

MISSION WEATHER SUPPORT

4.1. Mission Execution Forecast Process (MEFP). The MEFP translates the observed and forecasted state of the aerospace environment into impacts on the customer's mission. The end result of this process is a MEF. A MEF is a customized weather product providing terrestrial and space forecasts necessary for commitment of specified forces and resources in order to conduct military operations (see Joint Pamphlet 1-02, "execution authority").

4.1.1. MEFs are a fusion of perishable meteorological data, strategic, and operational level forecast products providing relevant meteorological intelligence data to commanders. MEFs specify and are amended for parameters unique to the individual weapons system(s) involved in a military operation.

4.1.2. CWTs are the most frequentpliers of the MEFP. Other weather units, such as specialized sections in an OWS (e.g., flight weather briefing cells or a contingency cells) and AFWA (Special Support Operations Branch), operate as a CWT and use the MEFP. In addition to the guidance in this manual, AFW units providing MEFs will follow the detailed guidance in AFMAN 15-135.

4.2. Flight Weather MEFs.

4.2.1. The DD Form 175-1, *Flight Weather Briefing*, has been the standard tool for delivering flight weather MEF briefings. However, the MEF for flight weather briefing may take other forms. A flight weather MEF can take the form of a customer-approved, stand-alone flimsy developed for local flying, a customized weather depiction for a specific mission (e.g., ARs, DZs, Low-levels), a DD Form 175-1, or other MAJCOM form. A primary consideration in developing flight weather MEFs is to use formats the customer needs and wants.

4.2.1.1. The flight weather MEF will present the general synoptic situation, current and forecast weather (including flight hazards and SIGMETs) for takeoff, en route, destination, and alternates, with special emphasis on severe weather and flight hazards. A reasonable rule of thumb is to brief flight hazards **within 25 miles** either side of the route and **within 5,000 feet** above and below the planned flight level.

4.2.1.1.1. Refer to **Attachment 6** for instructions on completing DD Form 175-1. If used, give the original DD Form 175-1 to the aircrew and retain a duplicate copy in files. If weather is rebriefed, cross out incorrect data (or use a green pen) and enter the updated information on the DD Form 175-1.

4.2.1.1.2. DD Form 175-1 may be given directly to aircrews or sent to crews via e-mail, fax, or posted to a web page. If the weather briefing is sent electronically (e.g., e-mail, fax, or web page) more than **90 minutes** before the scheduled departure time, verbally remind the aircrew to get an update before departing or put the following statement in the Remarks section of the briefing form: "UPDATE WEATHER BEFORE DEPARTURE."

4.2.1.2. Ensure weather data used for the flight weather MEF is the most current. Always brief the current conditions at the departure location, destination, and alternates.

4.2.1.2.1. As part of the MISSIONWATCH process, AFW units will provide weather updates when significant changes in weather occur after the briefing or after the aircrew has departed. Pass the updated information to the aircrew via the Supervisor of Flying (SOF), Command

Post, Base Operations, Air Traffic Control (ATC) (control tower or Radar Approach Control [RAPCON]) facility, Army Air Traffic Service personnel, Army Aviation Brigade Tactical Operations Center (TOC), or other agency (e.g., Tanker Airlift Control Center [TACC], Air Mobility Operations Control Center [AMOCC]) as required.

4.2.1.2.2. AFW units will conduct a MISSIONWATCH from the beginning to the end of every customer's mission they support. OWSs and Strategic centers serving in a CWT capacity are logistically unable to MISSIONWATCH every mission; however, MISSIONWATCH should be performed as thoroughly as resources permit. Mission forecasters and/or flight weather briefers should keep in mind that another agency, such as the TACC, theatre AMOCC, or a WSU, may perform the MISSIONWATCH function for specific missions. AFW units need to be knowledgeable of this to prevent duplication of the MISSIONWATCH. For detailed MISSIONWATCH procedures, refer to AFMAN 15-135, *Combat Weather Team Operations*.

4.2.1.3. Evaluate, interpret, and apply the contents of watches, warnings, advisories, and forecasts to each individual flight weather MEF. Radar, satellite imagery, observed data and products, and forecast products will be used to enhance briefings when possible. Briefings will be operationally consistent with the MEF for airfield operations and other applicable products. Weather watches, warnings, and advisories will be briefed to aircrews verbatim.

4.2.1.4. If a computer flight plan (CFP) is available, forecasters should subjectively evaluate the CFP valid time, temperature deviations, flight level winds, and forecast wind factors by comparing them to standard weather products. If the information on the CFP appears inaccurate, call the AFWA Operations Control Center Team Chief (OCCTC) at DSN (312) 271-2586 or Commercial (402) 294-2586 to report the problem. Adjust the CFP information using other meteorological products. Brief the adjustments to the aircrew.

4.2.1.5. Use the term thunderstorms rather than CBs or cumulonimbus in flight weather briefings.

4.2.1.6. Always request aircrews provide PIREPs (and take AIREPs when applicable) during takeoff, enroute, and destination arrival.

4.2.2. AFW units will inform aircrews on how to obtain a flight weather MEF at their destination.

4.2.3. CWTs are responsible for manning the local airfield when ATC is open for operations. Because CWTs are not manned to support VFR flights outside of normal ATC published operating hours, CWTs are not required to be on duty when ATC is closed unless the SWAP is implemented for tornadoes, high winds, or large hail. Therefore, the supporting OWS should provide flight weather MEF support to VFR flights conducting operations at an airfield when ATC and the CWT are closed.

4.2.4. OWSs will provide required flight weather MEF briefing services to Guard and Reserve units without collocated, assigned weather support. This support includes both mission planning and flight weather briefing support.

4.2.5. Based on customer requirements, AFW units providing flight weather MEF briefings will maintain or have readily available applicable Flight Information Publications (FLIPs), and the flight weather MEF briefing references listed in [Table 4.1](#). Many of these references are readily available at the AFWA Field Support Division web site.

Table 4.1. Flight Weather MEF Briefing References.

AFMAN 15-124, <i>Meteorological Codes</i>
Joint Meteorology and Oceanography (METOC) Training Handbook
Weather Service Operations Manual (WSOM), <i>Aviation Terminal Forecasts</i> , (Ch D-31)
AFI 11-202V3, <i>General Flight Rules</i>
AFJH 11-203V1, <i>Weather for Aircrews</i>
AFI 11 Series, <i>Flying Operations</i> (for applicable aircraft Operations Procedures)
Army Regulation 95-1, <i>Flight Regulations</i>
OPNAVINST 3710.7R, <i>NATOPS General Flight and Operating Instructions</i>
FAA Aeronautical Information Manual (NWS In-Flight Weather Advisories)
FAA Order 7340, <i>Contractions Handbook</i> FAA Order 7350, <i>Location Identifiers</i> and ICAO Doc 7910, <i>Location Indicators</i>

4.3. Flight Weather MEF Documentation and Retention.

4.3.1. AFW units will document all flight weather MEF briefings. Mandatory items to document along with the briefed MEF are briefing time, briefer initials, and aircrew call sign. MEF products can be documented electronically on a file server.

4.3.2. Document all verbal briefings (e.g., local flights, telephone, close-circuit television) on a locally developed form, or a MAJCOM or higher headquarters prescribed form. **Figure 4.1.** illustrates an example of a locally developed Aircrew Briefing Log.

Figure 4.1. Aircrew Briefing Log.

AIRCREW BRIEFING LOG						PERIOD OF RECORD		
						FROM XX Month XXXX		TO XX Month XXXX
ACFT TYPE	ACFT IDENT	DEP POINT/ DTG ETD	FL	DEST/ DTG ETA	SIGNIFICANT/SEVERE WEATHER BRIEFED		DTG WX BRF	PILOT NAME
					PHENOMENA/LOCATION		VOID	FCSTR INIT
UH1	Huey1	OFF 01/1000Z	030	SUX 01/1030Z	LGT TURBC SFC-020		PIREPS MEF	01/0900Z N/A 01/1030Z JR

4.3.3. AFW units providing flight weather MEF briefings will develop procedures to archive the briefing information. This includes briefing information disseminated over the NIPRNET, SIPRNET, or Internet (e.g., functional link from OWS home pages). The archived information can be either in hardcopy or softcopy format. Data saves for these products will be the same as that for DD Form

175-1. Use AFMAN 37-139, *Records Disposition Schedule*, 15-series table, for guidance concerning retention and disposition of flight weather information.

4.4. Web-Based Aircrew Briefing Terminals. AFW units will provide access information and procedures to supported units for computer/Internet-based briefing applications. Specific sites, (e.g., OWS-maintained sites) provide a source for mission planning and pre-flight review of weather conditions. Intended for use by DoD aviators, these sites are designed to minimize the need to contact an AFW unit for most VFR missions.

4.4.1. These briefing terminals provide the standard weather alphanumeric and graphics information, plus a full suite of satellite and radar imagery with an animation option. This includes airfield observations, forecasts, winds, weather hazards, pilot reports, and current weather warnings. NOTAM summaries and hourly updates are available by ICAO directly from the FAA facility at Herndon, VA. Purely automated products without a FITL presence must be thoroughly quality controlled for accuracy prior to posting.

4.4.1.1. AFW units will develop procedures to monitor the currency and accuracy of all web-based products aircrews access. Mission profiles approved to use OWS and CWT web-pages as a briefing source must be documented in WSDs and MOAs, and include procedures for providing aircrews access to the forecaster for follow-up, clarification, or to request a formal brief.

4.5. Transient Aircrews. Both OWSs and CWTs are providers of transient aircrew support. CWTs will continue to support transient aircrews according to standard duty priorities whenever the weather station is open. If the weather station is open but mission/weather requirements prevent expeditious servicing of transient aircrews, support from an OWS or the home station CWT (if open) is an aircrew option. OWSs are available 24/7 for transient aircrew support when CWTs are closed. CWTs will evaluate their supported wing's (to include collocated Guard and Reserve) scheduled flying missions and determine the best source for weather support (see [Chapter 5](#)). CWTs will provide this information during MEF briefings and enter the location and phone number of all subsequent weather providers/sources (including foreign sources) in the remarks or other suitable location of the briefing form or on an attachment.

4.5.1. When an OWS is designated as the primary source for a flight weather MEF or update, the CWT will ensure the aircrew is aware of methods for obtaining updates and is familiar with procedures for obtaining updates via an automated aircrew briefing terminal. CWTs will encourage transient aircrew members to provide the OWS a minimum of 2 hours advance notice before brief time. In addition, CWTs should fax or electronically transmit the DD Form 175-1s to the designated OWS. This action provides the OWS advance notification of weather update requirements for transient missions.

4.5.2. CWTs will provide and/or arrange for a designated area equipped with communication systems configured to allow transient aircrews to contact the supporting OWS and accomplish flight weather MEF briefings and provide training when required. At a minimum, every base/post weather unit will post AFVA 15-2 and 15-3 (CONUS and OCONUS OWS AORs with contact information) in the flight planning area and near the web-based briefing terminal, if installed. The location of this area should be convenient for transient aircrews to access (e.g., base operations, flight planning area). At a minimum, the briefing area will include the following items:

4.5.2.1. Class A (DSN/Commercial capable) telephone and fax machine.

4.5.2.2. Required briefing forms (e.g., DD Form 175-1 or MAJCOM-unique forms), writing paper, and expendable supplies.

4.5.2.3. Pertinent information (e.g., web site instructions, OWS Briefing Cell phone numbers/instructions) to assist the transient aircrews in completing their briefings.

4.6. Aircraft Mishaps. AFW units will develop procedures to save applicable terrestrial and space weather data when notified of any weather-related aircraft or ground mishaps requiring OPREP-3 reporting (or local reporting requirements). All data used in the development of any weather information, product, and/or service provided to a customer (to include MEFs, TDAs, space weather products, mission impact slides, etc.) must be saved. Each level within the "forecast funnel" is responsible for saving the data they produced/provided that was used to develop the final product(s) given to the customer. AFW units will save enough data before and after the mishap to fully reconstruct the environmental conditions. AFW units must coordinate the data save to ensure all units involved save the required data.

4.6.1. The unit initiating the data save (usually a CWT or OWS) will coordinate with the AFWA Help Desk at DSN (312) 271-2586/commercial (402)-294-2586 to save all applicable data and products that AFWA produced/provided used in preparing flight weather MEFs and/or other products given to the customer. Units contacting AFWA must be specific on what type data they need AFWA to save. CWTs and OWSs are not required to save data that AFWA can provide.

4.6.2. If a CWT is the initiating unit, it will coordinate with the supporting OWS to initiate a data save for OWS-produced/provided products used in preparing flight weather MEFs and/or other products given to the customer. If the CWT used products from other OWSs to support missions crossing AORs, they must coordinate with all applicable OWSs to initiate a data save. If the OWS provided the flight weather MEF or other products, they will coordinate the data save with all AFW units involved. At a minimum, OWSs will save the following products (if not saved by AFWA):

4.6.2.1. METSAT imagery (Visible, Infrared, and Water Vapor, etc.).

4.6.2.2. Radar products if available (Base Reflectivity, VAD Winds, Echo Tops, Composite Reflectivity, Base Velocity, and any other products pertinent to the situation).

4.6.2.3. Local area work charts (LAWCs).

4.6.2.4. Upper air package: 200/300mb to 925mb.

4.6.2.5. Forecast model package.

4.6.2.6. Hazard charts (MWA, thunderstorm, lower and upper level turbulence and icing, and any other appropriate charts.)

4.6.2.7. PIREPs, SIGMETs, and AIRMETs.

4.6.2.8. TAFs and observations for departure point, destination, and any alternate(s).

4.6.2.9. Weather warnings, watches, and advisories.

4.6.2.10. Upper air soundings enroute and nearest the mishap site.

4.6.2.11. DD Form 175-1 and flimsy package or Verbal Brief Log used to brief aircrew (for OWS-provided briefings).

4.6.3. The CWT at the departure installation and the mishap location (if on a military installation) will follow the Aircraft Mishap procedures in Chapter 7 of AFMAN 15-135. In addition, CWTs will activate the Aircraft Accident Investigation (AAI) function on N-TFS/AMIS as a fail-safe measure.

4.6.4. All AFW units involved will gather the saved data and hold it until requested or send the data to the unit initiating the data save, as coordinated. AFW units will not dispose of the data until the unit initiating the data save determines it is no longer needed and coordinates the disposition with all units involved.

4.7. Pilot Weather Report (PIREP)/Air Report (AIREP).

4.7.1. A PIREP is a report of in-flight weather provided by an aircrew member.

4.7.2. An AIREP is an in-flight evaluation usually made over areas where weather information is limited or nonexistent (for example, over an ocean).

4.7.3. Encode PIREPs and AIREPs IAW AFMAN 15-124. Use standard contractions in FAA Order 7340.1, *Contractions Handbook*. AFW units should keep the use of contractions to a minimum.

4.7.4. Requesting and collecting PIREPs/AIREPs.

4.7.4.1. AFW units will encourage aircrews to provide timely PIREPs/AIREPs to collect the following information:

4.7.4.1.1. Meteorological elements observed that may be of operational significance to other aircraft or to surface activities (i.e., low-level wind shear, valley fog, tornadic activity, etc.).

4.7.4.1.2. Specific data to fill a gap in the meteorological collecting system (i.e., cloud bases and/or tops when departing/arriving, in-flight visibility at low levels, upper winds, or turbulence/icing at a point or between two points).

4.7.5. Recording PIREPs/AIREPs.

4.7.5.1. Use Air Force Form 3805, Pilot Report, MAJCOM, or locally developed form as a worksheet to aid in formatting PIREPs for local/longline transmission.

4.7.5.2. Record receipt of AIREPs on AF Form 72, MAJCOM, or locally developed form.

4.7.6. Disseminating PIREPs/AIREPs.

4.7.6.1. Establish procedures to disseminate all urgent PIREPs (UUA) longline, and to locally disseminate all PIREPs that are significant to the flying operations and customer safety. Disseminate routine PIREPs longline unless they meet the following conditions:

4.7.6.1.1. When two or more PIREPs have substantially the same information, disseminate only the most recent. Include a remark indicating the number of reports of the same phenomena and the time interval in which they were received, e.g., "3 RPTS last five minutes," "NUMEROUS ACFT."

4.7.6.1.2. When reports of sky condition have been incorporated into a METAR or SPECI observation, unless deemed appropriate by the person entering the report.

4.7.6.1.3. Include only negative reports of icing and/or turbulence from locations outside forecast areas for these phenomena.

4.7.6.2. Establish procedures to ensure all routine (ARP) and special (ARS) AIREPs are disseminated longline, regardless if the aircrew transmitted them. Additionally, locally disseminate all AIREPs that are significant to the flying operations and customer safety.

4.7.6.3. OWSs and CWTs will ensure significant PIREPS/AIREPs are passed to each other and to AFWA to be included in the METWATCH process and the development/amendment of flight hazard products.

4.7.6.4. AFW units will develop procedures to use PIREP/AIREP data to enhance the AFP and MEFP, as required.

4.8. Pilot-To-Metro-Service (PMSV). Selected AFW units operate PMSV radio equipment on assigned frequencies to provide weather information. All contacts with airborne aircrews, including phone patches, L-bands, and via satellite equipment are considered PMSV contacts.

4.8.1. CWTs will support all PMSV contacts from aircrews requiring enroute weather updates. CWTs will also provide support to aircrews unable to contact their home station or an OWS.

4.8.1.1. CWTs monitoring common PMSV frequencies may respond if an aircrew request is not answered by their home station CWT or OWS after two calls.

4.8.1.2. CWTs will notify their supporting OWS when they are unable to monitor their PMSV.

4.8.2. OWSs will provide all PMSV support handled by a CWT during the hours the CWT is off-duty or unable to respond, as capability permits. Additionally, the OWS will provide PMSV support to aircrews unable to contact their home station CWT or another OWS.

4.8.3. Only PMSV-task qualified personnel will respond to PMSV calls. Trainees may respond with proper supervision. Individuals not fully task qualified to prepare and issue forecasts will identify themselves as "a weather apprentice" and will not interpret weather forecasts. If a forecast or interpretation of a forecast is required and a fully qualified journeyman or craftsman weather person is not available, they will refer the aircrew to the nearest operating PMSV facility with forecasting services. The weather apprentice, if not qualified to issue or interpret forecasts, may *only* relay the following information:

4.8.3.1. Surface observations.

4.8.3.2. TAFs for which an amendment capability exists. **NOTE:** a TAF containing a "LAST" remark does not have an amendment capability if the "LAST" time has passed.

4.8.3.3. Weather watches, warnings, and advisories.

4.8.4. AFW units will follow locally established SOPs on PMSV operations and use proper radio discipline and standard phraseology found in FAA Order 7110.10, *Flight Service*. PMSV SOPs will include, as a minimum, instructions on how to:

4.8.4.1. Respond to all PMSV contacts IAW Unit Duty Priorities (if applicable).

4.8.4.2. Provide current, complete, and relevant information.

4.8.4.3. Warn of all weather hazards.

4.8.4.4. Identify locations by well-known navigational aids or ground references.

4.8.4.5. Relay the position and movement of weather hazards to the aircrew. Do not vector aircraft around hazards, such as thunderstorms.

4.8.5. AFW units will solicit a PIREP and/or AIREP at the end of each PMSV contact.

4.8.6. AFW units will establish procedures to document all PMSV contacts. At a minimum, document the aircraft call sign or number, a brief summation of the information passed to the aircrew, and the DTG of the contact. **Figure 4.2.** illustrates an example of a locally developed PMSV log.

Figure 4.2. Example PMSV Log.

PILOT TO METRO SERVICE (PMSV) LOG					MONTH: XXX 01			
NO	CALL SIGN	TIME	INFORMATION GIVEN AIRCREW	PIREPS, TURBULENCE, REMARKS	INIT	DISSEMINATION		
----	-----	-----	-----1 XXX 01 --	-----	-----	LOCAL	LONG	ROS
						-----	-----	-----
1	TOWER	0001Z	RADIO CHECK – Loud/Clear		TM			
2	PUFFY 55	0640Z	WNDS CBI – COS 27060, FCST 0900Z COS 29010 7 SCT030 3005	LCK-CBI 180 LGT TURBC 220	RG		X	
3	JOY 31	0650Z	LCL FCST 0800Z 29010 7 SCT030 OVC050 3008	OVR SGF OVC CI TOP 330 LGT CAT 350 C-141	RG		X	

4.8.7. AFW units will perform and document at least one equipment check each day (an operational contact meets this requirement). Record any discrepancies, such as weak contact, weak reception, distortion, static, etc., to assist maintenance personnel in correcting the problem.

4.8.7.1. CWTs will log all PMSV equipment outages. The form or method used may be locally developed or MAJCOM/higher headquarters specified.

4.8.7.1.1. CWTs will ask the base/post ATC agency, such as the control tower, to monitor the assigned PMSV frequency and relay all requests for weather information to the CWT for short-term PMSV outages (normally less than one hour). ATC may, or may not, be able to honor the request based on their workload and duty priorities.

4.8.7.1.2. The supporting OWS will monitor all PMSV contacts for CWTs in their AOR for long-term outages, and short-term outages ATC cannot support (as capability permits).

4.8.7.1.3. CWTs will have procedures for placing long-term PMSV outage notification in local Airfield Advisories (see base/post Airfield Operations). Ensure ATC is aware of the outage.

4.8.7.2. OWSs will log outages of their PMSV monitoring/relay equipment. The form or method used may be locally developed or MAJCOM/higher headquarters specified. They will develop procedures to notify all supported units in their AOR of the outage and back-up arrangements. Procedures will include notifying all affected units when the PMSV equipment is back in operation.

4.8.8. PMSV back-up procedures will be documented in the formal agreement between CWTs and OWSs and in agreements between MAJCOMs (as required).

4.8.9. CWTs will establish a system to evaluate and document the altitude, direction, and distance reception capability of their PMSV system. This is normally accomplished by plotting PMSV contact

information on a map depicting the range of the radio system. Although not entirely conclusive, CWTs should strive to identify and determine if there are any suspected PMSV reception limitations (i.e., blind spots/trends).

4.8.9.1. If the evaluation reveals possible limitations, CWTs will pass that information to the local radio maintenance section of the installation communication agency for further test and evaluation.

4.8.9.2. If it is determined that a permanent radio limitation exists, CWTs will notify the local ATC and/or FAA facility and ensure the PMSV limitation information is included in the next update to the FLIP.

4.8.9.3. A re-evaluation is required whenever there is a change affecting PMSV performance, such as a PMSV upgrade, change in antenna configuration, new construction of large structures, etc. CWT leadership should consider re-evaluating PMSV performance on a recurring basis (e.g., every 1-3 years) to ensure optimal radio reception.

4.8.9.4. Retain the PMSV evaluations in a permanent systems file IAW AFMAN 37-139, *Records Disposition Schedule*, 15-series Tables.

4.8.10. AFW units will ensure all information concerning their PMSV/monitoring/relay equipment and operations is current and correctly described in DoD FLIPs (i.e., IFR Supplements, Flight Information Handbook). Required updates or changes will be coordinated through the local airfield management office or responsible agency and submitted using standardized procedures and formats found in the General Planning (GP) FLIP. Chapter 7 in AFMAN 15-135 describes additional items CWTs should consider for FLIP publication.

4.9. Tactical Decision Aids (TDAs). TDAs translate terrestrial and space weather parameters into mission impact descriptions (e.g., stoplight charts or go/no go charts), or compute weapon system acquisition and lock on ranges, illumination levels, and temperature contrasts between the target and background. TDAs range from simple look-up tables and graphs to complex software programs.

4.9.1. AFW units supporting missions involving precision guided munitions (PGMs) or weapons with advanced sensors will develop local procedures with operators and intelligence personnel to obtain the necessary mission and target data required to generate the TDAs.

4.9.2. AFW units producing a MEF may use TDAs depending on the mission and the weapon system used. TDAs should be used during the mission planning phase to assist operators on what weapon system to employ based on the impacts of weather and/or as part of the Army's Intelligence Preparation of the Battlefield (IPB) process to gain complete situational awareness of the battlefield.

4.9.3. Output from TDAs is often classified because it discloses details of the mission or performance of the weapon system. Each weather unit's local procedures must include security procedures for operating TDA software and handling the output.

4.9.4. AFW units will input weather data to TDA software and/or TDA products via pre-existing common user communications systems (e.g., SIPRNET, T-VSAT). If the unit cannot access the required weather data, they will need to develop TDA MEFs using manual data input. For detailed information on the available TDA software, refer to AFMAN 15-135, *Combat Weather Team Operations*.

4.10. Effective Downwind Messages (EDMs). AFWA will post EDM bulletins on JAAWIN as required.

4.11. Chemical Downwind Messages (CDMs). CWTs and those units acting as CWTs will provide CDM support to customers as required. Attachment 3 of AFMAN 15-135 contains procedures for developing CDMs.

4.12. Mission Planning Support. CWTs and weather staffs supporting headquarter-level planners will use climatological data, and long range terrestrial and space weather outlooks to help planners anticipate and exploit the weather to accomplish the operation. Mission planning support differs from mission execution support in several ways. For example, the time frame of the support is usually longer (days to months), and the detail of the information is often less than an execution forecast.

4.12.1. Weather personnel can help planners exploit or use aerospace weather. For example, CWTs can identify areas where weather may provide additional cover for ingress or egress, and select times when the space environment causes additional radio interference on the enemy's communication network.

4.12.2. Mission planning aerospace weather data may be provided in several different forms (e.g., a range of values, probability of occurrence, text summaries, table of data values, graphs, or map displays). The weather team providing the support will discuss the options with the supported unit and determine the best format based on the users needs.

4.12.3. Intelligence Preparation of the Battlefield (IPB) Process. Mission planners require aerospace weather data and forecasts to develop Courses of Actions (COA). AFWA, OWSs, and CWTs supporting Army and some Air Force units provide mission planners weather information through the 4-step IPB process. For more detailed guidance on IPB support to the Army, see Field Manual 34-81/AFMAN 105-4, *Weather Support for Army Tactical Operations*.

4.12.3.1. Step 1: Define the battlefield environment. AFWA (including AFCCC and AFWA/SPACEWOC) and OWSs provide analysis, discussion and forecast products, climatological data, and long-range outlooks that aid supported CWTs and units to understand the aerospace weather in the AOR or Area of Interest (AOI).

4.12.3.2. Step 2: Describe the battlefield effects. CWTs determine and describe the impact aerospace weather has on weapon systems.

4.12.3.3. Step 3: Identify impact of aerospace weather on the threat. CWTs work with mission planners to determine and describe how weather may increase or decrease the enemy's capability (e.g., low visibility due to fog reduces enemy's ability to identify forces).

4.12.3.4. Step 4: Determine impact of aerospace weather on COAs. CWTs determine and describe how aerospace weather increases or decreases the ability of US military forces to successfully execute the COA.

4.13. Weather Support to Non-DoD Agencies and Foreign Nationals. AFW units will process all requests through the local Public Affairs office and follow directions provided in AFI 33-129, *Transmission of Information via the Internet*; AFI 35-101, *Public Affairs Policies and Procedures*; AFI 33-202, *Computer Security*; and AFI 61-204, *Disseminating Scientific and Technical Information*. For interna-

tional transfers of AFW software/data, AFW units must also understand the process for releasing software/data so they can inform allies on the correct procedures.

4.13.1. **Ultimate Responsibility.** Secretary of the Air Force for International Affairs (SAF/IA) and MAJCOM/Field Operating Agency (FOA) Foreign Disclosure Officers (FDOs) are ultimately responsible for approving/disapproving foreign national requests for releasing US-owned software and data. SAF/IA and MAJCOM/FDO review of software/data transfers will be on a case-by-case basis through established internal review mechanisms in accordance with DoD Guidelines for International Transfers of Software Documentation. Subsequently, in order to facilitate action through SAF/IA and/or MAJCOM/FDOs, allied requests for release of software and data must adhere to the process described in paragraph [4.13.3](#).

4.13.2. **Purpose of Transfer.** Software or data should be transferred for a specific purpose. Normally, the purpose will be to provide the recipient with the means to support end-items purchased from the US, or to facilitate US collaboration in international cooperative research, development, and acquisition programs. The extent to which software or data is approved for transfer should be commensurate with its intended use.

4.13.3. **Transfer Process.** The process for international transfers of USAF-unique software and data is described below.

4.13.3.1. **Requesting Country Produces Letter of Request.** The transfer decision process begins with the country that wants US-owned, AF-unique software or data. Their first step is for the allied country to work with their embassy in Washington D.C. to produce a Letter of Request (LOR). The LOR must provide a detailed description of the desired product to include: what, when, and why it is needed; version number (as applicable); quantity; end-user(s) and end-uses (purpose), etc. Once the LOR is completed, the embassy forwards it to the appropriate SAF/IA country director. **NOTE:** In general, embassy staffs have significant experience in producing LORs and should therefore be able to assist their country in producing a LOR with the necessary information.

4.13.3.2. **SAF/IA staffs LOR.** If a policy decision (delegation of disclosure authority letter, or DDL) to release particular software or data has already been established, then SAF/IA either provides the appropriate release guidance to the applicable embassy or forwards the request to the appropriate MAJCOM or FOA FDO for processing. If necessary, a Letter of Offer and Acceptance (LOA) is produced and negotiated informing the requesting country (through their embassy) of the conditions that the country must agree with in order to receive the software or data. If a policy has not been established, SAF/IA staffs the LOR internally and forwards it to HQ AF/XOW and/or the appropriate MAJCOM or FOA FDO for recommendations.

4.13.3.3. **HQ AF/XOW and/or MAJCOM/FOA FDOs make recommendation to SAF/IA on releasing software/data.** The MAJCOM/FOA FDO will normally work with HQ AF/XOWP, Air Force Research Lab (AFRL), and AFWA personnel (as applicable) to staff a recommendation to SAF/IA on releasing the software or data to US allies. As a minimum, the staffing action must answer the following questions:

4.13.3.3.1. Software description--what does it do--uses--classification/security risks?

4.13.3.3.2. Who designed/for whom; designed under government contract or with government monies?

4.13.3.3.3. Who owns it? Who is currently using it and for what purpose?

- 4.13.3.3.4. List parties to whom you wish to release and purpose for which it will be used.
- 4.13.3.3.5. Is the software/data strictly militarily related or is it used in civil/commercial applications as well?
- 4.13.3.3.6. Will third parties have access? If so, for what purpose will they use the software?
- 4.13.3.3.7. Do you want to export software/data temporarily (demo) or permanently?
- 4.13.3.3.8. Do you want to include training, tech data, or source codes with software?
- 4.13.3.3.9. List/explain any documents/regulations that may apply to release of this software.
- 4.13.3.3.10. How much money are we charging to release the software/data?
- 4.13.3.3.11. Recommendation on releasing the software/data.

4.13.3.4. AF/XOW and/or the MAJCOM/FOA FDO will forward the package (with recommendation) to SAF/IAPD for disclosure guidance. In those circumstances, SAF/IAPD may staff the package through the appropriate agencies. If/when SAF/IAPD approves, a LOA is drafted by the SAF/IA country director and forwarded to the appropriate embassy. The LOA informs the requesting country (through their embassy) of the conditions that the country must agree with in order to receive the software or data.

4.13.3.5. SAF/IAPD produces DDL. SAF/IAPD may produce a DDL so that similar requests in the future can be handled more efficiently. SAF/IAPD may require HQ AF/XOWP and MAJCOM/FOA FDO assistance in producing the DDL.

4.13.4. HQ AF/XOW recently obtained SAF/IA and/or MAJCOM Foreign Disclosure Policy Office approval for releasing certain AFW data, products, and software to US allies (described below).

4.13.4.1. Real-time DMSP data is releasable to all NATO countries except Iceland, as well as to Australia, New Zealand, South Korea, and Japan. In addition, real-time DMSP data is releasable to coalition allies during CINC-authorized exercises and contingencies. NATO countries are Belgium, Canada, Czech Republic, Denmark, France, Germany, Greece, Hungary, Iceland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Turkey, and the United Kingdom (as of publication date).

4.13.4.2. All unclassified weather data and products (NEXRAD imagery, MM5 products, weather hazards charts, forecast products, etc.) are approved for release to all NATO countries, Australia, New Zealand, South Korea, and Japan. In addition, unclassified weather data/products are releasable to coalition allies during CINC-authorized exercises and contingencies.

4.13.4.2.1. During such CINC-authorized exercises/contingencies, weather products that are derived from unclassified weather data/products and used to support any classified or sensitive missions/weapons systems must still be approved for release by the CINC's Foreign Disclosure Officer.

4.13.4.2.2. Weather related software programs (including source, object, and executable codes) do *not* fit within the category of weather data/products. For these requests, countries must follow the guidance for obtaining access to AFW software programs (see paragraph [4.13.3.](#)).

4.13.4.3. Night Vision Goggle (NVG) Operational Weather Software (NOWS) and Target Acquisition Weather Software (TAWS) are approved for release IAW the provisos described below. As

the MAJCOM FDO for Air Force Material Command (AFMC), the Air Force Security Assistance Center (AFSAC/IAD) at Wright-Patterson AFB, Ohio, is the lead agency responsible for releasing NOWS and TAWS to foreign governments. As such, they are responsible for processing allied requests for this software. Country requests for NOWS and TAWS should be made IAW the guidance as follows.

4.13.4.3.1. NOWS is releasable to any country that has obtained NVGs from the US. Prior to releasing the software, AFSAC/IAD will ensure countries that request NOWS have purchased NVGs from the US.

4.13.4.3.2. TAWS (unclassified compact disk and classified attachment) is releasable to all countries IAW existing SAF/IA approved aircraft and weapons DDLs. Weapons not possessed (or in the process of being acquired) by the respective country must be deleted from the CD and attachment. AFSAC/IAD (lead agent) will work with SAF/IA, AFRL, and the AFW Technical Library (AFWTL) as appropriate to ensure these conditions are met prior to release of the software to allies.

4.13.4.3.3. For NATO countries, HQ NATO submitted a request (in May 2001) to SAF/IA for NOWS and TAWS. All other allies are required to follow the procedures outlined in paragraph **4.13.4.** for obtaining NOWS and TAWS.

4.13.5. HQ USAF/XOW and HQ AFWA/SC are working to obtain HQ USAF/CVA approval for foreign national access to AFW strategic center information systems (i.e., JAAWIN and the AFCCC web site). Once approved, implementation procedures will be disseminated to allies and all MAJCOMs. Meanwhile, AFW units should work with their MAJCOM DOWs to obtain approval for foreign national access to MAJCOM information systems IAW guidance below.

4.13.5.1. AFI 33-202, *Computer Security*, provides strict guidelines for authorizing foreign national access to all AFW information systems (i.e., web sites), whether those information systems reside at strategic, operational, tactical, in-garrison, or deployed locations. Paragraph 3.7 of the AFI states that for agencies outside HQ USAF and HQ USAF Direct Reporting Unit channels (where approval authority is the HQ USAF/CVA), MAJCOM commanders are responsible for authorizing foreign national access to information systems within their respective commands. Therefore, AFW units must obtain MAJCOM/CC (or CV) approval for allies to access AFW information systems at operational, tactical, in-garrison, or deployed locations.

4.14. Requests for Weather Support to Non-US Military Organizations. Requests for weather support outside DoD will be coordinated through applicable commands. If this weather support involves dissemination of Scientific and Technical Information, see paragraph **4.15.**

4.15. Requests for Scientific and Technical Information (STI) to Non-US Military Organizations.

Requests outside DoD for STI produced and/or controlled by DoD resources will be coordinated with the controlling Command's Scientific and Technical Information Officer (STINFO) IAW AFI 61-204, *Disseminating Scientific and Technical Information*. Coordination with the controlling Command's Foreign Disclosure Officer (FDO) should be sought if STI will possibly be given or exchanged with foreign nationals. STI dissemination outside DoD may be via any medium and may include such methods as operational work situations, exchange via the Internet, briefings, scientific papers, conferences, visits to

the organization, and/or cultural exchanges. Unclassified STI may also have restrictions on dissemination outside the DoD.

4.16. Weather Modification. Weather modification is defined as any activity performed with the intention of producing artificial changes in the composition, behavior, or dynamics of the atmosphere. This includes, but is not limited to, seeding or dispersing of any substance into clouds or fog to alter their characteristics, enhance rainfall or inhibit the development of hail or lightning, or using heat sources to evaporate fog. For further information on weather modification, contact the Tactical Environmental Support Branch, Air Force Research Laboratory, Hanscom AFB, MA (DSN 478-3667).

4.16.1. Statutory Authority. Statutory authority for this information is derived from Public Law 92-205, *An Act to Provide for the Reporting of Weather Modification Activities to the Federal Government*; Public Law 94-490, *An Act to Authorize and Direct the Secretary of Commerce to Develop a National Policy on Weather Modification*; and Section 908.8, Part 908 of Title 15, Code of Federal Regulations.

4.16.2. Required Actions (CONUS). AFW units engaged in weather modification activities or intending to engage in weather modification activities will:

4.16.2.1. Coordinate with the servicing legal office to ensure the legality of weather modification activities.

4.16.2.2. Coordinate with the local environmental management office to determine the need for initiating an environmental impact analysis.

4.16.2.3. Coordinate with the servicing public affairs office to ensure appropriate responses to potential public and media queries are prepared and approved prior to any weather modification activities.

4.16.2.4. Obtain approval from the proper agency at the federal or local level (state, county, or municipal), or both if required, prior to engaging in any weather modification activity.

4.16.2.5. Report the intent to engage in weather modification activities and report the actual weather modification activities to the National Oceanic and Atmospheric Administration, Office of Oceanic and Atmospheric Research R/PDC, 1335 East-West Highway, Silver Spring, MD 20910. For information on reporting rules or to request forms, call commercial (301) 713-9397.

4.16.2.6. Send informational copies of all reports to:

4.16.2.6.1. Directorate of Weather, Deputy Chief of Staff, Air and Space Operations, Headquarters USAF (HQ USAF/XOW), 1490 Air Force Pentagon, Washington, DC 20330-1490.

4.16.2.6.2. Air Force Research Laboratory (AFRL/VSBL), Hanscom AFB, MA 01731-5000.

4.16.2.6.3. Operations Division, Air Force Combat Climatology Center (AFCCC/DO) 151 Patton Ave., Room 120, Asheville, NC 28801-5002.

4.16.2.7. Send information copies of all news releases to HQ USAF/XOW and the Secretary of the Air Force, Office of Public Affairs (SAF/PA), 1690 Air Force Pentagon, Washington, DC 20330-1690.

4.16.3. Required Actions (OCONUS). AFW units implement appropriate weather modification techniques upon receipt of orders from the theater Commander-in-Chief or a designated representative.

Chapter 5

COORDINATED WEATHER SUPPORT

5.1. General. Coordinated weather operations ensure all operators/war-fighters and decision-makers receive the weather information they need at the right time. It also ensures the same weather information is used at all command levels. Therefore, AFW units must coordinate on how to provide weather support to missions involving more than one unit or service and when their customers operate away from their home station. This chapter defines the policy and procedures for coordinating weather support.

5.2. Terminology. The following terms and definitions apply to AFW units providing coordinated support:

5.2.1. Joint Operation Area Forecast (JOAF). Provides the official forecast for operational planning and should be used by all operational planners in the joint operational area. It provides a discussion and rationale for the expected meteorological and oceanographic (METOC) and space environmental conditions that impact joint force operations during the forecast period. JOAFs are issued according to Joint Publication 3-59, *Joint Doctrine, Tactics, Techniques, and Procedures for Meteorological and Oceanographic Operations*, and Unified Command Letters of Instruction.

5.2.2. Lead Weather Unit. The weather unit having overall responsibility for coordinating aerospace weather support, issuing the aerospace weather support Letter of Instruction (LOI), and providing or arranging aerospace forecasts for the Controlling MEF.

5.2.3. Controlling MEF (CMEF). The CMEF is the official forecast for concerted operations composed of multiple unit missions. The lead weather unit issues or arranges for a CMEF (e.g., ACC WSU CORONET forecast). The mission-critical thresholds will not be deviated from without prior coordination with the issuing agency.

5.2.4. Multi-Unit Mission. A mission with more than one unit operating together, supported by multiple CWTs, to accomplish a specific objective.

5.2.5. Staged Mission. A mission with flying and/or ground units operating away from home station for more than one day at any one location.

5.2.6. Transient Mission. A mission where a flying or ground unit stops at a location for a few hours to a day before continuing with its mission. This includes units that remain over night (RON) at a location.

5.2.7. Military Operating Area Forecast (MOAF). A forecast guidance product that provides the terrestrial and/or space environmental conditions for a specific area in which military operations are occurring.

5.3. Coordinated Weather Operations. A single Controlling MEF will be issued for concerted operations composed of multiple unit missions. An example is a KC-10 tanker refueling B-52 bombers and F-15 fighters prior to a combined strike mission. The OWS or CWT issuing the CMEF will use existing AFWA or OWS products, to include MOAFs issued for the specific mission. All weather units supporting the mission must use the CMEF to develop the MEF for their supported unit.

5.3.1. The CMEF (either unclassified or classified) may be a collection of the AFWA and OWS products or a separate product depending on the mission.

5.3.2. When two or more military units operate together and require weather support, a lead weather unit will be identified using the information below and [Table 5.1](#).

5.3.2.1. In general, the weather unit supporting the mission's command and control element is the lead weather unit. The weather unit assigned with the command and control (C2) element has direct access to mission planning information, mission execution status, and supports the commander making the mission's go/no go decision.

Table 5.1. Prioritized Rules for Determining the Lead Weather Unit.

Rule	Type of Mission	Designated Lead Weather Unit
1.	Joint Missions	Joint METOC Officer (JMO) defines weather support for a Joint Operation in Joint Operations LOI or support message (See NOTE)
2.	AEF	Weather Unit supporting the designated AEF lead unit
3.	GLOBAL POWER	Weather unit supporting the ACC C2 element
4.	CORONET	Weather unit supporting the ACC C2 element
5.	GLOBAL REACH	Weather unit supporting TACC C2 element
6.	Air Refueling (AR)	Weather unit supporting the lead receiving aircraft unit
7.	JA/ATTs & DZ	Weather unit supporting the lead airlift aircraft unit
8.	LZ & Land Maneuver	Weather unit supporting the lead Army unit
9.	Deployed or Transient	Weather unit assigned to support the unit at home station.
10.	Special Operations	Lead weather unit depends on nature of the operation (see paragraph 5.3.2.2.2.)

NOTE: If a Joint Meteorological Forecast Unit (JMFU) is established at an OWS, it will adhere to the procedures and formats outlined in Joint Publication 3-59 for preparing LOIs and JOAFs. The JOAF may include MOAFs as specified in [Chapter 2](#) and [Attachment 9](#).

5.3.2.1.1. If the lead weather unit or the coordination process is not defined in a Joint Operations LOI, use [Table 5.1](#) rules 2-10 to determine the lead weather unit.

5.3.2.2. Rules for missions with Special Operations Forces are as follows:

5.3.2.2.1. When Special Operations Forces operate with conventional forces under Operational Control (OPCON) of a theater CINC, then the lead weather unit is determined from rules 1-9 in [Table 5.1](#). Special Operations Force units will use the CMEF and appropriate OWS or SSOB products to produce their MEFs.

5.3.2.2.2. When Special Operations Forces operate solely in their own channels, the CWT supporting the Special Operations Force unit will be the lead weather unit.

5.3.3. The following are the responsibilities of the Lead Weather Unit:

5.3.3.1. The lead weather unit will contact all weather units providing support during the operation. They will also notify involved MAJCOM chain of command if cross MAJCOM support is

required. The lead unit will gather the following information during the pre-mission coordination process:

5.3.3.1.1. Special aerospace weather parameters or data needed for the mission.

5.3.3.1.2. Critical thresholds of aerospace weather parameters needed for the mission. These mission critical thresholds will be the minimum criteria for amending the CMEF.

5.3.3.1.3. The name of the unit producing the CMEF.

5.3.3.1.4. The times the CMEF will be available.

5.3.3.1.5. The CMEF dissemination method.

5.3.3.1.6. Points of contact for each weather unit involved, including secure/nonsecure telephone numbers, fax numbers, and e-mail addresses.

5.3.3.2. Based on the size and complexity of the mission, the lead unit will determine if a written LOI is required. Missions involving more than three units, operating between theaters, or having command interest (e.g., JCS, CINC, CSAF, or MAJCOM) will have a written LOI. For missions not requiring a written LOI, the lead weather unit can coordinate weather support issues via telephone calls, e-mails, etc. The objective is to ensure all weather units know how weather support is being provided and to use a coordinated weather forecast. Joint Publication 3-59 may be used as a guide for writing a LOI for both joint and non-joint operations. When a LOI is required, it will include at least the following information:

5.3.3.2.1. Identify the unit issuing the CMEF.

5.3.3.2.2. How forecasts will be disseminated.

5.3.3.2.3. When forecasts will be available.

5.3.3.2.4. List all units involved, including Point of Contacts (names, telephone numbers, and e-mail addresses).

5.3.3.3. During contingencies and major theater wars, the Senior METOC Officer (SMO) is responsible for ensuring coordinated aerospace weather support occurs. The SMO issues an LOI or an annex to an OPLAN that describes how coordinated weather operations are conducted in the theater of operations.

5.3.3.4. Some missions require special meteorological, climatological, oceanographic, or space environmental data or forecasts. The weather unit requiring the specialized products will submit a SAR to the appropriate OWS or strategic center using procedures in paragraph 2.9.

5.3.3.5. Some missions may require a conference call or other collaboration forum. The lead weather unit will determine if conference calls or other collaboration tools are required and make the necessary arrangements. The call will, as a minimum, discuss the weather situation, resolve differences in forecasts, and identify potential weather impacts to the operation. Discussion of classified mission information will be done over SIPRNET or secure phone networks.

5.3.3.6. Other weather units participating in a multi-unit mission will provide mission information to the lead weather unit POC, forecast product requirements, and critical aerospace weather thresholds prior to the mission. Participating weather units will produce a MEF for their support unit from the CMEF. These units will brief the MEF and perform a MISSIONWATCH for their supported unit.

5.4. Transient and Staged Missions . These missions occur when an entire or a portion of a flying or ground unit moves to or passes through a military installation other than their home station. Weather units assigned to support these units are responsible for providing or arranging weather support.

5.4.1. Transient Missions. For transient flying missions, CWTs will evaluate their supported customer's scheduled missions and determine the best source for weather support using the following guidelines.

5.4.1.1. CWTs will provide or arrange updates to MEFs for transient missions that require specialized support such as TDA or NVG forecasts. One example of such a mission is an aircrew that departs from their home station, stops enroute or remains overnight at a different location, and on the way back to home station, conducts training that requires a TDA forecast. In this instance, the home station CWT should have the aircrew call back for updates to their original MEF or arrange support as appropriate.

5.4.1.2. CWTs will provide or arrange updates to MEFs for missions that stop at several locations before returning to the original take-off location, i.e., round-robin/out-and-back missions. The home station CWT should brief the aircrews to call back for updates to their original MEF or coordinate updates with the CWTs at the intermediate stops.

5.4.1.3. OWSs are normally the primary support provider for transient missions that are not related to combat or combat training and do not require specialized support. However, CWTs will not deny service to any transient aircrew when open and priorities of duty permit.

5.4.1.3.1. CWTs should provide verbal aircrew briefing updates to transient aircrews upon request without referral to an OWS. This applies primarily to CWTs with a central briefing point that an aircrew can approach for assistance. This may also apply to a CWT contacted by telephone. However, the preferred method is for an aircrew to call back to their primary home station CWT for the update. All updates must be documented.

5.4.1.4. The home station CWT will provide or arrange for briefing support through the appropriate OWS (or Flight Service Station if required) when local Aero Club flights are performing official duties (e.g., Civil Air Patrol and Initial Flying Training Programs) in a transient status. CWTs should advise Aero Club members of the OWS' existing web-based capabilities and desired 2-hour advance notification for flight weather briefing support.

5.4.1.5. For strategic AMC missions under Mobility 2000, weather briefings, MISSIONWATCH, and updates will normally be provided by the TACC. However, should communications fail, etc., any CWT or OWS should provide appropriate assistance.

5.4.2. Staged Missions. For staged flying and ground missions, the assigned weather personnel should deploy with their supported unit. When personnel or funding shortfalls prevent the assigned weather personnel from deploying, the home station weather unit will use the following procedures in rank order as listed to coordinate and arrange weather support for their supported unit. The home station CWT will notify their MAJCOM functional through channels when they encounter problems coordinating support with another weather unit outside their MAJCOM chain of command.

5.4.2.1. If the home station CWT cannot deploy and the deploying unit is operating with another unit at the deployed location (i.e., not operating independently), they will coordinate and arrange for the CWT at the deployed location to provide weather support. A mass briefing may support these missions with minimal impact on the unit providing weather support.

5.4.2.2. If the CWT at the deployed location cannot provide the support, the home station CWT will coordinate and arrange for the OWS in the AOR to provide the support for the deployed unit. The deployed mission crew will call the OWS or use a web-based briefing site to receive weather support.

5.4.2.3. If the OWS cannot provide support and a web-based briefing terminal is not available, the home station CWT will arrange for the deploying unit to call back to the home station CWT to receive their weather support.

5.4.2.4. As a last resort, if the home station CWT is unsuccessful in providing or arranging weather support for their deploying unit, they will request assistance through their chain of command.

Chapter 6

WAR, CONTINGENCY, CRISIS, AND MILITARY OPERATIONS OTHER THAN WAR SUPPORT

6.1. General. In AFW, the technical aspects of providing aerospace weather information, products, and services to customers in a wartime environment will mirror day-to-day in-garrison operations as closely as possible. Weather leaders will develop technical guidance and procedures based on the "*same in peace as in war*" operational concept. For detailed guidance on Tactical Operations, refer to AFMAN 15-135. AFW units with a deployment commitment will follow the guidance in AFMAN 15-135 along with that in this manual.

6.1.1. Leaders of AFW units that deploy will review MAJCOM or higher headquarters directives and guidance on tactical operations, training, and reporting; and incorporate these requirements in the unit's tactical operations program. Review AR 115-10/AFJI 15-157, *Weather Support for the US Army*; FM 34-81/AFMAN 105-4, *Weather Support for Army Tactical Operations*; Joint Publication 3-59; the *Joint Meteorology and Oceanography (METOC) Training Handbook*; and AFMAN 10-100, *Airman's Manual*, to ensure the tactical operations program supports the requirements in these documents, as applicable.

6.2. Support to Operations During War, Contingencies, Crises, and Military Operations Other Than War.

6.2.1. Strategic weather centers. AFW strategic weather centers provide large-scale (campaign or global level) planning outlooks, climatology, space-environmental warnings and outlooks, and strategic and mesoscale NWP model data fields to support all customers. Strategic centers may be tasked to provide specialized products and services in support of contingency operations. The following describes the functions of individual centers.

6.2.1.1. AFWA. AFWA provides strategic-level weather forecast products, weather satellite imagery, space weather products, and strategic and mesoscale NWP model data to support deployed operations. Weather units may request new products, data, or imagery through the AFWA lead meteorologist (at DSN (312) 271-2586 commercial (402) 294-2586; by secure voice at DSN (312) 271-6558 or commercial (402) 294-6558); or by submitting a SAR using procedures in paragraph [2.9](#).

6.2.1.1.1. AFWA/SSOB. AFWA's SSOB provides fine-scale planning and mission execution forecasts across the total environment for any potential, emerging, or ongoing worldwide joint military operation that, for reasons of security or timeliness, cannot be supported from an OWS. The Special Operations Forces Weather Operations Cell (SOFWOC), a workcenter within SSOB, is the OWS for Army and Air Force SOFs and provides SOF reachback forecast capability. Weather support for ongoing non-SOF operations is handled by the OWS responsible for the AOR.

6.2.1.1.1.1. The SSOB provides specialized products for Army and Air Force SOF during SOF-only exercises and contingencies. The SSOB uses existing AFWA and OWS forecast products to make MEFs or products for units requesting support. When a SOF operation falls within an established or emerging joint force structure, the SOFWOC provides any

specialized SOF-related products required by the SMO or JMO that the JMFU cannot fulfill.

6.2.1.1.1.2. The SSOB coordinates Army and Air Force riverine and maritime littoral SOF requirements with Navy METOC centers.

6.2.1.1.1.3. The SSOB provides specialized products for rapidly emerging contingencies to support CINCs at any location as required by the OWS or JMFU.

6.2.1.1.1.4. The SSOB provides strategic, operational, and tactical level weather decision assistance and target forecasts to support other national program offices.

6.2.1.1.2. The AFWA/SPACEWOC provides space weather products and services. These services include observations, forecasts, and warnings along with anomaly assessments for satellite, radar and communications systems, and other technical support as required, at all levels of security classification. Weather units may request new products, data, or imagery through the SPACEWOC lead meteorologist (at DSN 560-6313 or commercial (719) 567-6313; by secure voice at DSN 312-560-2308); or by submitting a SAR using procedures in paragraph 2.9.

6.2.1.2. AFCCC. AFCCC produces special weather impact information used in planning and executing worldwide military operations for the DoD and allied nations.

6.2.2. OWSs. OWSs act as the central point for operational aerospace weather data for all conventional Army and Air Force customers operating within its AOR. The OWS will assume terminal forecast, watch, warning, and advisory responsibility as soon as they establish adequate connectivity with the deployed CWTs and coordinate the requirements. OWSs also issues severe weather discussions and MWA-style products for overseas AORs. OWSs will provide the majority of their wartime support in-place. OWSs supporting wartime operations should be augmented by personnel IAW the appropriate time-phased force and deployment data (TPFDD) executed for those operations. OWSs not augmented by an appropriate TPFDD for wartime/contingency operations in their AOR will contact their MAJCOM or higher headquarters to arrange the necessary augmentation to meet the additional support requirements of deployed CWTs.

6.2.2.1. Combat Operations Flight (COF). Some OWSs have an embedded COF. The personnel within this flight are the meteorological experts on an AOR that is not located in the same geographical region as the OWS. The COF concentrates on its AOR both during peacetime and while at war. It produces AOR-specific information and products and routes support to a shared database for use by their customers. The COF is one of the central points of contact for all Air Force and Army weather support products within the OWS' Unified Command or Sub-Unified Command's AOR. They will remain as the "reach-back" location for products and services for all USAF and Army CWTs operating within the operation's AOR, with the exception of the support identified in paragraph 6.2.1.1.1.1. for SOF support.

6.2.2.1.1. COF Planning Functions. The COF provides AF and Army planning and operational forecast products for decision-makers at the Numbered Air Force (NAF) and Echelon Above Corps (EAC) level, both in-garrison and deployed. The Joint Task Force Commander may designate the OWS to be the JMFU IAW Joint Publication 3-59.

6.2.2.1.2. Other COF functions are as follows:

6.2.2.1.2.1. Provide forecast products to required customers within its AOR. Additional product requirements will be coordinated with customers. Prepare Army IPB products

supporting the 4-step process defined in Army FM 34-130, *Initial Preparation of the Battlefield*.

6.2.2.1.2.2. Discuss and pass classified information to and from CWTs, strategic centers, and other military units via a secure means of communications (i.e., SIPRNET, STU III/STE). All COFs will have secure capabilities for both voice and data transmission.

6.2.2.1.2.3. Disseminate all information, products, and services to CWTs using existing common user communications systems (i.e., Internet, NIPRNET, and SIPRNET) and other systems such as the Global Broadcast System (GBS) or VSAT satellite receivers.

6.2.3. CWTs. When possible, CWT personnel will deploy with their supported unit. Time permitting, CWTs will coordinate deployed support requirements with the supporting OWS before deploying. If a CWT is moving locations, they will contact the OWS before (time permitting) and after the move to discuss changes in support requirements.

6.2.3.1. The CWT will use products provided by the OWS supporting the theater into which they are deployed. The OWS will post products on a secure OWS bulletin board for downloading and/or directly "smart push" to the CWT. CWTs must have SIPRNET access for secure operations to be effective in a deployed environment. CWTs may also utilize AF-provided Theater Deployable Communications (TDC), or Army Common User System (ACUS), or AFW-provided T-VSAT terminals.

6.2.3.2. If the entire CWT deploys, all CWT garrison meteorological support responsibilities will then revert to the OWS as defined in the OWS-CWT formal agreement.

6.2.4. Air Force Special Operations Command (AFSOC). AFSOC Special Operations airborne CWTs will use theater OWSs to the maximum extent possible when deployed. For situations in which security concerns prevent the OWS from providing support, the CWTs will use the AFWA SSOB. The SSOB and the theater SOC SMO will coordinate and de-conflict mission support as necessary and IAW AFWA/AFSOC formal agreements.

6.3. Alphanumeric Text Bulletin Headers (MANOP). For short-notice, rapid response support to real-world operations, AFWA or an OWS may have to issue a CMEF via an alphanumeric text bulletin over standard communication networks. In these cases, the bulletins require a unique MANOP bulletin header.

6.3.1. AFWA and each OWS will work with the AFWA/AWN to establish a set of temporary MANOP bulletin headers to support these short-notice real-world operations.

6.3.2. If a CWT issues the CMEF, the unit will normally obtain a MANOP bulletin header from AFWA. However, the CWT may need to obtain a MANOP header from the supporting OWS to support short-notice real-world operations. OWS-assigned MANOP headers are for temporary use only (generally less than 30 days).

Chapter 7

METEOROLOGICAL EQUIPMENT AND SENSORS

7.1. General. AFW units with weather radar, METSAT, forecasting, observing, and space weather monitoring equipment and sensors will develop comprehensive procedures to ensure the equipment/sensors are properly operated and maintained. Units will notify appropriate associate units of any degraded capability of weather equipment/sensors. AFW units are responsible for obtaining radio frequency assignments and reporting any interference to the Installation Spectrum Manager IAW AFI 33-118, *Radio Frequency Spectrum Management*.

7.2. Weather Surveillance Radar - 1988 Doppler (WSR-88D). Strategic weather centers, OWSs, and CWTs using WSR-88Ds within their AFP and/or MEFP will:

7.2.1. Participate on the Unit Radar Committee (URC).

7.2.1.1. When an AFW unit has a dedicated circuit to a NWS controlled WSR-88D, they will participate on the URC IAW FMH 11. When multiple AFW, Navy, Marine, or Army units are dedicated to a NWS-controlled WSR-88D, one of them (usually the OWS IAW AFI 15-128) will participate in the URC meetings as the DoD voting member. However, OWSs may request through the MAJCOM that the local CWT in the area represent the OWS on the URC. The voting member will coordinate significant changes affecting the control and operations (e.g., operational modes and volume coverage patterns), and the maintenance of the radar with all DoD dedicated users prior to attending the URC meeting. The voting member will provide a written summary of the URC meeting to all dedicated DoD users.

7.2.1.2. When the AFW unit has operational control of the radar and there are other units with dedicated circuits to that radar they will develop a URC IAW FMH 11.

7.2.2. Ensure personnel are qualified to operate Doppler weather radar equipment (to include Open Principal User Processor [OPUP]) and interpret radar imagery IAW the QTP listed in the AFW Career Field Education and Training Plan (CFETP). Fully exploit all other Doppler radar training resources available from AFWA and other agencies.

7.2.3. Develop procedures for the proper operation and maintenance of radar equipment IAW Technical Orders (TOs) and equipment manuals.

7.2.3.1. Develop local procedures for reporting equipment outages and trouble shooting problems to include startup, restart, and shutdown, as appropriate.

7.2.3.1.1. Radar maintainers will compile and submit information for OPREP-3 BEELINE reports IAW AFMAN 10-206, *Operational Reporting*, for extended outages (i.e., 48 hours or longer).

7.2.3.2. Establish local procedures to ensure personnel operating the radar are aware of the radar's status, alert area locations and thresholds, current Volume Coverage Pattern (VCP) and Routine Product Set (RPS) list and environmental factors (e.g., environmental winds vs. Velocity Azimuth Display Wind Profile [VWP], tropopause height, height of -20 C isotherm) prior to data interpretation. Procedures will also guide personnel in making optimum use of the RPS lists and VCP for storm interrogation and assist them in choosing the best product to use for a particular forecast regime.

7.2.3.3. AFW units with Unit Control Position (UCP) of the Radar Data Acquisition (RDA) will ensure assigned personnel are able to perform the minimum set of functions listed in **Table 7.1**.

Table 7.1. Unit Control Position Functions.

<ol style="list-style-type: none"> 1. Change the VCP. 2. Change the Pulse Repetition Frequency (PRF). 3. Modify the environmental wind table. 4. Monitor the principle user communication lines. 5. Enable local control of the RDA for maintenance actions. 6. Notify Principal User Processor (PUP) users of changes to the system. 7. Perform startup and shut down procedures.

7.2.3.4. All weather units using Doppler weather radar should have the following information available to the operator: list of points of contact (e.g., maintenance, units with UCP responsibility), systems troubleshooting guide, and the RPS for the VCPs.

7.2.4. Develop procedures to print/archive radar imagery for an aircraft mishap, Radar Imagery Reference File (RIRF), and local training.

7.2.5. Implement applicable portions of the program template provided in AFW ECHOES #18, *Radar Program* (AFWA online, <https://wwwmil.offutt.af.mil/afwadnt>). Maintain the references required to conduct an effective Doppler weather radar program.

7.3. Meteorological Station, Radar (AN/FMQ-18(V)). Strategic weather centers, OWSs, and CWTs using the AN/FMQ-18 weather radar equipment within their AFP and/or MEFP will:

7.3.1. CWTs will coordinate significant changes affecting the control and operations (i.e., range, elevation, display parameters, and screen capture intervals for the imagery products provided on the LAN and to the OWS, etc.), and maintenance of the AN/FMQ-18 radar with the supporting OWS.

7.3.2. Ensure personnel are qualified to operate the AN/FMQ-18 radar equipment IAW the contractor-provided training material and interpret applicable Doppler radar imagery IAW the QTP listed in the AFW CFETP. Fully exploit all other Doppler radar training resources available from AFWA, OWSs, the contract depot, and other agencies.

7.3.3. Develop procedures for the proper operation and maintenance of radar equipment.

7.3.3.1. Develop local procedures for reporting equipment outages and trouble shooting problems to include startup, restart, and shutdown, as appropriate.

7.3.3.2. Establish local procedures to ensure personnel operating the radar are aware of the radar's status and environmental factors (e.g., environmental winds, tropopause height, height of -20 and 0 C isotherms) prior to data interpretation.

7.3.3.2.1. Personnel must know how to use and interpret the automated screens on the status display to determine information such as the beam width and height above terrain and other operational data from the automated correction screens.

7.3.3.2.2. Procedures will also guide personnel in making optimum use of the system's capabilities and assist them in choosing the best displays and functions to use.

7.3.3.3. All weather units using the AN/FMQ-18 weather radar should have the following minimum information available to the operator: list of points of contact (e.g., maintenance, AFWA Help Desk), operation and organizational maintenance instructions, and computer-based training material.

7.3.4. Develop procedures to print/archive radar imagery for an aircraft mishap (See paragraph 4.6.), the RIRF, and local training.

7.3.5. OWSs and CWTs will use AFWA-provided system security documents to obtain site accreditation for AN/FMQ-18 screen capture systems. OWS and CWT leaders will adhere to all local and AFW security practices, to include ensuring connected networks are virus-free and passwords are protected.

7.3.5.1. A Radar System Administrator will be assigned to ensure proper network connection and manage the radar imagery (i.e., FTP addresses, C & A, etc.) posted on the LAN and system software.

7.4. Meteorological Satellite. Strategic weather centers, OWSs, and CWTs using METSAT within their AFP and/or MEFP will:

7.4.1. Ensure unit personnel are qualified to interpret METSAT imagery IAW the appropriate QTPs listed in the AFW CFETP. Fully exploit all other METSAT training resources available from AFWA and other agencies.

7.4.2. Develop procedures for the proper operation and maintenance of all METSAT equipment.

7.4.3. Develop procedures to print/archive METSAT for an aircraft mishap, METSAT Imagery Reference File (MIRF), and local training.

7.5. Space Weather Monitoring Equipment. AFWA and AFWA/SPACEWOC operate various telescopes and sensors to observe the sun and monitor the current state of the near Earth space environment.

7.5.1. The telescopes and sensors include the following:

7.5.1.1. Radio Solar Telescope Network (RSTN), AN/FRR-95. The RSTN telescopes gather standardized solar radio data and produce discrete frequency radio observations using Radio Interference Measuring Sets (RIMS) and swept frequency spectral radio observations using the Swept Frequency Interferometric Radiometer (SFIR) or its upgrade, and the Solar Radio Spectrograph (SRS). The RSTN provides timely, accurate solar radio alerts and analyses to SPACEWOC, NOAA's Space Environment Center (SEC), and other direct customers such as North American Aerospace Defense Command (NORAD) and National Aeronautics and Space Administration (NASA).

7.5.1.2. Solar Observing Optical Network (SOON), AN/FMQ-7. The SOON telescope gathers standardized photospheric, chromospheric, and coronal data in either computer assisted or non-computer mode. It provides the capability to observe, analyze, and report solar phenomena such as solar flares, sunspots, magnetic fields, and disk and limb activity. The SOON provides timely, accurate solar optical alerts and analyses to SPACEWOC, SEC, and other direct customers such as NORAD and NASA.

7.5.1.3. Digital Ionospheric Sounding System (DISS), AN/FMQ-12. The DISS is a high frequency pulse sounding radar system that routinely measures and automatically analyzes the behavior of the overhead ionosphere, especially the height and electronic density of the ionospheric E and F layers. It automatically records, displays, and transmits vertical ionospheric information in the form of digital ionograms, ionospheric parameters, and electronic density profiles. AFWA/SPACEWOC uses the data to specify the worldwide ionosphere and for determining radio propagation conditions for a variety of customers.

7.5.1.4. Ionospheric Measuring Set (IMS), AN/GMQ-35. The IMS is a passive, automated receiver that measures the transmitted signals of up to eight Global Positioning Satellites (GPS/NAVSTAR) and converts these measurements into equivalent Total Electron Content (TEC) for the paths between the satellite and the receiver. The data is used by SPACEWOC for analysis of the worldwide ionosphere and as input to ionospheric models.

7.5.2. AFW leadership will ensure personnel assigned to AFWA/SPACEWOC, and AFW solar observatories are qualified to interpret space weather observations via formal training classes and on-the-job training. Fully utilize all training resources available from other agencies.

7.5.3. Develop procedures for the proper operation and maintenance of all space weather monitoring equipment.

7.5.4. Record and disseminate solar observations in accordance with AFMAN 15-124.

7.6. Alternate Sources. All weather units will explore ways to glean weather data from sensors (e.g., mission videos, UAV displays) on supported units' platforms (e.g., aircraft, vehicles, or Army artillery systems).

7.6.1. Data gathered during missions will be used in the METWATCH and MISSIONWATCH processes. AFMAN 15-135, Chapters 4 and 5, contain further information on incorporating weather data into the forecast process and into the METWATCH and MISSIONWATCH functions.

7.6.2. Data collected in post mission reviews will be used to verify forecasts and improve the forecasting process.

Chapter 8

WEATHER COMMUNICATION AND PRODUCT DEVELOPMENT SYSTEMS

8.1. General . Communications and weather product development technology continues to rapidly evolve. Leadership at each weather unit must use the best weather systems and communication capabilities available to support their customers.

8.2. Weather Communication and Product Development Systems . Weather product development systems receive, display, manipulate, and disseminate meteorological information. They use various communications modes to include common user communications (Internet, NIPRNET, SIPRNET, and Joint Worldwide Intelligence Communications Systems), satellite, dedicated line, and high frequency radio. For NIPRNET and SIPRNET connectivity, weather systems should use existing common user base connectivity prior to pursuing their own dedicated long-haul connectivity.

8.3. System Management . Strategic weather center, OWS, and CWT leadership are responsible for establishing the standard procedures and system settings the unit will use to support their operations, such as determining which products they receive, which charts will be used, and what non-standard parameters will be analyzed. The unit leaders will appoint a primary and alternate system manager to manage the day-to-day operations of communication and productions systems, including system integration, configuration management, logistics, outages, certification/accreditation, and user-performed preventive maintenance. The primary and alternate system managers will attend MAJCOM directed formal training on the designated equipment, if applicable.

8.3.1. System Managers will maintain the configuration and system tables of all system workstations and perform duties IAW AFI 33-101, *Communications and Information Management Guidance and Responsibilities*; AFI 33-112, *Communications and Information*; AFI 33-202, *Computer Security*; and local communication directives. Unique weather unit operations include:

8.3.1.1. Maintaining system tables in order to satisfy the changing needs of the unit and its customers for system products. This includes managing system product requirements, local forms, and local product routing.

8.3.1.2. Updating or changing aerospace weather data requirements.

8.3.1.3. Ensuring unit personnel remain proficient in equipment operations including back-up systems.

8.4. New Tactical Forecast System/Advanced Meteorological Information System (N-TFS/AMIS) Requirements. In addition to the above requirements, those systems managers in units using N-TFS/AMIS will, as a minimum, be able to perform the functions listed in [Table 8.1](#).

Table 8.1. N-TFS/AMIS Functions Performed by System Manager.

<ol style="list-style-type: none">1. Install map backgrounds.2. Configure local destinations.3. Change/add/delete items in alert and default routing tables.4. Change product purge criteria.5. Change/add/delete entries in external product retention tables (PIDS).6. Change display levels of data on PI Sets, and change/add/delete a station to a PI Set.7. Perform an aircraft accident investigation (AAI) data save, as applicable.8. Prepare a Checkpoint CD. Checkpoint CDs are used to save important system configuration tables. They are used to restart N-TFS/AMIS after a hard drive crash/failure. Checkpoint CDs must be updated when making changes to the system and periodically as determined by unit leaders.9. Access and print information from the event log. The N-TFS/AMIS event log contains important messages about equipment performance and can be used to improve system performance. The system manager will maintain references in the event log for accessing, printing, and interpreting breakdown of codes and how they relate to the status of the system.10. Provide NOTAM assistance to AMIS NOTAM/BO users that do not have access to NOTAMs via the DoD Internet NOTAM Service (DINS) home page currently at URL: https://www.NOTAMS.jcs.mil.
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8.5. N-TFS/AMIS Users . Units using N-TFS/AMIS will have the information listed in **Table 8.2.** available to unit personnel.

Table 8.2. N-TFS/AMIS Information.

<ol style="list-style-type: none">1. Contractor Logistic Support (CLS) Management Plan. A copy can be obtained from your MAJCOM or higher headquarters N-TFS/AMIS functional manager.2. Relocation Plan. A copy can be obtained from your MAJCOM or higher headquarters N-TFS/AMIS functional managers or HQ AFWA/SCM.3. N-TFS/AMIS Site Activation Plan (Siting Criteria Plan).4. Site data.5. Checkpoint CD procedures.6. Procedures to change customer data sets.7. Location of terminals, peripheral equipment, etc. (functional area information).8. METWATCH criteria thresholds.9. Routing distribution.10. Purge table settings.11. A/N command sequences (titles and detailed description of output).12. Copy of an accurate Base Master Listing (BML).13. VSAT Configuration. Copy and maintain a disk of the VSAT configuration files.

8.6. Very Small Aperture Terminal (VSAT)/Tactical VSAT (T-VSAT) System. VSAT systems provide a satellite communication capability for receiving and transmitting weather data at OWSs and CWTs in both fixed base and tactical environments. VSAT coverage includes CONUS, Europe, the Azores, Southwest Asia, Alaska, Hawaii, Korea, and Japan

8.6.1. OWSs and CWTs are responsible for the operation, limited maintenance, basic configuration, and administration of their VSAT and tactical VSAT (T-VSAT) ground stations. T-VSAT users will also be required to set up the T-VSAT ground station and establish communication with the VSAT satellite. Users with a requirement to connect the T-VSAT ground station equipment with other networks will follow the procedures outlined in the users manual. These procedures include adding information to the VSAT or T-VSAT server to support delivery of products to this connected network.

8.6.2. OWSs and CWTs will implement a training program using AFWA-provided initial, follow-on, and recurring training materials.

8.6.3. OWS and CWT technical assistance for VSAT/T-VSAT follows the same procedures described in paragraph 8.7.

8.6.4. OWSs and CWTs will use AFWA-provided system security documents to obtain site accreditation for VSAT and T-VSAT ground stations. OWS and CWT leaders will adhere to all local and AFW VSAT security practices, to include ensuring connected networks are virus free and passwords are protected.

8.7. Technical Assistance. Units that require technical assistance with will notify the AFWA Help Desk at DSN (312) 271-2586. This section within the AFWA Operation Control Center is the single point of contact for AFW units requiring technical assistance and provides a 24-hour a day, 7-days a week service

to handle trouble calls. The Help Desk will maintain detailed information on all outages and will track these outages until successful resolution. *AFW units will not contact the contractors directly unless otherwise directed.*

8.7.1. The AFWA Help Desk will capture outage data to identify trends, extended outages, etc., and submit to AF/XOW in the AFWA daily update.

8.7.2. Units will develop local troubleshooting procedures to help personnel determine whether the problem is communications, equipment, or software based. With assistance from the AFWA Help Desk, unit personnel will generally be able to resolve most problems. If the problem cannot be resolved, the Help Desk will contact the appropriate maintenance agency. In some cases, the Help Desk may direct the unit to contact their local communication agency.

8.8. Accountability and Reporting. Accountability of N-TFS/AMIS equipment is monitored by Electronic System Center (ESC). Units must follow proper procedures outlined in the Relocation Plan when requesting additional equipment, moving existing equipment, or turning in equipment.

8.9. Certifying Newly Fielded Systems . AFW unit leaders will appoint a Certifying Official (CO) IAW AFSSI 5024, Volume 1, *The Certification and Accreditation (C&A) Process*, for all newly fielded information systems. The CO will coordinate site certification and accreditation efforts of these systems with the local Information Assurance (IA) office to obtain approval from the Designated Approval Authority. For additional assistance and guidance, please contact HQ AFWA/SCMT-I at DSN (312) 271-5825. New systems must be accompanied by an Air Force Command, Control, Communications, Computers, and Intelligence Support Plan (C4ISP).

Chapter 9

BACK-UP SUPPORT

9.1. General . AFW units must be prepared to transfer critical functions to other organizations during major equipment/communications outages or evacuations that disrupt operations. AFW units aligned to provide back-up support for another unit must be capable of providing the support and fully prepared to assume the responsibility in minimum time.

9.2. Level of Back-Up Support. AFW back-up support is prioritized into three tiers that define the importance of the mission. **Table 9.1.** outlines the three tiers of mission support, the types of products and services required to support the mission, and the back-up priority.

9.2.1. AFW units that are unable to provide support to their customers will arrange to transfer products and services to designated back-up units following the three-tier order in **Table 9.1.**

9.2.2. AFW units providing back-up support will assume the support following the three-tiered order in **Table 9.1.**

Table 9.1. Three-Tier Back-Up Support.

Mission Tier	Type of Products & Services	Back-Up Priority
Tier 1a. Wartime, Contingencies, and Military Operations Other Than War Tier 1b. Resource Protection	Flight Weather Hazards, MWAs, CMEFs, MOAFs, JOAFs, TAFs, Flight Weather MEFs, and classified products and services. Forecast Weather Watches, Warnings, Advisories, and Space Weather Warnings.	Must back-up. Immediate transfer to back-up unit.
Tier 2. Peacetime and Exercise Operations	Flight Weather Hazards, MWAs, CMEFs, MOAFs, JOAFs, TAFs, Flight Weather MEFs, and other products and services as resources allow.	Back-up to the greatest extent possible after satisfying Tier 1a & b. requirements.
Tier 3. Mission Planning	Long Range Forecasts, Space Weather Support, Climatology, Staff Support, etc.	Back-up as resources are or become available after satisfying Tier 1 & 2 requirements.

9.3. Strategic Weather Centers and OWS Back-Up Support.

9.3.1. Strategic weather centers will develop a back-up plan to continue providing information, products, and services to the greatest extent possible. The back-up plan may involve the transfer of support functions to several different organizations. Strategic weather centers should exploit available military and public resources when developing the back-up plan.

9.3.2. OWS commanders will develop a back-up plan and maintain a capability to continue support operations at the OWS or alternate location using guidelines in **Table 9.1**. The back-up plan may involve the transfer of support functions to several different organizations. Back-up plans will be forwarded to AFWA and all MAJCOMs.

9.3.3. Strategic Centers and OWSs will document the back-up plan in an appropriate document. The plan will specify the information, products and services provided by each designated organization along with detailed contact information. Back-up plans will outline both short and long term outages.

9.4. Back-Up Agreements . Strategic weather centers (as applicable) and OWSs will prepare formal agreements that outline the back-up support plan for their operations. OWSs will coordinate the back-up agreement with all organizations involved and the MAJCOM or higher headquarters. In addition, OWSs will coordinate their back-up agreement with the different command agency (i.e., MAJCOM, NAF) of all OWSs providing back-up support. See **Chapter 11** for information on preparing formal agreements.

9.4.1. Strategic weather centers and OWSs will provide HQ USAF/XOW with a copy of the back-up agreement.

9.4.2. The OWS will provide their command agency (i.e., MAJCOM, NAF) with a copy of their back-up agreement.

9.5. CWT Back-Up Support.

9.5.1. CWTs will establish an alternate observing site (AOS) IAW AFMAN 15-111. Unit leaders must work with base/post agencies to select the AOS site and secure the needed communications and other resources. At a minimum, units will establish communication from the AOS with the local ATC tower, command post, MEF support personnel, and the supporting OWS.

9.5.1.1. CWTs will develop written procedures and visibility charts for use at the AOS. If available, use tactical meteorological equipment (TACMET) for AOS operations. CWT leaders may want to pre-position some TACMET equipment at the AOS. TACMET equipment is not authorized for the sole purpose of satisfying alternate site requirements.

9.5.1.2. All task-qualified personnel will be able to successfully operate at the AOS IAW AFMAN 15-111 and local procedures. CWTs with a certified, fully commissioned automated surface observing system can use dial-in capability for back-up observing purposes.

9.5.2. CWTs providing MEF support will establish a back-up capability to provide support to customers from an alternate location (e.g., AOS, ATC facility, airfield terminal, squadron operations) or transfer functions to another unit. CWT leaders will develop written procedures for the alternate location and ensure all task-qualified personnel can provide adequate support to customers from that location. CWTs must be able to communicate with the command post, other weather personnel, the supporting OWS, and all of the primary supported units from the alternate location.

9.5.3. CWTs will notify the supporting OWS when moving to the alternate work areas. The CWT will provide the OWS temporary telephone numbers and any changes in the weather warning and advisory notification procedures. CWTs will document back-up operations in the local WSD.

9.6. Deployed CWT Back-Up Procedures. A deployed CWT will establish the necessary plans and procedures needed to continue mission support in the event of a communication outage or the work area

being destroyed or evacuated. The plan and procedures will be documented, and all team members must know the back-up procedures. The following functions must be backed up:

- 9.6.1. Recording and disseminating weather observations.
- 9.6.2. Receiving data and products required for the MEFP.
- 9.6.3. Providing MEFs and briefings to supported units.

Chapter 10

TRAINING

10.1. General. The AFW training mission is to provide the highest quality, fully trained weather technician and officer to support mission-tailored weather and space information—anytime, anywhere—from the mud to the sun. This chapter builds the framework of this mission. It describes how AFW will employ training for its people to deliver the highest quality, mission-tailored terrestrial and space weather information, products, and services to our nation’s combat forces. The key objectives of this chapter focus and standardize weather training on customer mission requirements, improve training and readiness, and achieve the greatest efficiencies and effectiveness possible through the optimum use of people and technology.

10.1.1. Units will conduct and document training in accordance with the following directives or any document that may supersede them:

10.1.1.1. AFI 36-2201, *Developing, Managing, and Conducting Training*.

10.1.1.2. AFMAN 36-2234, *Instructional System Development*.

10.1.1.3. AFMAN 36-2245, *Managing Career Field Education and Training*.

10.1.1.4. AFMAN 36-2247, *Planning, Conducting, Administering, and Evaluating Training*.

10.1.1.5. AF Handbook 36-2235V11, *Information for Designers of Instructional Systems*

10.1.1.6. 1W0X1/A Career Field Education and Training Plan (CFETP) and 15WQ CFETP.

10.1.1.7. AFMAN 10-100, *Airman’s Manual*.

10.2. Key Training Terminology and Concepts. AFW units will use the following training definitions and concepts:

10.2.1. Task. A unit of work activity or operation that forms a significant part of a duty. It usually has clear beginning and ending points and is a directly observable or otherwise measurable processes (AFH 36-2235 Volume 11, Attachment D).

10.2.1.1. Tasks listed in the CFETP/STS and on AF Form 797s, *Job Qualification Standard Continuation/Command JQS* (or computer equivalent), tend to be broad in scope, for example, certification on operating a complicated piece of equipment or decision-making practical application of complex principles and theories.

10.2.1.2. Complex tasks are often broken down into simpler applications and training concepts (e.g., sub-tasks, principles, and theories). Task breakdown improves the trainee’s chances of success. The concepts of Standardized Training Checklist (STCs) and Qualification Training Packages (QTPs) use this technique.

10.2.2. Certification. A formal indication of an individual’s ability to perform a task to required standards (AFI 36-2201, Attachment 1).

10.2.3. On-the-Job Training (OJT). Hands-on, over-the-shoulder training that a duty location uses for personnel to complete Upgrade Training and Qualification Training (AFI 36-2201, Attachment 1). OJT consists of self-study and supervised instruction. OJT is composed of three components.

10.2.3.1. The first component is Subject Knowledge consisting of fundamental principles and theories.

10.2.3.2. The second component is Task Knowledge attained by using directives that govern tasks.

10.2.3.3. The third component is Task Performance attained through demonstration and practical application.

10.2.4. Qualification Training (QT). Actual hands-on task performance training designed to qualify an individual in a specific duty position (AFH 36-2235 Volume 11, Attachment D).

10.2.4.1. QT occurs during and after upgrade training to maintain up-to-date qualifications (AFI 36-2201, Attachment 1), when the unit mission changes, a new piece of equipment/software comes into use, or a new forecast technique is implemented.

10.2.4.2. Certification (as in task certified) and qualification (as in duty position qualified) are not synonymous terms. Certification on a task is part of the QT process.

10.2.5. Upgrade Training (UGT). Training that leads to the award of a higher skill level (AFMAN 36-2245, Attachment 1, and AFMAN 36-2247, Attachment 1).

10.2.6. Continuation Training (CT). Additional advanced training exceeding the minimum upgrade training requirements with emphasis on present and future duties (AFMAN 36-2245, Attachment 5).

10.2.7. Mobility Training (MT). Training that fully prepares an individual for worldwide deployment. AFMAN 15-135, *Combat Weather Team Operations*, Chapter 9 contains detailed information regarding MT.

10.2.8. Standardized Training Checklist (STC). Checklists developed by HQ AFWA/DNT to outline training on weather-related subjects critical to the AFW career field. Trainers use STCs to aid in the QT, UGT, and CT process.

10.2.9. Qualification Training Package (QTP). Packages developed by HQ AFWA/DNT to baseline training on weather-related subjects critical to the AFW career field. These packages are specifically designed to teach task knowledge on the CFETP core training items. These QTPs contain task knowledge, task-based exercises, and GO/NO GO evaluation checklists for the trainer to evaluate a trainee's progress.

10.2.10. Master Training Plan (MTP). A single continuity-type document that contains the entire unit's training requirements and describes when and how the unit will accomplish the training. It should be organized in a binder with individual chapters or sections addressing QT, UGT, CT, MT, and any unique local training. All units should start with the current CFETP and build their MTP around requirements defined in those documents.

10.2.11. Master Task List (MTL). The document containing the current CFETP/STS with line-item tasks circled and identified by the various duty positions (i.e., color-coded). Additionally, an AF Form 797 (or computer equivalent) task training checklist includes local mission-unique tasks not listed in the STS, but required to perform in each duty position.

10.2.12. Master Training Outline (MTO). A document developed to establish a logical pattern of QT based on learning simple to complex tasks and following a common sense approach to apprentice, journeyman, craftsman, and officer career progression. See [Attachment 7](#) for an MTO example.

10.2.13. Lesson Plan (LP). A plan used to train each unit's MTO major objectives. They are primarily developed by HQ AFWA/DNT that match QTP materials for standardized OJT of CFETP core tasks to Initial Skills Course (ISC) graduates. Other LPs are also developed by each OWS to teach mission-unique AOR requirements.

10.2.13.1. The standard LP produced and maintained by HQ AFWA/DNT contains theory and knowledge on the same CFETP core training items addressed in the QTP documents. These standard LPs focus on qualification within an OWS and CWT based on the four standard training areas: *Analysis, METWATCH, Forecasting, and Briefing*.

10.2.13.2. The four QTPs that specifically address these training areas, along with their matching LPs, make-up the minimal standard OJT program units will follow and not defer or modify without approval of the AFW Career Field Manager (CFM). Since strategic centers have unique missions, they will use the LPs developed to the fullest extent and add local derived items as needed.

10.3. Standardized Training Concept. Standardized training ensures all personnel receive the same level of training on core tasks identified by the Utilization and Training Workshop (U&TW) and listed in the CFETP Specialty Training Standard (STS). The U&TW is composed of representatives from the Directorate of Weather (HQ USAF/XOW); the Headquarters (HQ) MAJCOM functional managers; the 335th Training Squadron at Keesler AFB, MS (335 TRS); and HQ AFWA training division at Offutt AFB, NE (HQ AFWA/DNT). HQ MAJCOMs and local units have the option to supplement this minimum standardized training with additional unique items that help further support their mission.

10.3.1. Standard Training Tools.

10.3.1.1. MTP, MTL, MTO, and LPs.

10.3.1.2. QTPs (including LPs written to be used in conjunction with each one).

10.3.1.3. STCs (use to supplement QTP information).

10.3.2. Standardized Training Levels for Formal Training.

10.3.2.1. Enlisted Initial Skills Course (ISC). Prior to reengineering the weather career field, this ISC was the Weather Apprentice Course that taught how to take meteorological observations. Most of these graduates went to the field for a couple of years and honed their observing skills. Then, they returned to Keesler AFB for the advanced Weather Forecaster Course. In some cases, people fast-tracked through both courses before working at a field unit. Under reengineering, the enlisted ISC was redesigned to teach trainees the basics of weather forecasting. It is called the Weather Forecaster Apprentice Course. No matter which career track people took, the ISC was required for entry into the 1W0X1A career field.

10.3.2.1.1. The new ISC provides basic skills required for employment within an OWS. This course instruction includes (1) basics of observing (concepts of an observation), (2) the basic fundamental concepts of meteorology (dynamics, air masses, fronts, advection, climatology, etc.), (3) the basic use of forecasting tools and techniques (rules of thumb, movement of systems, etc.), (4) elements of conducting a METWATCH, (5) basic computer skills and weather applications, and (6) fundamental briefing concepts. Graduates will be qualified at an appropriate proficiency for 3-skill level apprentices (1b to 2b). The intent of this course is to build the minimum foundation required for working within an actual operational environment.

10.3.2.1.2. Items outlined in the CFETP STS are those minimal requirements the weather school at Keesler AFB must teach. These requirements are reviewed annually by HQ MAJCOM functional managers and approved by the AFW CFM for enlisted personnel. This new course is a TDY of approximately 5 months in length and graduates earn their 3-skill level (1W031A).

10.3.2.2. Weather Officer Course (WOC). The WOC is required for entry into the 15WX career field. It provides the basic skills foundation for employment within an OWS. Course curriculum includes (1) basic concepts, (2) the basic use of forecasting tools and techniques (rules of thumb, movement of systems, etc.), (3) elements of conducting a METWATCH, (4) basic computer skills and weather applications, (5) fundamental briefing concepts, and (6) technical leadership.

10.3.2.2.1. Items outlined in the officer CFETP Course Training Standard (CTS) are the minimal requirements the weather school at Keesler AFB must teach new officers into the weather career field. These requirements are reviewed annually by HQ MAJCOM representatives and approved by the AFW CFM for officers. This course is a 3-month TDY. Graduates earn a 15W3 classification.

10.3.2.3. Combat Weather Team Operations Course (CWTOC). Under the reengineering concept, this formal in-residence course is mandatory for officer and enlisted personnel to complete upon notification of assignment to the trainee's first CWT. First and foremost, until automated sensor technology is fully deployed, all personnel must be trained and qualified in traditional observing practices (i.e., evaluate, encode, and disseminate surface meteorological observations).

10.3.2.3.1. Additional training includes (1) weapon system (Air Force and Army) familiarization, (2) doctrine and tactics, (3) the "art of weather warfare" defined as the application of weather support to methods of warfare, (4) electro-optics support, (5) using OWS-produced weather products, and (6) advanced forecasting techniques and applications. Combat and field skills training was removed from this course curriculum and will be obtained by a formal course being developed by the Army for weather personnel assigned to support Army field units. The CWTOC is mandatory for all graduates of the reengineered enlisted ISC and WOC (after 3 Dec 99) before being assigned to a CWT unit. A Personnel Processing Code (PPC) has been established to ensure a trainee attends this training before arriving at the CWT location.

10.3.2.3.2. Items outlined in the CFETP STS are minimal requirements the weather school at Keesler AFB must teach. These requirements are reviewed annually by HQ MAJCOM representatives and approved by the CFMs for both officer and enlisted personnel. This course is a 3-month TDY.

10.3.2.4. Weather Craftsman Course (7-Skill Level Course). This is a mandatory course for enlisted 5-skill levels to upgrade to a 7-skill level. It is held at Keesler AFB and is approximately 2 weeks in length. Course curriculum includes topics pertinent to managing a CWT and providing technical leadership. It covers management items unique to weather units. Items outlined in the CFETP STS are minimal requirements the weather school at Keesler AFB must teach. These requirements are reviewed annually by HQ MAJCOM representatives and approved by the AFW CFMs for both officer and enlisted personnel.

10.3.2.5. Supplemental Courses. Weather supplemental courses are reviewed during the U&TW process and are validated for transitional and/or end state applicability. The CFMs have responsibility to recommend to HQ USAF/XOW start-up or termination of a course based on U&TW decisions to meet training requirements. Supplemental courses will be evaluated for conversion to distance learning format or other delivery methods (e.g., computer-based training [CBT], web-based training [WBT]) consistent with Air Education and Training Command (AETC) initiatives to reduce resident training costs. Delivery methods are evaluated by AETC to determine the most efficient and effective means to fulfill this training need. Training Flights at each OWS, along with individual CWTs, identify supplemental training requirements to their respective HQ MAJCOM functional managers. A CWT unit can also identify training needs to their respective OWS if the training is AOR unique.

10.3.3. Informal Training.

10.3.3.1. OWS Training. Under reengineering, each OWS is designed to have a "critical mass" of weather personnel, to include experienced officers, NCOs, and/or civilian contractors to provide the capability to train and mentor ISC graduates. These graduates will enter a continual training process designed to develop higher levels of proficiency and meteorological skills, while resulting in increased levels of productivity from month to month and year to year. There is a heavy reliance upon OJT to develop a weather apprentice to the journeyman level. The training process will consist of a tailored blend of subject and task knowledge, along with hands-on task performance.

10.3.3.1.1. Subject and task knowledge will be provided through enrollment in the Career Development Course (CDC) and through information contained in the standardized QTPs and the LPs that go along with each package.

10.3.3.1.2. Skills training will be provided through demonstration and hand-on task performance under the supervision of a trainer using standardized QTPs and corresponding LPs. Units will follow the core areas to train, with Analysis being mandatory to complete first. After the Analysis block is completed, the unit has the option on which core area to train next, depending on needs. However, it is recommended the core areas be completed as follows: Analysis, Metwatch, Forecasting, and Briefing. The trainee will be fully qualified on CFETP core tasks. The structured training process will continue throughout the individual's tour-of-duty.

10.3.3.2. CWT Training. A CWT unit will employ centralized AFWA/DNT and OWS produced training products as much as possible to prepare personnel to support the mission. AFMAN 15-135 provides additional information regarding CWT training and available training sources.

10.4. Career Training Progression.

10.4.1. Enlisted Career Path Training Progression. Career progression entails becoming a 3-skill level apprentice upon ISC graduation, completing OJT (i.e., QTPs and LPs) plus CDCs to award a 5-skill level journeyman status, then gaining 7-skill level craftsman status, and finally earning 9-skill level superintendent status. Career progression matches the path laid out by Air Force guidance.

10.4.1.1. 5-Skill Level Training.

10.4.1.1.1. Development Course (CDC). The CDC independent-study correspondence course must be completed before awarding the 5-skill level. As soon as possible upon arrival at the

first duty assignment after ISC graduation, the Unit Education and Training Manager will enroll a trainee in this course. CDC volumes are issued one at a time to the trainee who completes each volume within 30 days. Trainers will make every attempt to use the CDC in conjunction with hands-on skills training. The CDC will normally build upon and reinforce subject knowledge from the ISC curriculum.

10.4.1.1.2. Skills Training. Experienced trainers will use the AFW Standardized Training Program core QTPs (Analysis, METWATCH, Forecasting, and Briefings) produced by AFWA/DNT to provide hands-on training. Trainees will be qualified to a "GO/NO GO" or fully proficient level. Position requirements will be identified and documented within the AF Form 623, Individual Training Record. Trainees must be qualified on all CFETP STS core tasks for award of the 5-skill level. A task certifier will ensure all core tasks have been successfully completed through checkride evaluations. Standardized QTPs and corresponding LPs will be used as much as possible to conduct skills training.

10.4.1.1.3. Time Requirements. To be awarded a 5-skill level, trainees must complete a minimum of 15 months UGT (9 months for retrainees). It is estimated the ideal time to be assigned to an OWS for 5-skill level UGT is approximately 3 years, but the trainee should have the basics completed within 12-18 months. The Air Force assignment system could have an individual moving within 1 year. It is critical OWS trainers follow the AFWA/DNT-developed core training materials and MTP to ensure standardization of the training.

10.4.1.2. 7-Skill Level Training.

10.4.1.2.1. General. Since no CDC is currently required for award of the 7-skill level, training will focus on preparing newly promoted SSGts to assume mid-level technician, supervisory, and managerial roles within the OWSs, CWTs, and strategic centers. The CFETP STS identifies certain 7-skill level requirements. Use QTPs to complete upgrade training. A mandatory formal Craftsman Course is held at Keesler AFB and is approximately 2-weeks long.

10.4.1.2.2. Time Requirements. To be awarded a 7-skill level, SSGt selectees are placed in UGT upon the first day of the promotion cycle and must complete 12 months OJT, and then attend the Craftsman Course.

10.4.1.3. 9-Skill Level. A 9-skill level is awarded upon promotion to SMSgt and completion of the SNCOA in-residence.

10.4.2. Officer Career Path Training Progression. Officer training is divided into three portions: Initial Skills, Qualification, and Advanced Skills. An officer's classification is linked to completion of training; reference [Chapter 5](#) in the weather officer CFETP.

10.5. Mission-Tailored Training.

10.5.1. Continuation Training (CT). One part of this training is to prepare trainees for an upcoming change in the seasonal weather patterns (regimes) and the type of phenomena to observe and forecast. The focus is on techniques and tools that are predominately used during a particular season (e.g., springtime severe thunderstorms/tornadoes, wintertime freezing precipitation, and fog/stratus scenarios) to refresh trainees and hone their skills. Some of this information may be extracted from QTPs, STCs, and other training sources as applicable. Units can use portions or all of these training sources to provide this training. A second part is using CT when new hardware/software technology is installed to progressively learn how to operate and exploit the system. Within an OWS, the Training

and Technical Services Flight will ensure CT is completed. At the CWT, unit leadership will ensure CT is completed.

10.5.2. Mobility Training (MT). The Mobility Officer/NCO will work with the Unit Education and Training Manager to ensure training on AOR climatology, AOR seasonal weather patterns, and preparation on how to forecast at the deployment site are periodically conducted IAW applicable USAF, Army, and local directives and guidance. Again, use all available training methods. AFMAN 15-135, Chapter 9 provides specific MT information and guidance.

10.6. Training Evaluation.

10.6.1. HQ AFWA/XOPS evaluates compliance with training standards based on operational weather needs as published in this manual and AFMAN 15-135. XOPS provides a master checklist containing all evaluation items on the Field Support Division (AFWA/XOP) web page.

10.6.2. HQ AFWA/XOPS or other evaluation agencies will evaluate individuals based specifically on what is defined on the Operations Review Checklist and qualified and/or certified tasks as documented in their OJT records. The unit's training processes are evaluated against the Process Review Checklist.

10.6.3. Evaluation results are forwarded through channels to the CFM and other appropriate agencies for review and necessary action.

10.7. Training Responsibilities for all AFW Units.

10.7.1. Personnel must have an initial and subsequent annual checkride for position certification. Units should track the overall performance on the checkrides to look for trends and identify training weaknesses (e.g., same areas missed by numerous trainees). Corrective actions should be brought to closure as soon as possible. Certify and annually re-certify personnel according to the MAJCOM standard.

10.7.2. Units should periodically complete spot-check task evaluations to look for trends and identify training weaknesses. Complete corrective actions as soon as possible.

10.7.3. Units will develop a MTP containing a MTL, MTO, and LPs. See the Key Training Terminology and Concepts section for a description of these documents.

10.7.4. Strategic weather centers, OWSs, and CWTs will establish QT programs for personnel who periodically rotate through their unit (e.g., Individual Mobilization Augmentee [IMA], Air Force Reserve [AFR], etc.). These personnel must complete QT before independently working functional shifts.

10.7.5. Units will conduct CT on a quarterly basis, as a minimum. In addition to what has already been described as good CT subjects, seminars and lessons learned through forecast reviews fall into this arena. CT will also include review of the basics of space weather physics, the current state of space weather support, and impacts of space weather on DoD systems.

10.7.6. All CWTs and OWSs with UTC assigned personnel will conduct MT on a quarterly basis to maintain proficiency on tactical weather equipment and to refresh personnel on weather-unique support to the unit's Expeditionary Air Force. Emphasize the deployed mission, weapon systems, and weather sensitivities of supported units. Units unable to conduct MT in-house due to lack of equipment or other resources will work with their MAJCOM to satisfy these requirements.

10.8. AFW CFM-Specific Responsibilities.

- 10.8.1. Responsible for the overall AFW training program.
- 10.8.2. Consolidate and analyze training metrics and direct solutions.
- 10.8.3. Chair the U&TW and track action items through completion.
- 10.8.4. Plan and program improvements to AFW training process.

10.9. AFWA-Specific Responsibilities.

- 10.9.1. HQ AFWA/DNT and HQ AFWA/XOP develop and coordinate standard evaluation checklists for standardized weather training and systems training packages.
- 10.9.2. Coordinate on and develop solutions for training on all new weather systems with CFM approval.
- 10.9.3. Assist CFM in managing the U&TW process.
- 10.9.4. Write, publish, and distribute meteorological technique applications and technology exploitation publications.
- 10.9.5. Manage the Cooperative Program for Operational Meteorology, education, and Training (COMET) program as a source to develop technical training materials.
- 10.9.6. Operate the main AFW web site for training and field support information and services.
- 10.9.7. Develop, manage, and maintain QTPs with corresponding LPs to standardize core competencies. AFWA/DNT in consultation with the CFM and HQ MAJCOM functional managers determine operational requirements for QTPs and the prioritization of development. CFM approves the standardized QTPs and corresponding LPs. MAJCOMs use these materials to implement their training programs at the OWS and CWT units. Local or MAJCOM-unique items may be added to these QTPs as appropriate, but mandatory items cannot be deleted or modified without U&TW approval.
- 10.9.8. Provide a Subject Matter Expert (SME) for developing formal course instruction, CDCs, and QTPs involving space information and techniques.
- 10.9.9. The Air Force Combat Weather Center (AFCWC) assists AFWA/DNT in developing training materials on AFW systems and conducting on-site training as part of mobile training teams during the fielding of new systems. They also develop and conduct just-in-time training courses for tactical systems, catering to personnel with short-notice requirements for spin-up time.

10.10. MAJCOM-Specific Responsibilities.

- 10.10.1. Collect training metrics from their OWSs and CWTs and forward to the CFM.
- 10.10.2. Provide direct assistance to their OWSs to resolve training problems and forward problems not solvable to the CFM for assistance.
- 10.10.3. Evaluate their OWS and CWT units for compliance with training standards.
- 10.10.4. Coordinate on the MTO of each unit.

10.11. OWS-Specific Responsibilities.

10.11.1. The Training and Technical Services Flight (or equivalent function) manages all technical training and is the focal point for OWS forecast improvement. This flight crossfeeds appropriate technical training materials to CWTs within their AOR and provides technical advice to the MAJCOM or other CWT units upon request.

10.11.1.1. This flight is normally made up of civilian contractors and/or active duty meteorologists and technicians. The civilian contract employees add much-needed continuity to the training process and to regional forecasting improvement, while the active duty personnel add to the flow of new ideas and experience from other areas.

10.11.1.2. The OWS is structured to train ISC graduates in the "art" of forecasting as their main function. However, this flight is responsible for all aspects of technical training within the OWS to include CT, new equipment training, etc. There is a Senior System Trainer/Coordinator and System Trainers/Training Specialists (numbers will vary depending on OWS size).

10.11.2. Provide training metrics to the MAJCOM.

10.11.3. Coordinate on the MTOs for CWTs that fall within their AOR.

10.11.4. Provide standardized training to the ISC graduates. Graduates of the ISC will enter a continual training process designed to develop higher levels of proficiency and meteorological skills, while resulting in increased levels of productivity from month to month and year to year. The suggested length of training is 3 years, but it will likely be 1 to 2 years due to the assignment process. There will be a heavy reliance upon OJT and CT. The training process will consist of a tailored blend of knowledge education with hands-on performance task training using the AFW Standardized Training Package core QTPs, as a minimum.

10.11.4.1. ISC graduates will receive the following standardized training. **NOTE:** Orientation and Analysis blocks must be completed first and second respectively.

10.11.4.1.1. Orientation. Orientation is the first mandatory training block to complete. It is usually locally generated training that normally takes about 2 months to complete, depending on the length of the First Term Airman's Course (FTAC). The orientation includes squadron in-processing, FTAC, AOR familiarization, climate familiarization, OWS mission, structure, customers, and system/equipment orientation.

10.11.4.1.2. Analysis. Analysis is the mandatory second block of training. This part of training is a combination of classroom, CDCs, QTPs, and OJT to advance the trainee to the next level. Estimated time for completion is 6 months. The trainees will be able to complete the tasks listed below and pass the portion of the Exercise Evaluation Package (EEP) in the QTP dealing with that line-item task. The trainer will then sign off the line item in the CFETP. Once signed off, the trainee may work alone on the specific line-item task. **Table 10.1.** lists the skills taught in the Analysis block.

Table 10.1. Analysis Skills.

Item	CDC Course	QTP #1, Module
Decode Metar Observations	N/A	Module 1
Decode PIREPS	N/A	Module 2

Item	CDC Course	QTP #1, Module
Vertical Consistency.	N/A	Module 3
Analyze Upper Air	N/A	Module 4
Analyze Surface Charts	N/A	Module 5
Reanalyze Computer Products, SFC	N/A	Module 6
Reanalyze Computer Products, U/A	N/A	Module 6
Analyze Thickness	N/A	Module 7
Perform Streamline Analysis	N/A	Module 8
METSAT	N/A	Module 9
Analyze Severe Convective Parameters	N/A	Module 10
Analyze Severe Nonconvective Parameters	N/A	Module 10
Identify Radar Features	Course A	Module 11

10.11.4.1.3. METWATCH. This part of training is a combination of classroom, CDCs, QTPs, and OJT to advance the trainee to the next level. Estimated time for completion is 2 months. The trainees will be able to complete the tasks listed below and pass the portion of the EEP in the QTP dealing with that line-item task. The trainer will then sign off the line item in the CFETP. Once signed off, the trainee may work alone on the specific line-item task. [Table 10.2.](#) lists the skills taught in the METWATCH block.

Table 10.2. METWATCH Skills.

Item	CDC Course	QTP #2, Module	Lesson Plan
Evaluate Weather Cross Sections	Course A	Module 2	3.2
Decode TAFs	N/A	Module 1	3.1
Evaluate Weather Cross Sections	Course A	Module 2	3.2
Apply METWATCH Techniques	Course A	Module 3	3.3
Apply Products to Operations (Space)	Course A	Module 4	3.4

10.11.4.1.4. Forecasting. This training is a combination of classroom, CDCs, QTPs, and OJT to advance the trainee to the next level. Estimated time for completion is 6 months. The trainees will be able to complete the tasks listed below and pass the portion of the EEP in the QTP dealing with that line-item task. The trainer will then sign off the line item in the CFETP. Once signed off, the trainee may work alone on the specific line-item task. [Table 10.3.](#) lists the skills taught in the Forecasting block.

Table 10.3. Forecasting Skills.

Item	CDC Course	QTP #3, Module	Lesson Plan
Interpret NWP Products	N/A	Module 1	4.1

Item	CDC Course	QTP #3, Module	Lesson Plan
Forecast Weather Elements, Basic State (temp, dewpoint, pressure, wind)	Course B	Module 2	4.2-4.5
Forecast Weather Elements, Clouds	Course B	Module 2	4.6
Forecast Weather Elements, Weather and Obstruction to Vision	Course B	Module 2	4.7
Forecast Weather Elements, Visibility	Course B	Module 2	4.8
Forecast Weather Elements, Turbulence	Course B	Module 2	4.9
Forecast Weather Elements, Icing	Course B	Module 2	4.10
Forecast Severe, Convective	Course B	Module 3	4.11
Forecast Severe, Non-convective	Course B	Module 4	4.12
Prepare Forecast Products, TAF	N/A	Module 5	4.13
Prepare Forecast Products, Watch/WW/WA	N/A	Module 6	4.14
Prepare Forecast Products, Target Forecast	N/A	Module 7	4.15
Prepare Forecast Products, Airfield (not TAF)	N/A	Module 8	4.16
Prepare Forecast Products, Route	N/A	Module 8	4.17
Prepare Forecast Products, Range/Area	N/A	Module 8	4.18
Quality Control	N/A	N/A	4.19

10.11.4.1.5. Briefing. This part of training is a combination of classroom, CDCs, QTPs, and OJT to advance the trainee to the next level. Estimated time for completion is 2 months. The trainees will be able to complete the tasks listed below and pass the portion of the EEP in the QTP dealing with that line-item task. The trainer will then sign off the line item in the CFETP. Once signed off, the trainee may work alone on the specific line-item task. [Table 10.4](#) lists the skills taught in the Briefing block.

Table 10.4. Briefing Skills.

Item	CDC Course	QTP #4, Module	Lesson Plan
PMSV	N/A	Module 1	5.1
Encode PIREPs	N/A	Module 2	5.2
Shift Change Briefing	N/A	Module 3	5.3

Item	CDC Course	QTP #4, Module	Lesson Plan
Flight (MEF) Briefing	N/A	Module 3	5.4
Mission (MEF) Briefing	N/A	Module 3	5.5
Apply Space Products	N/A	Module 4	5.6

10.11.5. The OWS provides skills/performance training. Experienced trainers will use the AFW Standardized Training Program core QTPs produced by AFWA/DNT to provide hands-on training, as a minimum. Trainees will be qualified to a "GO/NO GO" or fully proficient level (equated to a 3c level). Position requirements will be identified and documented within the individual's Job Qualification Standard (JQS). Trainees must be qualified on all JQS line items identified as core tasks. A third-party evaluation (checkride) will ensure all core tasks have been successfully completed. Use AFWA-developed QTPs as much as possible to conduct skills training.

10.11.5.1. Senior System Trainer/Coordinator Duties.

10.11.5.1.1. Responsible for all aspects of the OWS upgrade, refresher, and CT programs. This includes management of the radar, satellite, and weather system training programs. They ensure OWS training is standardized within the squadron.

10.11.5.1.2. Manage OWS technical training programs. They will be in direct contact with the MAJCOM staffs of their supported CWTs and AFWA/DNT to coordinate MAJCOM-unique training requirements and provide feedback to help ensure the health of the OWS training program.

10.11.5.1.3. Implement standardized training plans produced or approved by the CFM.

10.11.5.1.4. Design, develop, and administer training modules to supplement standardized programs in support of local training issues.

10.11.5.1.5. Tailor OWS and CWT training packages to meet local requirements.

10.11.5.1.6. Ensure qualified trainers teach seminars and/or classroom instructions. Assist in the scheduling and creation of OWS forecast seminars. Ensure seminars are conducted as part of the OWS training program. Arrange for seminars to be crossfed to CWTs operating in its AOR.

10.11.5.1.7. Develop and/or direct local seminars based upon OWS/CWT requirements.

10.11.5.1.8. Assist trainers in maintaining training records.

10.11.5.1.9. Through the interaction with AETC, AFWA, and other sources, they will cross-feed regional technical training/exploitation material to CWTs within the OWS AOR.

10.11.5.1.10. Identify and forward new training requirements (from OWS and CWT) to respective MAJCOM(s) for review and inclusion into training plans.

10.11.5.1.11. Attend MAJCOM(s) Utilization & Training Action Groups (U&TAG), as requested.

10.11.5.1.12. Provide input for improving training at the OWS and CWTs.

10.11.5.1.13. Collect, maintain, analyze, and forward training metrics data.

- 10.11.5.1.14. Develop/implement corrective actions as required.
 - 10.11.5.1.15. Supervise System Trainers/Training Specialists.
 - 10.11.5.1.16. Provide annual training requirements for future training courses to respective MAJCOM(s).
 - 10.11.5.1.17. Develop and provide training for assigned System Trainers/Training Specialists Duties.
 - 10.11.5.1.18. Conduct training evaluations.
 - 10.11.5.1.19. Follow all duties outlined in AFI 36-2201, as applicable.
 - 10.11.5.1.20. Complete other duties, as required.
- 10.11.5.2. System Trainers/Training Specialists Duties.
- 10.11.5.2.1. Implement training plans.
 - 10.11.5.2.2. Present seminars and/or classroom instruction as required.
 - 10.11.5.2.3. Perform rotating shift work with trainees based on production and training managers' schedule. The System Trainers/Training Specialists will be responsible for the certification training of OWS personnel.
 - 10.11.5.2.4. Supervise trainees with OJT in all tasks while on shift.
 - 10.11.5.2.5. Schedule special instruction (i.e., distance learning, CBT, etc.).
 - 10.11.5.2.6. Assist trainees in completing CDCs, correspondence courses, and exportable material.
 - 10.11.5.2.7. Counsel trainees on training requirements and progress and document corrective plans.
 - 10.11.5.2.8. Maintain trainees' training record IAW AF 36-22 directives.
 - 10.11.5.2.9. Assist assigned trainees in the creation of forecast reviews.
 - 10.11.5.2.10. Assist Senior System Trainer/Coordinator with design and update of training material.
 - 10.11.5.2.11. Assist in designing, validating, and providing training material to CWTs.
 - 10.11.5.2.12. Maintain proficiency on all equipment (hardware/software) used by trainees.
 - 10.11.5.2.13. Attend training courses/conferences as required.
 - 10.11.5.2.14. Provide technical assistance and training to CWTs as requested (i.e., via telephone, in-person visits, distance learning, etc.).
 - 10.11.5.2.15. Administer standardized evaluation instruments and locally developed check-rides.
 - 10.11.5.2.16. Assist in collecting training metric data.
 - 10.11.5.2.17. Complete other duties, as required.

10.12. CWT-Specific Responsibilities. Training at the CWTs is conducted through formal schools and OJT.

10.12.1. Conduct Mission-Tailored Training. Training options include a resident course, a distance learning course, CBI, worldwide web-based training, a correspondence course, and Intranet/Internet training.

10.12.1.1. AFWA/DNT will exploit existing sources of training to minimize development time and costs. In addition, every attempt should be made to utilize existing customer-provided Air Force courses (e.g., intelligence, tactics) to train weather personnel on non-weather topics needed to provide mission-specific weather support. QTPs and Equipment Training Workbooks (ETWs) will be used when available to ensure standardized training.

10.12.1.2. CWTs also provide customer-driven training programs for operations (e.g., Instrument Refresher Courses [IRCs]). Customer-driven training focuses on aerospace weather parameters that impact missions. AFWA provides a variety of generic IRCs for units to use. CWTs will tailor these IRCs to their supported units' missions and operating locations.

10.12.2. CWT Leadership Functions. Each CWT will have an Officer-in-Charge (OIC) and an NCOIC. These leaders are responsible to ensure training is a key priority and provide their unit the tools, support, and time to train. CWT leadership is responsible for the following items and tasks.

10.12.2.1. The MTO ensures the technical proficiency of members of the flight and the best/most current training material and forecasting improvement techniques are available to personnel. The OIC will ensure the technical proficiency through checkrides.

10.12.2.2. The MTO will include the scheduling, implementation, and tracking of all training to include mobility training (at CWTs) not included in a wing/group/squadron-level program for personnel. **Table 10.5.** lists the major objectives of the MTO for CWTs.

Table 10.5. CWT MTO Major Objectives.

Block 1: CWT Orientation.
In-processing/base orientation
AOR familiarization
Climate familiarization
Mission: Service organization/structure
Mission: Weapon systems and tactics
Introduction to CWT systems and equipment (i.e., N-TFS, METSAT, Radar, STT, IMETS, VSAT, etc.)
Block 2: Weather Operations.
Observing
MEF Process (MEFP)
Meso/Microscale forecasting
Electro-Optics
Block 3: Tactical (as needed).
TACMET
Tactical communications
Limited data forecasting
Weather training for deployed locations
Field skills
Block IV: Advanced Weather.
Limited data forecasting (if not completed in block 3)
Tropical (if needed)
Hydrology/oceanography (if needed)
Follow on training
Advanced systems exploitation (N-TFS, Radar, METSAT, etc.)
Seasonal weather training

10.12.2.3. The OIC is responsible for all aspects of CT programs, to include observing, application of weather to combat operations, radar, satellite, and other weather system training programs.

10.12.2.4. The OIC will assign, in writing, a Unit Education and Training Manager and Mobility Training Manager (if mobility required) to ensure training is completed.

10.12.3. CWT Training Manager Responsibilities. Perform all duties and responsibilities outlined in the AFI 36-22 series directives (i.e., AFI 36-2201, etc.). In addition, the CWT Training Manager is responsible for the following items and tasks.

10.12.3.1. Develop a MTO specific to the CWT. Crossfeed the MTO to the supporting OWS.

10.12.3.2. Manage all aspects of the CWT upgrade, refresher, and CT programs. This includes management of the radar, satellite, N-TFS, and other weather system training programs.

- 10.12.3.3. Manage CWT technical training programs. MAJCOM-unique training will be coordinated with the MAJCOM.
- 10.12.3.4. Implement standardized training plans produced or approved by the CFM. Administer training modules to supplement standardized programs in support of local training issues.
- 10.12.3.5. Identify and forward new training requirements to MAJCOM for review and inclusion into training plans.
- 10.12.3.6. Attend MAJCOM(s) Utilization & Training Action Groups (U&TAG), as requested.
- 10.12.3.7. Provide input for improving training at the OWS and CWTs.
- 10.12.3.8. Collect, maintain, and analyze Training Metrics data. Develop/implement corrective actions as required.
- 10.12.3.9. Provide annual training requirements for future training courses to respective MAJCOM(s).
- 10.12.3.10. Schedule special instruction (i.e., distance learning, CBI, etc.).
- 10.12.3.11. Administer standardized and locally developed checkrides.
- 10.12.3.12. Complete other training duties, as required.

10.13. Training Documentation. All training will be documented as required by established USAF training policy and 15-series AFIs and AFMANs.

- 10.13.1. Enlisted: Document all training on the AF Form 623 using the CFETP, AF Form 1098, AF Form 797, and/or other locally directed forms.
- 10.13.2. Officers: Document training for all new ISC graduates and CWTOC graduates using AF Form 623, the CTS, AF Form 1098, AF Form 797, and/or other locally directed forms.
- 10.13.3. Civilians: Document training in the Supervisor's Employee Work Folder or as required by the local Civilian Personnel Office.
- 10.13.4. CT: Document training on a standard AF form or locally developed form.

10.14. Training Metrics. RCS HAF-XOW(AR)0124. Each unit will report any trainee's failure to progress (i.e., CDC failure, not meeting time lines outlined in this chapter, inability to achieve position qualification, etc.). Units will forward information to their respective MAJCOM by the 20th of the month, and MAJCOMs will forward the compiled information to AFWA/DNT and the Career Field Manager (AF/XOWR) NLT the 25th of each month. This report has been designated emergency status code C3. Continue reporting during emergency conditions, delayed precedence. Report may be delayed to allow the submission of higher precedence reports or data.

- 10.14.1. Required training metric inputs include identifying the trainee's problem and annotating the cause by listing the appropriate category:
 - 10.14.1.1. Category 1: Administrative (e.g., receipt of CDCs was delayed, PC-III did not update, etc.).
 - 10.14.1.2. Category 2: Instructor Deficiency.
 - 10.14.1.3. Category 3: Training Material Deficiency (e.g., CDCs, QTPs, CBIs, etc.).

10.14.1.4. Category 4: Inability of Trainee to Learn (e.g., educational background, maturity, personal problems, etc.).

10.14.1.5. Category 5: Medical (e.g., trainee in hospital for extended period, etc.).

10.14.1.6. Category 6: Other (explain what the issue is that delayed or stopped training).

10.14.2. OWSs should consider internally tracking the following information to help gather the information for the monthly metrics:

10.14.2.1. Names and numbers of trainees by skill level or job nomenclature (e.g., 3-, 5-, 7-level, 1340, 1341, and officers).

10.14.2.2. Date arrived station (the standard training start date).

10.14.2.3. CDC completion by CDC name and volume (date started and completed).

10.14.2.4. List individual position qualification for each work center position by date certified.

10.14.2.5. Compute total months in training.

10.14.2.6. Optional inputs may include any pertinent remarks, such as adverse trends, training material deficiencies, training issues requiring clarification, etc.

Chapter 11

WEATHER SUPPORT DOCUMENTS, FORMAL AGREEMENTS & STANDING OPERATING PROCEDURES

11.1. General. This chapter contains general information and guidance on preparing weather support documents (WSD), formal agreements, and standing operating procedures (SOP). The WSDs (e.g., base/post plans or instructions) define support between the OWS or CWT and the supported operational and installation units. Formal agreements (e.g., Memorandum of Understanding [MOU], Memorandum of Agreement [MOA], and LOI) define support between CWTs, OWSs, and AFWA.

11.2. Weather Support Documents and Formal Agreements . If weather support provided by a CWT is not documented in an existing publication (e.g., base/post plan or instruction) then a separate WSD is required. Weather units on an Army installation may find it more effective to document weather support to the post in a separate WSD. OWSs will jointly develop formal agreements with CWTs within their AOR.

11.2.1. CWT Weather Support Document . Every CWT provides weather support to numerous base/post agencies, and receives support from agencies on the installation. Each CWT will have a WSD that outlines the requirements and support responsibilities provided to all their supported agencies.

NOTE: The OWS-CWT formal agreement, not the WSD, is the document used to task the supporting OWS. It will specifically details the information, products, and services the CWT needs from the OWS to maintain day-to-day operations. It will also outline types of support provided to base/post agencies by the CWT-OWS team. In some instances, the WSD may include support provided by the CWT-OWS team for clarification (e.g., weather warnings, etc.). WSDs will not include support to the CWT by other local agencies that are mandated by another USAF or local directives.

11.2.1.1. Selecting the Format. Document weather support in an official publication (e.g., wing/base plan or instruction, ANNEX H to Base Support Plan). Consult your base/post plans office and your supporting Publications Manager (PM) to obtain administrative details and assistance on selecting the format and preparing the WSD.

11.2.1.1.1. **Attachment 8** contains a list of items covering the basic areas that CWTs should address in the WSD. Refer to installation, MAJCOM, and higher headquarters directives and guidance for additional information on documenting weather support.

11.2.1.2. Documenting Weather Operations. The WSD must be clearly written in a non-technical format and agree with other prescribing directives. Where technical terms are necessary, ensure they are defined. Normally, weather information included in another document is not repeated; a reference will do. However, if the customer does not have easy access to the referenced material (e.g., AFMAN 15-111, AFMAN 15-124), include the information in the WSD. Attachments and appendices are good ways to document information such as special and local observation criteria, forecast specification/amendment criteria, notification processes and formats, etc. **Table 11.1.** contains information that CWTs will include, as a minimum, in their WSD.

Table 11.1. WSD Information.

- All supported agencies.
- The mission and requirements of supported agencies.
- Weapon systems (e.g., aircraft, missiles, combat vehicles) and weather sensitivities.
- Mission-limiting terrestrial and space weather parameters (e.g., tactics).
- Type, format, and frequency of weather support information, products, and services (e.g., watches, WWs, WAs, MEFs). Justify documented support procedures and requirements. Use source documents when appropriate.
- Requirement for routine climatic data.
- All equipment and communications maintenance and restoral priorities.
- Weather and airfield information exchange, such as cooperative weather watch and relaying of PIREPs, weather watches, warnings, advisories, runway condition readings (RCR) and runway surface conditions (RSC), and aircraft emergencies/incidents.
- A diagram of the warning notification pyramid structure including all on- and off-base/post agencies (e.g., swimming pool, golf course, childcare centers) requiring notification.
- Back-up/uninterruptable power requirements and agreements.
- Procedures for updating FLIPs.

11.2.1.3. **Coordination, Implementation, and Review.** Coordinate the WSD with all supported agencies. Provide a final signed copy to all agencies addressed in the WSD. Publish the WSD IAW with local base/post procedures. At a minimum, review and update the WSD annually to ensure the document remains up to date and reflects the current requirements of all supported units.

11.2.2. OWS Formal Agreements. OWSs and the CWT will jointly develop a formal agreement with each supported CWT and Reserve Component unit in its AOR. The agreement will normally be in the form of a MOA signed at a commensurate level of command. The supporting OWS will initiate development of the agreements and will be the Office of Primary Responsibility (OPR) for the document. The OWS will review the formal agreement with the supported unit (e.g., CWT or Reserve Component Unit) on an annual basis. Any impasses that cannot be resolved between the OWS and the CWT in the agreement process will be forwarded to the appropriate MAJCOM or higher headquarters for resolution. For OWS-CWT formal agreements, the OWS and CWT will forward MOAs to their MAJCOM for review before the agreement is signed. OCONUS OWSs may choose to document support agreements in another manner, based on MAJCOM requirements. Deploying CWTs will document support requirements using a LOI versus a MOA as described in [Chapter 5](#).

11.2.2.1. **Scope of the Agreement.** The agreement outlines the weather information, products, and services provided by the OWS-CWT team and individual responsibilities in support of base/post activities. Actions and agreements in the document will be consistent with the WSD for that location; complement existing regulations, instructions, plans, agreements, or similar directives and apply only to the participating parties. **NOTE:** MOAs typically address CWT-unique support that is not mandated in other higher-level weather directives. However, in some cases (e.g., ATC cooperative weather watch) it may be appropriate to identify the support requirement and the govern-

ing regulation. All agreements will be valid for all personnel assigned to, attached to, or associated with these units.

11.2.2.2. Agreement Structure and Format. The overall format of the agreement is flexible and should be adapted to the operations of each supported location. **Attachment 8** contains a list of items covering the basic areas that the OWS and CWT should address in the agreement. OWSs are encouraged to crossfeed established agreements with other OWSs that are developing their own agreements. Refer to MAJCOM or higher headquarters directives and guidance for additional information on developing formal agreements.

11.3. Standing Operating Procedures (SOPs). All AFW units will develop and maintain SOPs. SOPs are clear and effective, locally devised aids containing procedures for completing a specific task or operation performed by one or more individuals within a unit or workcenter. They ensure tasks and operations are accomplished in a standardized manner in accordance with applicable directives. The format of the SOP should be made as functional as possible for the users. For example, they may be document-style in a binder, placed on quick-reference SOP cards, or referenced on procedural flowcharts.

11.3.1. Administrative Control. SOPs will be maintained in their appropriate workcenters. If several workcenters have one or more SOPs in common, the unit will maintain a master list with a Table of Contents that cross-references the SOP to its location, and establish unit distribution of those SOPs. Organize and index SOPs based on subject matter to ensure ease of use and reference. Review SOPs at least annually and update them as often as necessary to ensure they are current and easy to use and understand. All unit personnel will review applicable SOPs at least annually.

11.3.2. SOP Topics. **Table 11.2.** contains examples of SOP topics for CWT operations. This list is not all-inclusive, nor will all units require SOPs for all the topics listed. SOPs need to be tailored to meet the requirements of the supported agencies.

Table 11.2. Example SOP Topics (CWT Operations).

SOP	CWT Operations
1	Duty Priorities.
2	Shift Duties.
3	Emergency Actions—Alert/Disaster Response.
4	Mission Execution Forecast Process (MEFP).
4.1	Base/Post Launch and Recovery MEFs.
4.2	Flight Mission MEFs, DV/VIP MEFs, and Transient Aircrew MEFs.
4.3	Range, AR, DZ, Low Level (MOAFs) MEFs, etc.
4.4	Weather Effects MEFs (EOTDA, TAWS, NOWS, IWEDA, etc.) to include space environment effects.
4.5	MISSIONWATCH.
4.6	Miscellaneous MEFs.
5	CWT-OWS Coordinated METWATCH Procedures.

SOP	CWT Operations
6	Computers, Weather, and Communication Equipment.
6.1	Integrated Weather Systems Operations/Computer Resources & Tools.
6.2	Weather Equipment Operations.
6.3	Weather Equipment Outage and Back-up Procedures.
6.4	Communication Outages and Back-up Procedures.
6.5	Power Outage Procedures.
7	Severe Weather Action Procedures (SWAP).
8	Coordinated Weather Operations.
9	Standby and Recall Procedures.
10	PIREP/AIREP Recording and Dissemination/CFP Debriefs.
11	PMSV Operations.
12	Weather Radar Operations.
13	Quality Control/Assurance Program.
14	Evacuation Procedures and Alternate Operating and Observing Site Procedures.
15	Observing Procedures.
15.1	Special/Local Criteria.
15.2	Runway Visual Range (RVR) - Runway Condition Report (RCR) - Runway Surface Condition (RSC) & Runway Change Procedures.
15.3	Basic/Cooperative Weather Watch.
16	Weather Dissemination Procedures.

11.4. Duty Priorities. AFW units should develop clearly defined duty priorities as needed. Duty priorities can be particularly useful to direct operations where there is only one technician on duty (e.g., night-time CWT shift). If used, display the priority list in plain view to technicians and customers. [Table 11.3.](#) and [Table 11.4.](#) contain example duty priorities for OWSs and CWTs. The OWS should develop duty priorities tailored for each functional area within the operations.

Table 11.3. Example Duty Priorities (OWS).

Order Of Priority	Duties
1	Perform OWS Emergency War Order (EWO) Taskings.
2	Execute OWS Evacuation.
3	Provide Products and Services in Support of Combat, Contingency & MOOTW Operations.
4	Provide Airborne Aircrew Support.
5	Provide Resource Protection Products (forecast weather watches, warnings, advisories, etc.).
6	Prepare and Disseminate Peacetime/Exercise Regional and Operational-Level Graphics and Alphanumeric Products.

Order Of Priority	Duties
7	Prepare and Disseminate Aerodrome Forecasts (TAFs).
8	Provide Scheduled Flight Weather MEFs and Tactical-Level, Non-contingency (MEFs).
9	Provide other Aerospace Weather Products, Information, and Weather Briefings.
10	Accomplish other Routine Weather Requirements.
11	Accomplish Recurring Training.
12	Accomplish Administrative Tasks.

Table 11.4. Example Duty Priorities (CWT).

Order Of Priority	Duties
1	Perform Emergency War Order (EWO) Taskings.
2	Respond To Aircraft/Ground Emergencies.
3	Respond to Pilot to Metro Service (PMSV) Contacts.
4	Provide Supervisor of Flying (SOF) Support.
5	Record and Disseminate Surface Weather Observations/Provide "Eyes Forward" Support to OWS.
6	Perform Coordinated METWATCH Support
7	SWAP Operations.
8	Produce and Disseminate Mission Execution Forecasts (MEFs).
9	Relay Urgent PIREPs and Special AIREPs to OWS.
10	Disseminate PIREPs/AIREPs.
11	Provide MEF Briefing Support.
12	Perform MISSIONWATCH.
13	Weather Function Training.
14	Accomplish Administrative Tasks.

Chapter 12

QUALITY ASSURANCE AND METRICS PROCESSES

12.1. General. The main objectives of the AFW Quality Assurance (QA) and Metrics programs are to ensure supported customers consistently receive the highest quality products and services possible and to promote continuous improvement of weather forecasting processes used to support combat operations. AFW unit leaders will ensure weather products and services conform to customer needs, meet or exceed established standards, and produce customer satisfaction. Data collected from QA assessments will be used to identify adverse trends, improve procedures, and focus training efforts on key problem areas. Data collected from operational verifications and technical evaluations of weather products and services will be used to measure and assess, and act to continuously improve, the AFP or the MEFP. AFW units will implement and manage their QA and Metrics programs IAW AFI 15-114, *Functional Resource and Weather Technical Performance Evaluation*.

12.1.1. AFWA (including AFWA/SPACEWOC) and OWS QA and metrics processes will evaluate how well their products forecast aerospace weather categories that have broad applicability across their customer base (e.g., standard turbulence and icing categories, VFR/IFR thresholds). For location-specific products, such as TAFs and weather warnings, AFWA and OWSs will evaluate how well these products forecast criteria that are significant to that individual location.

12.1.2. CWTs will perform QA IAW AFMAN 15-135.

12.1.3. AFW units may use AF Form 3811, *Quality Control Register*, or an automated program with similar utility to help manage a local quality assurance program.

12.2. Methods of Quality Assurance (QA).

12.2.1. On-the-Spot (OTS) QA. OTS QA is the most important tool for unit leaders to use to ensure customers receive accurate and timely weather support (i.e., information, products, and services). Unit leaders will implement OTS QA processes for all support provided to customers. Ideally, OTS QA should be performed on all products before they are issued. A successful OTS QA program will identify and correct weather support deficiencies BEFORE delivery to the customer. Unit leaders should place the most emphasis of the QA program on OTS QA.

12.2.2. After-the-Fact (ATF) QA. Unit leaders will use ATF QA to evaluate the quality of weather support provided to customers to identify areas that might require additional training or better procedures. This may be done on a smaller scale than the OTS QA. Unit leaders will focus most ATF QA on the end products and support received by customers (e.g., TAFs/observations, flight weather MEFs/flimsies, METWATCH support products), with less focus on the internal weather processes and tools used to develop the support.

12.2.3. Horizontal QA. Unit leaders will use this method to check all products on a given day for basic horizontal consistency. Horizontal QA is the process of ensuring multiple products/information produced within the same operations center, valid for the same time period, are meteorologically consistent when they are disseminated to the customer. For example, TAFs will be consistent with all other products, including current observations, weather warnings and watches, etc. Elements within each TAF must be consistent (e.g., the appropriate wind speed and/or hail size must be specified if severe thunderstorms are forecast). Product consistency prevents customers from receiving conflict-

ing information. Consider developing checklists that evaluate the horizontal consistency of all weather support received by customers.

12.2.4. Customer Surveys and Feedback. All weather units must develop and implement procedures to obtain feedback from supported customers to determine the quality and accuracy of its information, products and services. Unit leaders will develop feedback procedures (e.g., surveys, mission debrief forms) that are realistic, and quick and simple to complete. They should not be a burden to customers.

12.3. Miscellaneous Metrics. AFW units will track specific metrics as assigned (e.g., manpower hour breakdowns) and forward the data to their parent MAJCOM. MAJCOMs will compile the data and forward to the requesting agency (i.e., HQ USAF/XOW or AFWA).

12.4. Forms Adopted.

12.4.1. DD Form 175-1, *Flight Weather Briefing*.

12.4.2. AF Form 72, *Air Report (AIREP)*.

12.4.3. AF Form 3805, *Pilot Report (PIREP)*.

12.4.4. AF Form 3806, *Weather Watch Advisory Log*.

12.4.5. AF Form 3807, *Watch/Warning Notification and Verification*.

12.4.6. AF Form 3811, *Quality Control Register*.

CHARLES F. WALD, Lt General, USAF
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Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

NOTE: Publications marked with an asterisk (*) are recommended for most weather units.

All applicable DoD Flight Information Publications (FLIPs)*

DoD Instruction 4000.19, *Interservice and Intergovernmental Support*

Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*

Joint Publication 3-59, *Joint Doctrine, Tactics, Techniques, and Procedures for Meteorological and Oceanographic Operations*

AFDD 1, *Air Force Basic Doctrine*

AFDD 2, *Organization and Employment of Aerospace Power*

AFGWC/FM-81/001, *Meteorological Analysis and the LFM; They Work Together*

AFI 10-229, *Responding to Severe Weather Events**

AFI 10-400, *Aerospace Expeditionary Force Planning*

AFI 11-202, Vol. 3, *General Flight Rules**

AFI 15-114, *Functional Resource and Weather Technical Performance Evaluation**

AFI 15-128, *Aerospace Weather Operations - Roles and Responsibilities*

AFJI 15-157, *Weather Support for the US Army*

AFI 25-201, *Support Agreement Procedures*

AFI 32-4001, *Disaster Preparedness Planning and Operations*

AFI 33-101, *Communications and Information Management Guidance and Responsibilities*

AFI 33-103, *Requirements Developing and Processing*

AFI 33-112, *Communications and Information*

AFI 33-116, *Long-Haul Telecommunications Management*

AFI 33-118, *Radio Frequency Spectrum Management*

AFI 33-129, *Transmission of Information via the Internet*

AFI 33-202, *Computer Security*

AFI 33-326, *Preparing Official Communications*

AFI 35-101, *Public Affairs Policies and Procedures*

AFI 36-2201, *Developing, Managing, and Conducting Training*

AFI 61-204, *Disseminating Scientific and Technical Information*

AFIND 8, *Numerical Index of Specialized Education Training Publications*

AFJH 11-203V1, *Weather for Aircrews**
AFMAN 10-100, *Airman's Manual**
AFMAN 10-206, *Operational Reporting*
AFMAN 15-111, *Surface Weather Observations**
AFMAN 15-124, *Meteorological Codes**
AFMAN 15-125, *Weather Station Operations*
AFMAN 15-135, *Combat Weather Team Operations**
AFMAN 26-2247, *Planning, Conducting, Administering, and Evaluating Training*
AFMAN 37-139, *Records Disposition Schedule*
AFMAN 36-2234, *Instructional System Development*
AFMAN 36-2245, *Managing Career Field Education and Training*
AFOSH Standard 91-66, *General Industrial Operations*
AFOSH Standard 91-100, *Aircraft Flight Line - Ground Operations and Activities*
AFPD 15-1, *Atmospheric and Space Environmental Support*
AFSPC PAM 15-2, *Space Environmental Impacts on DoD Operations*
AFSSI 5024, Volume 1, *The Certification and Accreditation (C&A) Process*
AFTO 31P1-4-108-78-1, *PUP User's Guide (WSR-88D Doppler Radar)*
AFTO 31P1-4-108-61, *Operator's Manual - PUP Workstation (WSR-88D Doppler Radar)*
AFTO 31P1-4-108-58-1, *User's Guide - Unit Control Position*
AFTO 31P1-4-108-51, *Operator's Manual - Unit Control Position WSR-88D Radar*
AFW *Career Field Education and Training Program**
AFWA TN-98/002, *Meteorological Techniques**
AFW ECHOES #18, *Radar Program*
AFWTL/TC-00/001, *Catalog of Air Force Weather Technical Documents 1941-2000**
Applicable 11 Series AFIs, *Flying Operations*, pertaining to specific aircraft Operations Procedures*
Army Regulation 95-1, *Flight Regulations**
Army FM 34-81/AFMAN 105-4, *Weather Support for Army Tactical Operations*
Army FM 34-130, *Initial Preparation of the Battlefield*
AWS/AFSPC FYI #37, *Space Environmental Impacts on DoD Operations*
AWS FM 82/009, *Relationship Between Cloud Bands in Satellite Imagery and Severe Weather*
AWS FM 83/006, *Satellite Depiction of the Life Cycle of a Mesoscale Convective Complex*
AWS/FM-92/001, *A New Severe Thunderstorm Identification Technique*

AWS/FM-92/003, *Verification of a Severe Thunderstorm Identification Technique*

AWS/FM-94/001 (AD-B1996769) *Estimating IR Visibility from an "Astere" OTDA* (Electro-optical Tactical Decision Aid)

AWS FM-300-Series/001, 002, 004, and 005, *Single Station Analysis and Forecasting*

AWS/FM-600-Series, *Severe Convective Weather*

AWS/TN-79/002, *Forecast Reviews and Case Studies*

AWS TN 79/003, *Satellite Applications Information Notes*

AWS/TN-87/001, *What's Hot & What's Not-Practical Guide to TDA*, Jul 87

AWS TN 88/001, *Satellite Imagery Interpretation for Forecasters*

AWS/TR-79/006, *Use of the Skew-T, Log P Diagram in Analysis and Forecasting*

AWS TR 212, *Application of Meteorological Satellite Data in Analysis and Forecasting*

AWS-TR-225, *Use of Asynoptic Data in Analysis and Forecasting*

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Abbreviations and Acronyms

ACM/T—Air Combat Maneuver/Training Area

ACUS—Army Common User System

AEF—Aerospace Expeditionary Force

AETC—Air Education and Training Command

AFCCC—Air Force Combat Climatology Center

AFCWC—Air Force Combat Weather Center

AFOSH—Air Force Occupational Safety and Health

AFP—Analysis and Forecast Process

AFR—Air Force Reserve

AFRL—Air Force Research Laboratory

AFSAC—Air Force Security Assistance Center

AFSOC—Air Force Special Operations Command

AFSPC—Air Force Space Command

AFW—Air Force Weather

AFWA—Air Force Weather Agency

AFWTL—Air Force Weather Technical Library

AGL—Above Ground Level

AI—Areas of Interest

AIREP—Air Report

AIRMET—Airman's Meteorological Information (A NWS In-Flight Weather Advisory)

ALT—Actual Lead-time

AMD—Amendment

AMIS—Advanced Meteorological Information System

AMOCC—Air Mobility Operations Control Center

ANG—Air National Guard

AO—Area of Operations

AOI—Area of Interest

AOR—Area of Responsibility

AOS—Alternate Observing Site

AR—Air Refueling

ASOG—Air Support Operations Group

ASOS—Air Support Operations Squadron

AT—Ancillary Training

ATC—Air Traffic Control

ATE—Allowed to Expire

ATF—After the Fact

AWC—Aviation Weather Center

AWN—Automated Weather Network

BFM—Battlefield Forecast Model

BKN—Broken

BML—Base Master Listing

BWW—Basic Weather Watch

C4ISP—Command, Control, Communications, Computers, and Intelligence Support Plan

C & A—Certification and Accreditation
CAMS—Core Automated Maintenance System
CAT—Clear Air Turbulence
CB—Cumulonimbus
CBI—Computer-Based Instruction
CBT—Computer-Based Training
CENTCOM—Central Command
CFETP—Career Field Education and Training Plan
CFM—Career Field Manager
CFP—Computer Flight Plan
CINC—Commander in Chief
CLS—Contractor Logistic Support for N-TFS Management Plan
CMEF—Controlling Mission Execution Forecast
CO—Certifying Official
COA—Course of Action
COAMPS—Coupled Ocean Atmospheric System
COF—Combat Operations Flight
COMET—Cooperative Program for Operational Meteorology, Education, and Training
CONOPS—Concept of Operations
CONUS—Continental United States
COP—Common Operating Picture
CSFO—CONUS Severe Forecast Operations
CT—Continuation Training
CWT—Combat Weather Team
CWTOC—Combat Weather Team Operations Course
CWW—Continuous Weather Watch
DDL—Delegation of Disclosure Authority Letters
DET—Detachment
DII COE—Defense Information Infrastructure and Common Operating Environment
DINS—DoD Internet NOTAM Service
DISS—Digital Ionospheric Sounding System
DLT—Desired Lead-time

DMS—Defense Message System
DNTT—AFWA Technical Training Branch
DoC—Department of Commerce
DoD—Department of Defense
DoT—Department of Transportation
DOW—Directorate of Weather
DRU—Direct Reporting Unit
DSN—Defense Switched Network
DTG—Date-Time Group
DV/VIP—Distinguished Visitor/Very Important Person
DZ—Drop Zone
EAC—Echelon Above Corps
ECMWF—European Centre for Medium-Range Weather Forecasts
EEP—Exercise Evaluation Package
EO—Electro-Optics
ESC—Electronic System Center
ETA—Estimated Time of Arrival
ETD—Estimated Time of Departure
ETW—Equipment Training Workbook
EZ—Extraction Zone
FAA—Federal Aviation Administration
FARRRP—Forward Area Refueling, Rearming & Refitting Point
FDO—Foreign Disclosure Officer
FITL—Forecaster-in-the-Loop
FLENUMMETOCEN—Fleet Numerical Meteorology Oceanography Center, Monterey CA
FLIP—Flight Information Publication
FM—Field Manual
FOA—Field Operating Agency
FRN—Forecast Reference Notebook
FTAC—First Term Airmen’s Course
FTP—File Transfer Protocol
FWA—Forecast Weather Advisory

GP—Ground Planning
HURCONS—Hurricane Conditions
IA—Information Assurance
IAW—In Accordance With
ICAO—International Civil Aviation Organization
IFM—Integrated Flight Management
IFR—Instrument Flight Rules
IM—Information Manager
IMA—Individual Mobilization Augmentee
IMasT—Integrated METEOGRAM and SKEW-T
IMETS—Integrated Meteorological System
IMS—Ionospheric Measuring Set
IPB—Intelligence Preparation of the Battlefield
IR—IFR Military Training Route/Infrared
IRC—Instrument Refresher Course
IRTSS—Infrared Target Scene Simulation System Software
ISC—Initial Skills Course
IWEDA—Integrated Weather Effects Decision Aid
JA/ATT—Joint Airborne/Air Transportability Training
JAAWIN—Joint Air Force and Army Weather Information Network
JAAWIN-S—Secure Joint Air Force and Army Weather Information Network
JCS—Joint Chief of Staff
JMA—Japan Meteorological Agency
JMFU—Joint Meteorology and Oceanography Forecast Unit
JMOC—Joint Meteorology and Oceanography Center
JOAF—Joint Operation Area Forecast
JTF—Joint Task Force
JTWC—Joint Typhoon Warning Center
LAM—Limited Area Model
LAN—Local Area Network
LAWC—Local Area Work Chart
LLWS—Low Level Wind Shear

LOA—Letter of Acceptance
LOI—Letter of Instruction
LOR—Letter of Request
LP—Lesson Plan
LZ—Landing Zone
M2K—Mobility 2000
MAJCOM—Major Command
MEF—Mission Execution Forecast
MEFP—Mission Execution Forecast Process
METAR—Aviation Routine Weather Report
METCON—Meteorological Conference or Discussion
METOC—Meteorology and Oceanography
METWATCH—Meteorological Watch
METSAT—Meteorological Satellite
MIC—Maximum Instantaneous Coverage
MIRF—METSAT Imagery Reference File
MISSIONWATCH—Mission Meteorological Watch
MM5—Mesoscale Model Version 5
MOA—Memorandum of Agreement
MOAF—Military Operation Area Forecast
MODCV—Modeled Ceiling and Visibility
MOU—Memorandum of Understanding
MRF—Medium Range Forecast Model
MSL—Mean Sea Level
MT—Mobility Training
MTL—Master Task List
MTO—Master Training Outline
MTP—Master Training Plan
MWA—Military Weather Advisory
NAF—Numbered Air Force
NASA—National Aeronautics and Space Administration
NBC—Nuclear, Biological, Chemical

NCA—National Command Agency
NCOIC—Noncommissioned Officer in Charge
NEXRAD—Next Generation Weather Radar
NIPRNET—Non-secure Internet Protocol Router Network
NLT—No Later Than/Negative Lead Time
NM—Nautical Mile
NOAA—National Oceanic and Atmospheric Administration
NOGAPS—Navy Operational Global Atmospheric Prediction System
NORAD—North American Aerospace Defense Command
NOTAM—Notice to Airmen
NOWS—NVG (night vision goggles) Operations Weather Software
N-TFS—New Tactical Forecast System
NVA—Negative Vorticity Advection
NVG—Night Vision Goggles
NWP—Numerical Weather Prediction
NWS—National Weather Service
OCONUS—Outside Continental United States
OIC—Officer-in-Charge
OJT—On-the-Job Training
OPCON—Operational Control
OPLAN—Operation Plan
OPORD—Operation Order
OPSEC—Operations Security
OPS II—Operational Weather Squadron Production System Phase II
OPUP—Open Principal User Processor
OSS—Operations Support Squadron
OTS—On the Spot
OVC—Overcast
OWA—Observed Weather Advisory
OWL NET—Operations Weather Limiters Network
OWS—Operational Weather Squadron
OWW—Observed Weather Watch

PACAF—Pacific Air Force
PACOM—Pacific Command
PGM—Precision Guided Munitions
PGS/S—Program Generation Scheduler/Server
PI—N-TFS Projection Indicator
PID—Product Identifier
PIREP—Pilot Weather Report
PIT—Point in Time
PLT—Positive Lead Time
PM—Program Manager
PMSV—Pilot-to-Metro Service
PRF—Pulse Repetition Frequency
PUP—Principal User Processor
PVA—Positive Vorticity Advection
QA—Quality Assurance
QT—Qualification Training
QTP—Qualification Training Package
RAPCON—Radar Approach Control
RAREP—Radar Report
RC—Reserve Component
RCR—Runway Condition Reading
RDA—Radar Data Acquisition
RIRF—Radar Imagery Reference File
RON—Remain Overnight
ROT—Rule of Thumb
RPG—Radar Product Generator
RPS—Routine Product Set
RSC—Runway Surface Condition
RSTN—Radio Solar Telescope Network
RUC—Rapid Update Cycle
RVR—Runway Visual Range
SAF/AI—Secretary of the Air Force, International Affairs

SAR—Support Assistance Request
SATCOM—Satellite Communications
SCI—Sensitive Compartmentalized Information
SEC—Space Environment Center
SECDEF—Secretary of Defense
SEON—Solar Electro-optical Observing Network
SFIR—Swept Frequency Interferometric Radiometer
SIGMET—Significant Meteorological Information (A NWS In-Flight Weather Advisory)
SIPRNET—Secure Internet Protocol Router Network
SM/ALC—Sacramento Air Logistics Center
SME—Subject Matter Expert
SMO—Senior Meteorological and Oceanographic Officer
SOCS—Surface Observation Climatic Summary
SOF—Supervisor of Flying/Special Operations Forces
SOFWOC—Special Operations Forces Weather Operations Cell
SOON—Solar Observing Optical Network
SOP—Standing Operating Procedures
SORTS—Status of Resources and Training System
SOUTHCOM—Southern Command
SPACEWOC—AFWA Space Weather Operations Center
SPC—Storm Prediction Center
SPECI—Aviation Selected Special Weather Report
SR—Slow-Speed Low-Altitude Training Route
SRS—Solar Radio Spectrograph
SSOB—Specialized Support Operations Branch
STC—Standardized Training Checklist
STI—Scientific and Technical Information
STS—Specialty Training Standard
SWAP—Severe Weather Action Procedures
SWAT—Severe Weather Action Team
TAA—Total Area Affected
TACC—Tanker Airlift Control Center

TACCOM—Tactical Communications
TACMET—Tactical Meteorological Equipment
TAF—Aerodrome Forecast
TALCE—Tanker Airlift Control Element
TAWS—Target Acquisition Weather Software
TCOR—Typhoon Condition of Readiness
TCV—Technical Consultation Visit
TDA—Tactical Decision Aid
TDC—Theater Deployable Communications
TDY—Temporary Duty
TN—Technical Note
TO—Technical Order
TP—Time Phased
TPFDD—Time-Phased Force and Deployment Data
TR—Technical Report
UA—Upper Air
UCP—Unit Control Position
UGDF—Uniform Grid Data Field
UGT—Upgrade Training
UKMO—United Kingdom Meteorological Office
URC—Unit Radar Committee
USG—US Government
USR—Unsatisfactory Service Report
U&TAG—Utilization and Training Action Group
UTC—Unit Type Code/Coordinated Universal Time
U&TW—Utilization and Training Workshop
VCP—Volume Coverage Pattern
VFR—Visual Flight Rules
VR—VFR Military Training Route
VSAT—Very Small Aperture Terminal
VT—Valid Time
VWP—WSR-88D Velocity Azimuth Display Wind Profile

WA—Weather Advisory
WBT—Web-Based Training
WF—Weather Flight
WMO—World Meteorological Organization
WPSB—Weather Product Standardization Board
WOC—Weather Officer Course
WSD—Weather Support Document
WSI—Weather Support Instruction
WSOM—Weather Service Operations Manual
WSP—Weather Support Plan
WSR-88D—Next Generation Doppler Radar
WSSC—Weather System Support Cadre
WW—Weather Warning
XOP—AFWA Field Support Division
XOR—AFWA Current Operations Division
XOW—Director of Weather (United States Air Force)

Terms

Actual Lead-time—The elapsed time between issue time of an advisory or warning and the first occurrence of the event.

After-the-Fact (ATF) QA—A quality assurance process used to evaluate the quality of a small portion of weather support provided to customers to identify areas that might require additional training or better procedures.

Air Force Weather Agency (AFWA)—A strategic weather center at Offutt AFB NE, providing strategic atmospheric data and strategic analysis/forecast products required by the regional OWSs and the CWTs worldwide. AFWA provides the centralized repository for global observations and forecasts that are databased at AFWA and, in turn, disseminated to DoD weather data users worldwide. In addition to global observations and forecasts collected from worldwide sources, AFWA collects meteorological satellite data from multiple sources. Based on global analysis of available data, AFWA creates global analysis and forecast products to meet the strategic forecast requirements of its customers.

AIRMET—NWS in-flight weather advisories issued only to amend the area forecast concerning weather phenomena which are of operational interest to all aircraft and potentially hazardous to aircraft having limited capability because of lack of equipment, instrumentation, or pilot qualification. AIRMETs concern weather of less severity than that covered by SIGMETs or convective SIGMETs.

Air Report—A pilot report made over areas where weather information is limited or nonexistent (e.g., over an ocean).

Amendment—Used as a message modifier when transmitting an aerodrome forecast amendment.

Analysis and Forecast Process—A systematic and consistent approach to weather forecasting. The AFP identifies techniques and tools used to forecast individual weather elements, describes requirements for locally prepared work charts/composites, and explains refinements and application of centralized products.

Area Meteorological Watch—The monitoring of weather for a designated military operating area (e.g., restricted flying area, desert training area) and informing supported agencies when certain weather conditions could affect operations.

Advanced Meteorological Information System—AMIS is the software for the New Tactical Forecast System (N-TFS). This software is the first step toward the DoD standard and Defense Information Infrastructure and Common Operating Environment (DII COE) compliant weather information system. AMIS is fielded in both in-garrison and tactical versions to provide weather personnel "same in peace as in war" operating capability.

Automated Weather Network (AWN)—A global communications network that collects and distributes alphanumeric environmental/weather data and Notices to Airmen (NOTAMs).

Aviation Routine Weather Report—The WMO code format used to encode weather observations.

Case Study—An in-depth, detailed forecast review of a specific event.

Combat Weather Team (CWT)—An umbrella term covering any military weather organization providing direct operational support at the tactical level. In addition to designated weather units, (OSS weather flights, Weather Detachments and Squadrons, ANG Weather Flights) specialized sections in an OWS (flight weather briefing or contingency cell) and AFWA (Special Support Operations Branch) also operate as CWTs.

Desired Lead-time—The amount of advance notice a supported agency desires before the onset of a particular weather phenomenon.

Eyes Forward—CWT forecasters are the eyes forward for the forecasters in the OWS and integrate weather radar data, meteorological satellite imagery, lightning detection readouts, and non-standard weather data systems (vertical profilers, mesonet data, etc.) to create an integrated weather picture and near-term trend forecasts for the OWS. Eyes forward yields meaningful meteorological information not contained in coded observations to the servicing OWS and is an integral part of the meteorological watch for an installation or contingency operating location.

Forecast Reference Notebook—An informal publication containing information on forecasting for locations for which the unit has forecast responsibilities.

Forecast Review—A written review of the meteorological data and reasoning used to develop the forecast.

Forecast Weather Advisory (FWA)—A weather advisory issued when the customer requires advance notification of an impending weather condition with sufficient time to allow for protective actions.

Forecast Worksheet—Tool used to document, track, and evaluate past and future weather events. It may contain forecast rules-of-thumb, question and answer discriminators, decision logic trees, etc., to help develop a forecast.

ICAO Identifier—A specifically authorized 4-letter identifier assigned to a location. The ICAO is not to be confused with the Routing Identifier used by the ADWS to transmit addressed messages including

ARQs. Routing IDs may not always match a station ICAO and can have 5 characters.

Horizontal Consistency—Weather data provided in one product that is consistent to data provided in another product for the same area and time. For example, TAFs must be consistent with all other products, including current observation, weather warnings and watches, etc. Elements within each TAF must also be consistent, for example, if heavy snow showers are forecast, the visibility will be restricted appropriately. Strong gusty winds or hail would generally be expected if severe thunderstorms are forecast. Product consistency prevents customers from receiving conflicting information.

Initialization—The process of comparing numerical prediction model output to the actual state of the atmosphere at the valid time of the model. Adjustment between the model and the actual state of the atmosphere can then be made to subsequent model outputs.

Integrated Meteorological System (IMETS)—An Army-fielded system that uses satellite communications to ingest AFW model data to create an internal database, which is linked to Army Command and Control. IMETS is used to provide weather support and tactical decision aids to the Army in a wartime environment.

Integrated Weather Effects Decision Aids (IWEDA)—IWEDA is the Integrated Weather Effects Decision Aid, which is available to weather and non-weather users in Digital TOCs served by the IMETS Weather Effects Workstation. IWEDA uses a hierarchy of systems (typically platforms, for instance, a helicopter) subsystems, (for instance a missile) and components, (for instance, the missile's target acquisition system); each element has weather effects rules. The user selects a system or several systems to be examined, and views a Weather Effects Matrix, which provides the worst weather effects for each selected system, as a function of time. By clicking on a particular weather effects matrix element, the operator can display red, amber, and green weather effects on a map, and by clicking on a particular map location, find the weather effects rules which "fired" at that particular location and time.

Intelligence Preparation of the Battlefield (IPB)—IPB is the Army's 4-step systematic, continuous process of analyzing the threat and environment in a specific geographic area. It is designed to support staff estimates and military decision making. Applying the IPB process helps the commander selectively apply and maximize his or her combat power at critical points in time and space on the battlefield.

International Civil Aviation Organization—A United Nations organization specializing in international aviation and navigation.

Infrared Target Scene Simulation System Software (IRTSS)—A UNIX-server, (hosted by AFWA and the OWSs) full-physics, tactical decision aid capability that illustrates the weapons-eye (sensor's spectral response) view of the target area.

Issue Time—The time when an agency is notified of a watch, warning, or advisory. When more than one agency is notified, the issue time is the time the last agency is notified. Follow-up notifications are not considered when determining issue time.

Joint Operations Area Forecast (JOAF)—The JOAF, as approved by the JMO, is the official planning forecast for all components of the joint force. It is issued at the JFC level to ensure that all components are aware of what the JFC is using to plan the coordinated battle. Significant deviations from the JOAF will be coordinated with the JMO. Components and individual units will use the JOAF as the point of departure to tailor METOC information and to develop tailored mission execution forecasts. The JOAF may include a forecast database when needed for tactical decisions used in planning.

Limited Duty Station—A weather station that provides less than 24-hour a day forecast service.

Local Forecast Study—A study that specifies techniques for predicting weather elements applicable to one specific terminal or location.

Macroscale—The largest scale of weather systems generally covering an area of thousands of kilometers, with a duration from several days to several weeks; e.g., persistent jet streams, baroclinic waves, semi-permanent pressure systems (i.e., Bermuda High, Aleutian Low), or seasonal monsoon circulations.

Mesoscale—Weather systems ranging in size horizontally from a few to several hundred kilometers and having a duration from tens of minutes to several hours (e.g., fronts, low level jets, squall lines, thunderstorms, land-sea breezes, mountain waves, and precipitation bands in tropical and extratropical cyclones).

METWATCH—Monitoring aerospace weather for a route, area, or terminal and advising concerned organizations when phenomena that could affect their operations or pose a hazard to life or property are observed or about to occur.

Metrics Program—Tools used to measure and show how well customers are supported by identifying trends in key processes.

Microscale—The smallest scale of weather systems generally covering an area of less than two kilometers with a duration from a few seconds to a few minutes (e.g., tornadoes, dust devils, thermals, or turbulence).

Military Operating Area Forecast (MOAF)—A forecast guidance product that provides the weather or space environmental conditions for a specific area in which military operations are occurring.

Mission Execution Forecast (MEF)—A MEF is a customized weather product providing terrestrial and space weather data and forecasts for a specific mission, or set of missions. It fully integrates aerospace weather with the customer's tactics, weapon systems, environmental sensitivities of equipment, and other operational requirements.

Mission Execution Forecast Process (MEFP)—A systematic, repeatable process for forecasting the customer's mission limiting meteorological parameters. This process provides a basic framework for fusing perishable meteorological data, operational and strategic forecast products, and an understanding of the customer's tactics that will be applied to any mission their customer may undertake. The MEFP describes an end-to-end process incorporating MEF management, MEF development, mission meteorological watch, and post mission analysis of the unit's forecasts.

MISSIONWATCH—The monitoring of aerospace weather for a specific mission (i.e., ground, air or space) and informing supported agencies when unforecast mission-limiting phenomena could impact operations.

Mobility 2000 (M2K)—a comprehensive AMC Command and Control modernization initiative. Part of this initiative is Integrated Flight Management (IFM). IFM provides the flight manager at TACC and aircrews real time access to all critical information relating to the flight plan, aircraft position, performance, destination, weather, cargo, passengers, fuel, etc. It provides for integrated planning and better use of resources.

New Tactical Forecast System (N-TFS)—The computer system and associated interfaces that provide an automated weather support and communications capability to the CWT.

Notice to Airmen—A notice containing information concerning the establishment, condition, or change in any aeronautical facility, service, procedures, or hazard, the timely knowledge of which is essential to

personnel concerned with flight operations.

Numerical Weather Prediction (NWP)—The processes involved in representing the atmospheric system with fundamental mathematical equations, which can be solved in discrete time steps to achieve a numerical forecast of the parameters (e.g., pressure, temperature, humidity) used to define the state of the atmosphere.

Objective Verification—A review to determine if a forecast phenomenon occurred or did not occur.

Observed Weather Advisory (OWA)—A weather advisory issued when a particular weather event first occurs and the customer does not require advanced notification of the observed weather phenomenon.

On-the-Spot (OTS) QA—A quality assurance process to ensure customers receive accurate and timely weather support (i.e., information, products, and services). Successful OTS QA will identify and correct weather support deficiencies BEFORE delivery to the customer.

Operation Order (OPORD)—A directive issued by a commander to subordinate commanders for the purpose of effecting the coordinated execution of an operation.

Operation Plan (OPLAN)—A plan for one or more operations that deployed units carry out simultaneously or in a series of connected stages. Higher authorities normally issue OPLANs as directives based on stated assumptions to allow subordinate officers to prepare supporting plans and orders.

Operational Weather Squadron (OWS)—An organization comprised of management, technician, and training personnel responsible for providing regional weather support. Their mission is to produce theater-scale tailored weather forecast products and services to customers within their area of responsibility (AOR).

Operations Weather Limiters Network (OWL NET)—An interactive program units access to research customer weather sensitivities. OWL NET is hosted on each OWS web site as well as the HQ AFWA Field Support Division web page and at AFCCC.

Pilot Report—A report of in-flight weather provided by an aircrew member.

Principal User Processor—NEXRAD remote workstation.

Product Consistency—Ensuring that products provide the same information to the customer within the constraints of regulations and the weather support document established with the local customers.

Product ID—A 10-character code used to identify each N-TFS graphic product.

Regime—A synoptic and/or mesoscale weather pattern that affects a location (also known as a Weather Regime).

Request for Service—The document required to add, delete, or change communications terminal equipment or circuits.

Rule of Thumb—A concise, empirical forecast rule providing a specific answer that can be verified objectively.

Severe Thunderstorm—A thunderstorm that produces hail greater than or equal to 3/4 inch diameter and/or surface wind greater than or equal to 50 knots.

Severe Weather—Any weather condition that poses a hazard to property or life.

SIGMET—NWS in-flight weather advisories issued concerning weather significant to the safety of all

aircraft. There are convective and non-convective SIGMETs.

Strategic Centers—There are three AFW Strategic Centers: the Headquarters Air Force Weather Agency (AFWA), the Air Force Combat Climatology Center (AFCCC), and the Joint Typhoon Warning Center (JTWC). They provide a spectrum of centralized weather products and services. Each has the mission to provide specified large-scale (campaign or global) support.

Subjective Verification—A review to determine meteorological soundness by comparing the product in question with other weather data and products.

Support Assistance Request (SAR)—Used to request specialized weather, space environmental, or climatological support from AFWA, AFCCC, or OWSs.

Synoptic Scale—Weather systems ranging in size horizontally from several hundred to several thousand kilometers and having a duration of tens of hours to several days (e.g., migratory high and low pressure systems, frontal systems, or tropical cyclones).

Timing Error—The difference between the forecast time of occurrence and the actual time of occurrence. Timing error is positive (+) if the event occurred later than forecast and negative (-) if it occurred earlier than forecast.

Uniform Grid Data Field—A product composed of data values assigned to regularly spaced points.

Unit Control Position—The master computer terminal that controls all function of the NEXRAD.

Unit Type Code (UTC)—A five-character alphanumeric code that uniquely identifies each type of unit of the Armed Forces.

Vector Graphics—Products consisting of data describing weather maps, charts, and figures. These may be vectors, graphic symbols, environmental symbols, or A/N labels, as required by the product originator to fully define a product.

Very Small Aperture Terminal (VSAT)—An economical and reliable means for transmitting a large volume of weather data to multiple recipients. VSAT is used in conjunction with other communications methods, including common user communications, dedicated communications, mobile satellite systems (such as Iridium satellite phone), and high frequency radio to provide weather data to fixed and tactical units supporting the war-fighter in areas where the capability exists.

Vertical Consistency—Weather features are three dimensional, but products are often two-dimensional. Vertical consistency ensures the proper vertical structure is maintained across different products.

Weather Advisory—A special notice provided to a supported agency when an established weather condition that could affect its operation is occurring or is expected to occur.

Weather Warning—A special notice provided to a supported agency when an established weather condition of such intensity as to affect operations, pose a hazard to life or property, and requires protective action, is occurring or is expected to occur.

Weather Watch—A special notice provided to supported customers that alerts them of a potential for weather conditions of such intensity as to pose a hazard to life or property for which the customer must take protective action.

Work Chart/Composite—A representation of meteorological elements or features and their variability in space and time. Work charts/composites supplement or refine centralized products.

Attachment 2

SAMPLE WEATHER DISCUSSION/SHIFT CHANGE BRIEFING GUIDE

A2.1. General. **Figure A2.1.** contains a sample weather discussion/shift change briefing guide. AFW leaders should tailor the specific contents of this guide to meet the unit's requirements in the forecast funnel. As part of their training, weather apprentices should conduct the discussion under the supervision of an experienced trainer.

Figure A2.1. Sample Weather Discussion/Shift Change Briefing Guide.

The Current Weather:

1. Current surface observation and trends.
2. Summary data (i.e., total precipitation, peak winds, high/low temps, new extremes).

Hemispheric Scale Pattern:

1. Location, intensity, and continuity of long-wave troughs/ridges.
2. Rationale for movement of long-wave troughs/ridges.
3. Comparison of long-wave trough/ridge positions with satellite imagery.
4. Effects of long-wave pattern on local weather.
5. Any relevant long-wave discussion bulletin information.

Upper Air Analysis Package:

1. Location, intensity, and continuity of significant upper air features (i.e., jet streams, pressure centers, troughs, ridges).
2. Comparison of upper air features with satellite imagery.
3. Temperature and moisture advection at selected levels.
4. Continuity of representative contours at selected levels.
5. Significant height falls at selected levels.
6. Low level wind maxima (e.g., 700, 850, 925 mb levels).
7. Any relevant upper air discussion bulletin information.

Surface Analysis Package (locally developed LAWCs and other surface products):

1. Location, intensity, and continuity of frontal systems.
2. Location, intensity, and continuity of other surface weather features.
3. Comparison of surface features with satellite imagery.
4. Any relevant surface feature discussion bulletin information.

Forecast Model Initialization/Verification:

1. Current conditions (products and METSAT) to initial forecast model data.
2. Current conditions to previous forecast run (usually the 12-hour forecast).
3. Significant height changes, system movement, and intensity changes at select levels.
4. Positive vorticity advection (PVA), negative vorticity advection (NVA), and vorticity maxima/minima at select levels.
5. Available moisture, vertical velocity, and other significant feature at select levels.
6. Significant thickness features, changes, and advection at select levels.
7. Significant surface frontal features (e.g., location, type, movement, associated weather).
8. Any relevant model discussion bulletin information.

Centralized Products:

1. AFWA Military Weather Advisory (MWA), where applicable.
2. Thunderstorm, icing, and turbulence products.
3. Any relevant product discussion bulletin information.

Other Significant Aerospace Weather Information:

1. Identification of current weather regime and associated conditions and expected changes.
2. Current watches/warnings/advisories in effect and duration.
3. Other forecast tools (e.g., TAF/MEF worksheet, severe weather analysis worksheets).
4. Weather radar (e.g., local WSR-88D products and alerts, radar summary products).
5. Operationally significant PIREPs, and NWS In-Flight Weather Advisories (i.e., SIGMETs, AIRMETs).
6. Current level of solar activity and summary of recent solar activity.

Changes to Local Weather Elements:

1. Significant changes based on observations, new regime, continuity, satellite, LAWCs, forecast models, local rules of thumb, climatology, etc.
2. Timing of changes.
3. Impact of changes on customer operations.

Current Forecast Products (i.e., graphical products, TAFs, MEFs, watches, warnings, advisories, flight flimsies):

1. Consistency between current products and previously issued products.
2. Reasons for significant deviations between current and draft products.

Long-Range Outlook (as determined by weather leaders).**Operational Support – Current and Future:**

1. Mission of the Day.
2. Upcoming scheduled air and ground missions/exercises requiring weather support.
3. Upcoming missions requiring specialized/classified support.
4. Weather impacts on current and upcoming missions.
5. MISSIONWATCH of current air and ground missions.

Equipment/Communications Status and Outages:

1. Current and scheduled outages, to include maintenance outages.
2. Extended outages.
3. Communications systems (e.g., NIPRNET, SIPRNET, local LAN, JAAWIN, PMSV).

Open Discussion.

Attachment 3

STANDARD WEATHER REPRESENTATION AND SYMBOLOGY

A3.1. General Instructions . Line types and colors for commonly used isopleths are depicted in Figure A3.1. The standard depictions for bounded areas of specific weather parameters are illustrated in Figure A3.2. Figure A3.3. contains the standard symbols for frontal zones and other weather features. Figure A3.4. contains the standard criteria and shading for MWA products.

Figure A3.1. Recommended Line Types and Colors for Commonly Used Isopleths.

Isobars (Surface)	BLACK solid	
Contours (upper air)	BLACK solid	
Isotherms	RED dashed	
Isotachs	PURPLE dashed	
Isodrotherms	GREEN solid	
Thickness	RED dashed*	

(* Only on products without isotherms)

Figure A3.2. Standard Depictions for Bounded Areas of Weather.



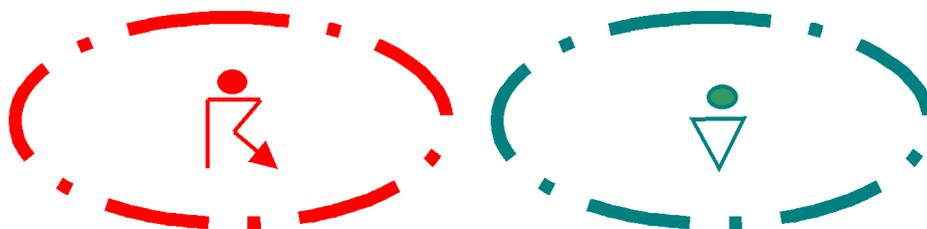
(YELLOW solid line and optional shading)

Areas of Fog: Distribute the appropriate fog symbol over the zone.



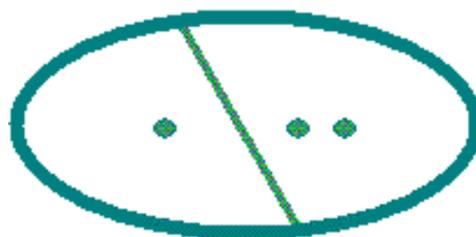
(BROWN solid line and optional shading)

Areas of Dust, Duststorms, Sandstorms, or Haze: Distribute the appropriate phenomena symbol over the zone.



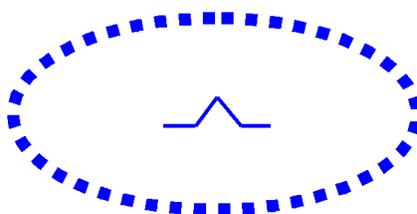
(Thunderstorms—RED line with dash or dot)
 (Rain/Snow Showers—GREEN line with dash or dot)

Thunderstorm-Convective Precipitation Areas: Distribute the appropriate convective weather symbol over the zone with the height of the thunderstorm top, if applicable.



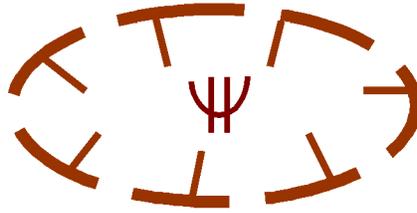
(GREEN/RED solid line)

Non-Convective Continuous or Intermittent Precipitation Areas: Distribute the appropriate precipitation symbol over the zone. Color in RED for freezing precipitation. Optional: Cross hatch continuous and single hatch intermittent precipitation.



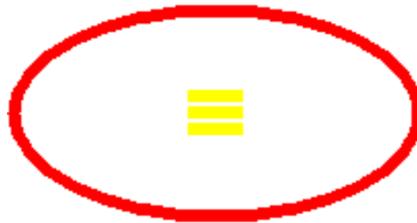
(BLUE dots or dashes: Clear Air Turbulence (CAT) & Mechanical)
 (BLUE solid line: Mountain Wave)

Turbulence Areas: Distribute the appropriate turbulence symbol over the zone with the height of the bases and tops.



(BROWN intersecting line segments)

Icing Areas: Distribute the appropriate icing symbol over the zone with the height of the bases and tops.



(RED solid line)

Areas of Ceilings less than 1500 feet and/or Visibility less than 3 miles: Distribute the appropriate weather symbol causing IFR conditions over the zone.

Areas of Ceilings less than 3,000 feet but greater than or equal to 1500 feet and/or Visibility less than 5 miles but greater than or equal to 3 miles: Outline in BLUE scalloped line.

Areas of Ceilings less than 10,000 feet but greater than or equal to 3000 feet: Outline in PURPLE scalloped line and place bases/tops inside cloud areas.

200

140

Upper-air moisture and areas of $\geq 50\%$ RH on Model Charts: Bound in light GREEN scalloped line.

Areas of $\geq 90\%$ RH on Model Charts: Bound in darker GREEN scalloped line and optional light green color fill.

Dry areas on upper-air/model charts: Bound in brown scalloped line.

Figure A3.3. Symbols for Frontal Zones and Other Weather Features.

Item	Symbol
(BLUE)	
Cold front at the surface	
Cold front above the surface	
Cold front frontogenesis	
Cold front frontolysis	
(RED)	
Warm front at the surface	
Warm front above the surface	
Warm front frontogenesis	
Warm front frontolysis	
(PURPLE)	
Occluded front at the surface	
Occluded front above the surface	
Occluded front frontolysis	
(ALTERNATE RED & BLUE)	
Quasi-stationary front at the surface	
Quasi-stationary front above the surface	
Quasi-stationary front frontogenesis	
Quasi-stationary front frontolysis	
Quasi-stationary occluded front at the surface	
Quasi-stationary occluded front above the surface	
Quasi-stationary occluded front frontolysis	
(RED or BLACK)	
Jet Stream Maximum Wind Line	

Item	Symbol
(BLACK) Instability line Shear line	
(ORANGE) Near Equatorial Tradewind Convergence (NEWTC), formerly called the Inter-Tropical Convergence Zone (ITCZ). See Note.	
<p>NOTE: The separation of the two horizontal lines gives a quantitative representation of the width of the NETWC. The diagonal lines may be added to indicate areas of activity.</p>	
(ALTERNATE RED & GREEN) Inter-tropical discontinuity	
(BROWN) Sub-tropical discontinuity	
(BLACK) Axis of trough	
Axis of ridge	
(BLUE) Highs	
(RED) Lows	
Positive Vorticity Advection (PVA)/Convergence Vorticity troughs	<p>Shade RED RED trough symbol</p>
Positive Vorticity Centers	<p>RED X</p>
Negative Vorticity Advection (NVA)/Divergence Vorticity ridges BLUE	<p>Shade BLUE BLUE ridge symbol</p>
Negative Vorticity Centers	<p>BLUE X</p>

Figure A3.4. Standard Criteria and Shading for MWA Products.

CONVECTIVE WEATHER	
Criteria	Shading/Solid Bounded
Tornadoes and severe thunderstorms	RED
Severe thunderstorms—hail $\geq 3/4$ " and/or winds ≥ 50 kts	BLUE
Moderate thunderstorms—hail $1/2$ "- $5/8$ " and/or gusts 35-49 kts	GREEN
General thunderstorms—hail $< 1/2$ " and/or gusts < 35 kts	ORANGE
NONCONVECTIVE WEATHER	
Criteria	Shading/Solid Bounded
Surface winds, not associated with Thunderstorms, ≥ 35 kts	BLACK (black outline only, do not shade in)
Heavy rain (≥ 2 " in ≤ 12 hrs)	PURPLE
Heavy snow (≥ 2 " in ≤ 12 hrs)	PURPLE HATCHED
Freezing precipitation (regardless of type or intensity)	BROWN

Thunderstorm **COVERAGE**: Total Area Affected (TAA). Implied 1-hour maximum coverage.

Geographical Coverage of Effected Area in AOR (TAA)	Blocks on DD Form 175-1	Coverage	Standard Contraction on MWA
01-24%	01-02%	Isolated	ISOLD
25-49%	03-15%	Few	FEW
50-74%	16-45%	Scattered	SCT
75-100%	46-100%	Numerous	NMRS

Attachment 4

INSTRUCTIONS FOR COMPLETING AF FORM 3807, WATCH/WARNING NOTIFICATION AND VERIFICATION

A4.1. General Instructions. Unit leaders may use these instructions as guidance in preparing local procedures for logging weather watches and warnings. Enter all times in UTC.

A4.1.1. Block 1. Number . Enter the locally specified number, or numbers when a watch and corresponding warning have different numbers (e.g., Watch # A4-008, WW # 4-002).

A4.1.2. Block 2. Location . Enter the location (installation or area) for which the watch/warning is valid.

A4.1.3. Block 3. Date . Enter the issue date of the watch/warning.

A4.1.4. Block 4. Issued By . Enter the name or initials of the individual who issues the watch/warning.

A4.1.5. Block 5. Verified By . Enter the name or initials of the individual who verifies the warning.

A4.1.6. Block 6. Criteria:

A4.1.6.1. Watches/Warnings Are Issued For The Following . Enter the watch/warning criteria.

A4.1.6.2. Desired Lead-Time . Enter the customer's desired lead-time. Watches for winds greater than or equal to 50 knots, hail 3/4 inch or greater, and for lightning require lead-time. All other watches do not require lead-time.

A4.1.6.3. Valid Period . Enter the valid period of the watch/warning on the appropriate line (opposite the criteria for which the watch/warning is issued). The ending time for observed lightning will reflect the estimated duration.

A4.1.6.4. Forecast . Enter the specific value or category forecast if different than that listed in the watch/warning criteria block. For example, if the threshold is for winds greater than 35 knots, but the forecast is for 40 knots, specify 40 knots in this block.

A4.1.6.5. Verification . See paragraph [3.2.7](#) for WW verification procedures.

A4.1.6.5.1. Occurred . Enter the time the weather element first occurred within the area covered by the warning. For weather warnings issued for winds 50 knots or greater, or hail 3/4 inch or greater that do not occur within the area covered by the warning but DO occur within 10 nautical miles, use the time the event occurred within 10 nautical miles. If the weather element did not occur, leave blank and indicate the nonoccurrence in the Did Not Occur block.

A4.1.6.5.2. Did Not Occur . Check those weather elements that did not occur.

A4.1.6.5.3. Lead-Time . Enter the actual lead-time of each verified weather element. In cases where a warning downgrades an earlier warning that did not verify (with no break in coverage), compute actual lead-time using the issue time of the earlier warning.

A4.1.6.5.4. Timing Error . Enter the timing error if a lead-time was computed.

A4.1.6.6. Text . Enter the text and valid period of the watch or warning as disseminated to customers. Overprinting the text of standardized watch warning criteria (with blanks for specific values) may improve relay times. For example, overprint:

**THUNDERSTORMS WITH _____ WINDS AND _____ INCH HAIL
OR
WINDS _____ KNOTS NOT ASSOCIATED WITH THUNDERSTORMS**

This space may also be used to document extension information.

A4.1.6.7. Block 7. Dissemination:

A4.1.6.7.1. Agency . List all agencies notified of the watch or warning. Include the primary dissemination system and all agencies not on the primary dissemination requiring notification. Some agencies on the primary dissemination system may require a back-up call to verify receipt (indicated by an *); do not use the time of back-up calls in verification statistics.

A4.1.6.7.2. Contact . List primary and secondary means of contacting the agencies, for example, N-TFS/x1234.

A4.1.6.7.3. Agency Criteria . Mark the watch/warning criteria for each agency.

A4.1.6.7.4. Watch Issued . Enter the dissemination/notification time, the initials of the forecaster issuing the watch, and the initials of the person receiving the watch if that agency requires a back-up call or is not on the primary dissemination system.

A4.1.6.7.5. Watch Cancelled . Enter the dissemination/notification time, the initials of the forecaster canceling the watch, and the initials of the person receiving the cancellation if that agency requires a back-up call or is not on the primary dissemination system. If the watch runs full term, enter an appropriate remark such as "allowed to expire" or "ATE."

A4.1.6.7.6. Warning Issued . Enter the dissemination/notification time, the initials of the forecaster issuing the warning, and the initials of the person receiving the warning if that agency requires a back-up call or is not on the primary dissemination system.

A4.1.6.7.7. Warning Cancelled . Enter the dissemination/notification time, the initials of the forecaster canceling the warning, and the initials of the person receiving the cancellation if that agency requires a back-up call or is not on the primary dissemination system. If the warning runs full term, enter an appropriate remark such as "allowed to expire" or "ATE."

A4.1.6.8. Block 8. Remarks . Use for miscellaneous information.

A4.1.6.9. Block 9. Pertinent Observations (back of form). List all pertinent observations, both "official" and "unofficial," radar information if available, and other information that verifies and/or justifies the watch/WW, or provides reasoning why the warning was not cancelled when it did not verify. Include available information (i.e., radar information, off-duty observer reports, locally reported weather conditions) used to verify warnings for winds greater than or equal to 50 knots or hail greater than or equal to 3/4 inch (or the substituted local severe weather thresholds where different) that are reported or observed within *10 nautical* miles rather than in the area covered by the warning.

A4.1.6.10. Block 10. Forecast Review and Comments (back of form). Use for forecast review information. AFW leaders can use this space to include written comments on weather watches and warnings.

Attachment 5**INSTRUCTIONS FOR COMPLETING AF FORM 3806, WEATHER WATCH ADVISORY LOG**

A5.1. General Instructions. Unit leaders may use these instructions as guidance in preparing local procedures for logging forecast and observed weather advisories. Enter all times in UTC.

A5.1.1. Date . Enter the month and year.

A5.1.2. Issued . Enter the issue DTG.

A5.1.3. Valid . Enter the valid time of the WA. Leave blank for observed WAs.

A5.1.4. Terminal or Area . Enter the installation or area for which the advisory is being issued. Enter the locally assigned WA number (e.g., WA # 05-A05).

A5.1.5. Text . Enter the text of the advisory.

A5.1.6. Dissemination . Use this section to enter information for the initial issuance, extensions, and cancellations of WAs. If the WA is allowed to expire, enter a remark such as "allowed to expire" or "ATE" in one of the time blocks. Use the Remarks block or back of the form if needed.

A5.1.6.1. Agency . Enter the agencies notified of the WA. Include the primary dissemination system and all agencies not on the primary dissemination system that must be notified. **NOTE:** Minimize individual notification calls to no more than three.

A5.1.6.2. Time . Enter the time each agency was notified.

A5.1.6.3. Initials . Enter the initials of the individual receiving the WA information, if required. This is normally used for agencies not on the primary dissemination system and for follow-up calls.

A5.1.6.4. Forecaster . Enter the name or initials of the forecaster issuing, extending, or canceling the WA.

A5.1.7. Remarks . Use as required.

A5.1.8. Verification . Verify all forecast WAs either objectively or subjectively as determined by unit leaders. For WAs containing multiple phenomena, verify each phenomena separately.

A5.1.8.1. Occurred . Check "Yes, No, or Not Applicable."

A5.1.8.2. Lead-Time . Enter the actual lead-time. Lead-time is not required for observed WAs, downgrades of previously verified WAs or WAs with no break in coverage, or extensions unless the WA has not yet verified. In cases where a WA downgrades an earlier warning or advisory that *DID NOT* verify (with no break in coverage), compute the lead-time using the issue time of the earlier warning or advisory.

A5.1.8.3. Timing Error . Enter the calculated timing error, if required.

A5.1.8.4. Verified By . Enter the initials of the individual verifying the advisory.

A5.1.8.5. Comments/Remarks . Enter enough meteorological reasoning and information, such as observations, radar reports, and PIREPs, to verify and/or justify the WA. This includes information to verify the WA objectively or subjectively.

Attachment 6

DD FORM 175-1, FLIGHT WEATHER BRIEFING INSTRUCTIONS

A6.1. General Instructions . Unless directed by MAJCOMs, higher headquarters, or local operating procedures, all entries in the individual blocks are mandatory. Entries on the DD Form 175-1 or equivalent briefing form must be horizontally and vertically consistent and show sound meteorological reasoning. For example, if a weather warning or advisory for surface wind is indicated in block 11, the surface wind forecast in block 9 should reflect the warning or advisory wind criteria, along with the warning or advisory number entered in block 13. Enter all times in UTC, all winds in five digits (six for wind speeds over 99 knots), and record all heights in hundreds of feet with the surface level as "SFC."

A6.2. PART I - MISSION/TAKEOFF DATA. Enter the general forecast for takeoff 1 hour either side of the estimated time of departure (ETD).

A6.2.1. Block 1. **DATE (YYMMDD).** Enter the UTC departure Year, Month and Day. The day corresponds to the departure time in Block 3.

A6.2.2. Block 2. **AIRCRAFT TYPE/NO.** Enter aircraft type (F4, B52, C5) and radio call sign, mission number, or the last three digits of the tail number.

A6.2.3. Block 3. **DEP PT/ETD.** Enter the departure location identifier and estimated time of departure. Enter departure grid point or latitude/longitude for locations that do not have location identifiers.

A6.2.4. Block 4. **RUNWAY TEMP.** Enter in degrees Celsius unless requested in Fahrenheit.

A6.2.5. Block 5. **DEW POINT.** Enter in degrees Celsius unless requested in Fahrenheit

A6.2.6. Block 6. **TEMP DEV.** Enter in degrees Celsius unless requested in Fahrenheit. For USAF flights, enter "Temp Dev" as the difference between the forecast temperature for climb and the US Standard Atmosphere temperature. For Navy/Marine flights, enter the difference between forecast runway temperature and US Standard Atmosphere temperature corresponding to field elevation.

A6.2.7. Block 7. **PRESSURE ALT.** Enter in feet with algebraic sign. Primarily used by USAF aviators. Army aviators usually use density altitude.

A6.2.8. Block 8. **DENSITY ALT.** Enter in feet with algebraic sign. Primarily used by Army aviators in mountainous terrain only.

A6.2.9. Block 9. **SFC WIND.** Enter magnetic direction for missions departing your airfield; enter true direction for missions departing another airfield. In either case, specify "magnetic" or "true" during the briefing and suffix magnetic entries with an "M." Enter surface wind direction to the nearest 10 degrees true in three digits and surface wind speed (including gust) in two or three digits. Ensure wind entries use a minimum of 5 digits (3 digits for direction and 2 digits for speed). Surface winds will have 2 digits to represent gusts, while winds aloft will use 3 digits for speed when winds exceed 99 knots. Enter "VRB" for a forecast variable wind direction and "CALM" when a calm wind is forecast.

A6.2.10. Block 10. **CLIMB WINDS.** Enter the true direction. Enter a representative wind (or winds) from takeoff to cruise altitude. Enter climb winds in layers if there are significant differences (wind speed changes of greater than or equal to 20 knots and/or wind direction changes greater than or equal to 30 degrees and the wind speed is expected to be over 25 knots) from one stratum to another.

A6.2.11. Block 11. **LOCAL WEATHER WARNING/ADVISORY.** Enter any known forecast/observed weather watch, warning, or advisory valid for ETD +/-1 hour. When watch, warning, and advisory information for a location is not available (e.g., remote briefing), enter "Check with local flight agencies." Inform the aircrew that the status of local weather watches, warnings, and/or advisories is undeterminable, and recommend they check with the local ATC or airfield operations for any weather watches, warnings, or advisories that may be in effect.

A6.2.12. Block 12. **RCR.** Enter the latest reported Runway Surface Condition/Runway Condition Reading (RSC/RCR) for the departure airfield, if available (e.g., WR//, RCRNR, IRPSR10, P DRY). When RSC/RCR is not available, enter "N/A."

A6.2.13. Block 13. **REMARKS/TAKEOFF ALTN FCST.** Enter remarks on weather that will affect takeoff and climb (e.g., inversions, icing, turbulence, LLWS). Ensure the contents of the briefing and the local TAF are consistent. If requested, enter a terminal forecast for the takeoff alternate.

Figure A6.1. Example PART I - MISSION/TAKEOFF DATA.

FLIGHT WEATHER BRIEFING							
PART I – MISSION/TAKEOFF DATA							
1. DATE (YYMMDD)	2. ACFT TYPE/NO.	3. DEP PT/ETD	4. RUNWAY TEMP	5. DEW POINT	6. TEMP DEV	7. PRESSURE ALT	8. DENSITY ALT
990218	C130/CATS01	KOFF/1410Z	0 °F/C	-1 °F/C	°C	+1140 FT	FT
9. SFC WIND M 29012G18	10. CLIMB WINDS 24025 (SFC-060) 21035 (060-100)	11. LOCAL WEATHER WARNING/ADVISORY 02-A03 SNOW >4"				12. RCR LSR15	
13. REMARKS/TAKEOFF ALTN FCST MDT RIME ICG 005-140 DURGC KOFF TAKEOFF ALTN KSUX VALID 1410Z-1540Z OVC018 4 -SN 08012 ALSTG 29.95 TEMPO OVC009 1 -SN							

A6.3. PART II – ENROUTE DATA. Enter data for the duration of the entire route of flight. Insert specific briefings for drop zones, ranges, air-refueling areas, or low-level routes at the appropriate point during the en route briefing.

A6.3.1. Block 14. **FLT LEVEL.** Enter planned flight level in hundreds of feet in three digits (e.g., "280" for 28,000 feet, "080" for 8,000 feet).

A6.3.2. Block 15. **FLT LEVEL WINDS/TEMP.** Enter true wind direction at flight level in tens of degrees and speed to the nearest 5 knots. Enter forecast flight level temperature in degrees Celsius. If there are significant wind speed and direction changes, break the forecast into legs (e.g., BLV-MXF 27045/-45). Otherwise, brief a representative wind and temperature for the entire route (e.g., 32040/-38). If a computer flight plan (CFP) is available, review it for accuracy before briefing aircrews. If accurate, enter "See CFP" in this block. See paragraph 4.2.1.4. for CFP evaluation procedures.

A6.3.3. Block 16. **CLOUDS AT FLT LEVEL.** Check appropriate block. "Yes" implies flight in cloud at least 45 percent of the time; "No" implies that the flight will be in cloud less than 1 percent of the time; and "In and Out" implies that flight will be in cloud between 1 percent and 45 percent of the time.

A6.3.4. Block 17. **MINIMUM VISIBILITY AT FLT LEVEL OUTSIDE CLOUDS.** Enter minimum in-flight horizontal visibility en route outside of clouds. Specify the phenomena that will lower the visibility.

A6.3.5. Block 18. **MINIMUM CEILING.** Enter minimum ceiling enroute in hundreds of feet **AGL** and the geographical location (e.g., "060 ft BLV-MXF"). If the minimum ceiling is over hilly or mountainous terrain, or in thunderstorms, so indicate; e.g., "010 feet BOSTON MTS," or "020 feet SW KY TSTMS."

A6.3.6. Block 19. **MAXIMUM CLOUD TOPS.** Enter maximum tops of cloud layers (exclusive of thunderstorm tops) with more than 4/8 coverage in hundreds of feet **MSL** and the geographical location.

A6.3.7. Block 20. **MINIMUM FREEZING LEVEL.** Enter height of lowest freezing level en route in hundreds of feet **MSL** and geographical location. If lowest freezing level is at the surface, enter "SFC" and geographical location.

A6.3.8. Block 21. **THUNDERSTORMS.** Indicate the applicable AFWA MWA or OWS equivalent product(s), local WW/WA number, or date/time of other products used (e.g., radar summary, satellite imagery, NWS or foreign weather service In-Flight Weather Advisories). Enter the type, extent, maximum tops, and geographical location of thunderstorms that may affect the flight. The extent percentages on the DD Form 175-1 directly correspond to the Maximum Instantaneous Coverage (MIC) depicted on AFWA and OWS thunderstorm products. Never use the terms "cumulonimbus or CB," use thunderstorm.

A6.3.9. Block 22. **TURBULENCE.** Enter date/time group of the turbulence forecast products used (e.g., AFWA/OWS products, NWS or foreign In-Flight Weather Advisories). If the forecast is based on NWS or foreign In-Flight Weather Advisories (i.e., SIGMETs, AIRMETs), strike out "CAT" and substitute the product as appropriate. Enter the type, intensity, levels, and locations of turbulence (not associated with thunderstorms) when forecast area is within 25 NM of route of flight and within 5,000 feet above and below the flight level.

A6.3.10. Block 23. **ICING.** Enter date/time group of the icing forecast products used (e.g., AFWA/OWS products, NWS or foreign In-Flight Weather Advisories). Check the applicable intensity type blocks, enter the levels, and geographic locations of icing (not associated with thunderstorms) when forecast area is within 25 NM of route of flight and within 5,000 feet above and below the flight level.

NOTE: Like AFWA and OWS forecast products, In-Flight Weather Advisories are advisory in nature and should be used as guidance when preparing the enroute forecast. They must be carefully evaluated and tempered with all available data (e.g., radar, PIREPs/AIREPs, upper air soundings, online resources) to determine the potential effects on the specific mission and aircraft. Even if not used as the basis for the forecast, weather personnel must alert aircrews to all existing In-Flight Weather Advisories that affect their mission. If the weather briefer disagrees with the advisory, annotate the fact in the "Remarks" section of the 175-1 or equivalent. Whether or not the condition described is potentially hazardous to a particular flight is for the pilot to evaluate based on experience, the mission, and the operational limits of the aircraft. See FAA Aeronautical Information Manual for detailed information on NWS In-Flight Weather Advisories.

A6.3.11. Block 24. **PRECIPITATION.** Enter the type, character, intensity, and geographical location of precipitation areas that may affect the flight. This block is for precipitation encountered at flight level, not at the surface.

Figure A6.2. Example PART II – EN ROUTE DATA.

PART II – ENROUTE DATA															
14. FLT LEVEL 100				15. FLT LEVEL WINDS/TEMP KOFF - KSUX 21035/-10 KSUX - Nrn MN 17050/-05											
16. CLOUDS AT FLT LEVEL						17. MINIMUM VISIBILITY AT FLT LEVEL OUTSIDE CLOUDS						3 MILES DUE TO			
X	YES	NO	IN AND OUT			SMOKE	DUST	HAZE	FOG	X	PRECIPITATION			NO OBSTRUCTION	
18. MINIMUM CEILING				LOCATION		19. MAXIMUM CLOUD TOPS				LOCATION		20. MINIMUM FREEZING LEVEL		LOCATION	
003		FT AGL		Ern NE		280		FT MSL		NE, IA, Srn SD		SFC		FT MSL RTE	
21. THUNDERSTORMS				22. TURBULENCE				23. ICING				24. PRECIPITATION			
MWA /WW-NØ. AFWA 18A				CAT ADVISORY 15OWS 18/12 Z				NONE 15OWS 18/12				NONE			
X	NONE	AREA	LINE	NONE	IN CLEAR	IN CLOUD		RIME	MIXED	CLEAR		DRIZ	RAIN	SNOW	SLEET
	ISOLATED 1-2%			LIGHT		X	TRACE				LT			X	
	FEW 3-15%			MOD			LIGHT				MOD			X	
	SCATTERED 16-45%			SVR			MOD	X			HVY				
	NUMEROUS – MORE THAN 45%			EXTREME			SVR				SHWRS				
HAIL, SEVERE TURBULENCE & ICING, HEAVY PRECIPITATION, LIGHTNING & WIND SHEAR EXPECTED IN AND NEAR THUNDERSTORMS.				LEVELS 080-120				LEVELS SFC - 140				FRZG			
LOCATION				LOCATION Ern NE – Srn SD				LOCATION NE, IA, Srn SD				LOCATION NE, IA, Srn SD			

A6.4. PART III - TERMINAL FORECASTS. Enter the destination and alternate forecast, if an alternate is required. Brief the worst conditions expected to prevail during the valid period for both destination and alternate. The need for and the selection of an alternate is a pilot decision. However, forecasters need to be familiar with the basic AF, Army, and Navy/Marine provisions for alternate selection. Refer to AFI 11-202V3, *General Flight Rules*, Army Regulation 95-1, *Flight Regulations*, or OPNAVINST 3710.7R, *NATOPS General Flight and Operating Instructions* for specific alternate requirements. Enter forecasts for subsequent stops and alternates on request, but advise the pilot that updates are necessary. Brief destination forecasts in terms the aircrew understands and prefers.

A6.4.1. Block 25. **AERODROME.** Indicate the appropriate designator (DEST or ALTN) and enter station identifier. For Army multi-stop missions, where the terminal forecast for all stops is similar, enter "A/S" (for "all stops"), enter the worst conditions expected along the route and identify the terminal having the worst condition. These entries imply that conditions at all other stops are the same, or better.

A6.4.2. Block 26. **CLOUD LAYERS.** Enter the lowest prevailing condition expected during the valid period. Enter temporary fluctuations to forecast conditions described by a TEMPO group on the next line. **NOTE:** PGS/S-developed briefings place TEMPO groups on the same line. Weather briefers must fully evaluate all NWS probability groups (i.e., PROB30/40%) and indigenous variations of the TAF code. Ensure the aircrew is briefed on, and fully understands, the entire weather situation at the destination and alternates. If necessary, use the Remarks section of the 175-1 to record the briefer’s assessment and translation of these conditions.

A6.4.3. Block 27. **VSBY/WEA.** (Statute miles in CONUS/meters for overseas flights.) Enter the lowest prevailing condition and weather expected during the valid period. Enter conditions described by a TEMPO group on the next line.

A6.4.4. Block 28. **SFC WIND.** Enter true direction if the destination is an airfield other than your own. If the flight is a "round robin" that departs from and terminates at your own airfield with no intermediate stops, enter the direction magnetic. In either case, specify "magnetic" or "true" during the briefing and suffix magnetic entries with "M." Enter wind direction to the nearest 10 degrees. Wind speeds (including gusts) are entered to the nearest whole knot expected at destination. For "A/S" missions enter the highest wind speed expected (including gusts) and the location.

A6.4.5. Block 29. **ALTIMETER.** Enter the lowest altimeter setting expected during the valid period in all cases except those in which it is impossible to obtain or determine.

A6.4.6. Block 30. **VALID TIME.** For AF and Navy/Marine missions, enter valid time as 1 hour either side of ETA. Briefings for Army missions require a valid time from ETA through 1 hour after ETA. For flights less than 1 hour, the valid period will be ETD to ETA plus 1 hour. For "A/S" entries, valid times are determined from original ETD to last stop ETA + 1 hour.

Figure A6.3. Example PART III - TERMINAL FORECASTS.

PART III - TERMINAL FORECAST					
25. AERODROME	26. CLOUD LAYERS	27. VSBY/WEA	28. SFC WIND	29. ALTIMETER	30. VALID TIME
DEST/ALTN KOFF	OVC005	1/2 SN	04012G18M	29.70 INS	1705 Z TO 1905 Z
DEST/ALTN	MDT RIME ICG 050-100			INS	Z TO Z
DEST/ALTN				INS	Z TO Z
DEST/ALTN KSUX	OVC012	6-SN	06014	29.80 INS	1735 Z TO 1935 Z
DEST/ALTN TEMPO	OVC005	1-SN BR		INS	Z TO Z
DEST/ALTN				INS	Z TO Z
DEST/ALTN KRDR	SCT060 BKN090	7	06009	30.04 INS	1800 Z TO 2000 Z
DEST/ALTN				INS	Z TO Z

A6.5. PART IV - COMMENTS/REMARKS.

A6.5.1. Block 31. **BRIEFED ON LATEST RCR FOR DEST AND ALTN.** Check the appropriate block and enter RCR value briefed to aircrew in Block 33, Remarks.

A6.5.2. Block 32. **REQUEST PIREP AT.** If PIREPs are requested for specific areas, enter the areas. In addition, enter the PMSV frequency and/or phone patch number of the requesting weather unit.

A6.5.3. Block 33. **REMARKS.** Enter any other significant data (e.g., data for which there was insufficient space in other blocks, and specialized forecasts, such as for low-level mission areas, air refueling, or gunnery/bombing ranges, etc. Weather briefings provided electronically (e.g., faxed, posted on web page or e-mailed) must include the following statement: "*Call (weather unit designation) at DSN ###-#### or commercial (###) ###-#### for a weather update.*" Information about how the air-

crew should get weather support at the next location should be included in Block 33. For example: "Wx updates/briefs at Eglin AFB, call 28 OWS at DSN 965-0588 or toll free at 1-877-297-4429."

Figure A6.4. Example PART IV - COMMENTS/REMARKS.

PART IV – COMMENTS/REMARKS			
31. BRIEFED ON LATEST RCR FOR DESTN AND ALTN	<input checked="" type="checkbox"/>	YES	NOT AVAILABLE
32. REQUEST PIREP AT		KOFF 342.5	
33. REMARKS			
<p>Call (weather unit designation) at DSN ###-#### or commercial (###) ###-#### for a weather update (e.g., Wx updates/briefs at Eglin AFB, call 28 OWS at DSN 965-0588 or toll free at 1-877-297-4429)</p> <p>ORBIT (Nrn MN) FL080-100 VALID 1500Z-1700Z</p> <p>070 130 FL VIS 7+</p> <p>SCT BKN-SCT FL WND/TEMP 17050/-05</p> <p>050 090 NO TSTMS/TURBC/ICG</p> <p>RCR KRDR DRY</p>			

A6.6. PART V - BRIEFING RECORD.

A6.6.1. Block 34. **WEA BRIEFED.** Enter time the briefing was provided. For briefings that are sent electronically, this will be the time the briefing was faxed, posted on a Web page or local LAN, or passed to a central dispatch facility (TACC, AMOCC, etc.) and appended with an "E" in front of the time (e.g., E1015Z). This indicates the crew was not verbally briefed. If the crew calls later for a verbal briefing, put a solidus after the "E" time and enter the verbal brief time (e.g., E1015Z/1035Z).

A6.6.2. Block 35. **FLIMSY BRIEFING NO.** If a flight weather briefing folder, flimsy, or CFP was prepared for this mission, enter the folder, flimsy, or CFP identification number.

A6.6.3. Block 36. **FORECASTER'S SIGNATURE OR INITIALS.** Enter a legible signature or initials of the weather briefer or the forecaster preparing and disseminating the briefing.

A6.6.4. Block 37. **VOID TIME.** (Army, Navy/Marine Only). Army: Add 1:30 to the entry in "Weather Briefed." Navy/Marine: Briefing void time will be 2 hours from the Weather Briefed time, not to exceed 1/2 hour past ETD. For briefings sent electronically, calculate the void time from the "E" time in paragraph A6.6.1. If the crew calls later for a verbal briefing, recalculate the void time from the verbal briefing time and enter the new void time after the first time (e.g., 1145Z/1205Z).

A6.6.5. Block 38. **EXTENDED TO.** (Army, Navy/Marine Only). When an Army or Navy/Marine pilot asks for an extension, recheck all weather entries, rebrief, and indicate the required changes (i.e., highlight/bold if electronic, green ink if paper). Extensions follow the same rule as for void times.

A6.6.6. Block 39. **WEA REBRIEFED AT.** (Not required for Army, Army equivalent is "extended to" entry). If weather rebriefed is different than originally briefed, indicate the changes to original weather entries as specified for Block 38 and enter the rebriefing time.

A6.6.7. Block 40. **FORECASTER'S INIT.** Enter initials of the forecaster providing the extension, rebriefing, or update.

A6.6.8. Block 41. **NAME OF PERSON RECEIVING BRIEFING.** (Remote briefings only). If available, enter receiver's name and, if applicable, military grade.

Figure A6.5. Example PART V - BRIEFING RECORD.

PART V – BRIEFING RECORD				
34. WEA BRIEFED E1329/1345 Z	35. FLIMSY BRIEFING NO.		36. FORECASTER'S SIGNATURE OR INITIALS JR	
37. VOID TIME 1459/1515 Z	38. EXTENDED TO Z	39. WEA REBRIEFED AT Z	40. FORECASTER'S INIT	41. NAME OF PERSON RECEIVING BRIEFING

DD Form 175-1, SEP 89 (EG)

Previous edition may be used.

Attachment 7

EXAMPLE OWS MASTER TRAINING OUTLINE

Time	OWS MASTER TRAINING OUTLINE	OJT	LECTURE	LAB	STC	QTP	CDC	Technical Reference
1 DAY	Major Objective 1: OWS Familiarization							
	Lesson Plan 1-1: Concept of Operations.							
	Lesson 1-2: Organizational Structure, Pyramid Recall Procedures, Commander Policies, etc.							
	Lesson 1-3: Production Floor Functions.							
	Lesson 1-4: Communication and Computer System Architecture.							
	Lesson 1-5: Operating Instructions (OIs).							
	Lesson Plan 1-6: Training Program Overview.							
3 DAYS	Major Objective 2: Theater or Region Area of Responsibility (AOR) Familiarization							
	Lesson Plan 2-1: Geopolitical Boundaries (e.g., resource protection area coverage, flight training ranges, drop zones, air refueling routes, etc.)							
	Lesson Plan 2-2: Memorandum of Agreement (MOA) with each CWT, ANG, AFR Unit.							
	Lesson 2-3: Mission Overview of Support to each Base/Post in the AOR (e.g., fighters, bombers, tankers, airlift, helicopters, ground vehicles, infantry, morale/welfare/ recreation services, etc.).							
	Lesson 2-4: Mission Critical Aerospace Weather Thresholds at each Base/Post in the AOR.							
	Lesson 2-5: Back-up Support.							

Attachment 8

WEATHER SUPPORT DOCUMENT (WSD) & FORMAL AGREEMENT PREPARATION

A8.1. CWT Weather Support Document. CWT leaders need to ensure the weather support is documented as described in **Chapter 11**. Use **Figure A8.1**. WSD Preparation Items as a guide in preparing a WSD. Develop and organize the WSD in accordance with the applicable directives governing the format selected. **Figure A8.3**. and **Figure A8.4**. provide a sample of the contents of a Weather Support Plan (WSP) and a Weather Support Instruction (WSI).

A8.2. OWS-CWT Formal Agreement. OWS and CWT leaders must ensure the formal agreement they jointly develop completely captures the "*Team*" structure that must exist between the OWS and the CWT. **Figure A8.2**. contains items covering the basic areas that OWS and CWT leaders should address in the agreement. The provided verbiage is not all-inclusive and must be tailored to each agreement. **Figure A8.5**. provides a sample Cover Page, Table of Contents, and Signature Page of a standard Memorandum of Agreement (MOA). Refer to MAJCOM or higher headquarters directives and guidance for additional information on developing formal agreements.

Figure A8.1. WSD Preparation Items.

GENERAL INFORMATION

1. Are unit designators current?
2. Are CWT duty priority lists included, if used?
3. Are all references, abbreviations, acronyms, and terms explained and referenced from official sources?
4. Does the WSD fully describe the reengineered weather "Team" operations when needed to clarify weather services, such as weather warnings?
5. Does the WSD list the assumptions, shortfalls, and limiting factors of the CWT?
6. Does the WSD outline the weather support geographic area of responsibility?
7. Are the CWT operating hours explained?
8. Is the primary local weather dissemination process and system described? (See Note).
9. Does the WSD describe products disseminated by the CWTs?
10. Are back-up dissemination procedures described for all weather services? (See Note).
11. Does the WSD include example dissemination formats?
12. Does the WSD explain back-up support in the event of an OWS support interruption?
13. Does the WSD explain the evacuation of the CWT and back-up support?
14. Does the WSD contain the required agency distribution list?

NOTE: CWT leaders may want to describe the primary and back-up dissemination procedures for each individual weather service or product.

AIRFIELD SERVICES

1. Are the hours of observing service described?
2. Does the WSD explain the type of weather watch performed (i.e., Basic or Continuous) and describe local Cooperative Weather Watch responsibilities?
3. Does the WSD list all special and local observation criteria?
4. Are observation service limitations explained?

5. Is the AOS defined and services/limitations explained?

CWT OPERATIONS

1. Are forecast products (i.e., MEF) specification and amendment criteria fully described?
2. Does it explain the MEF update and MISSIONWATCH process whereby the CWT may update MEFs in emergency situations or during rapidly changing weather conditions?
3. Does the WSD describe all supported unit MEF requirements (e.g., MEFs for flight weather, staff weather, Alert Force, electro-optics, Bioenvironmental, Communications Space, hurricane support)?
4. Does the WSD describe procedures (e.g., recall CWT personnel, contact OWS) for obtaining weather support (e.g., flight weather MEF briefing, battlestaff briefings, etc) when the weather personnel are not on duty?
5. Are all other CWT services described (e.g., climatology briefings, instrument refresher course briefings, ATC limited observation training)?
6. Are the PMSV responsibilities and existing limitations fully explained?
7. Is the Alternate MEF support location defined and services/limitations explained?

WEATHER WATCHES, WARNINGS, AND ADVISORIES

1. Does the WSD describe the responsibility of the supporting OWS to issue forecast weather watches, warnings, and advisories?
2. Does it describe the responsibility of the CWT and OWS to issue observed weather warnings and advisories?
3. Are the weather watch, warning, and advisory criteria and the desired lead-times clearly defined?
4. Does the WSD explain the watch, warning, advisory numbering system and define the areas of coverage?
5. Does the WSD list all agencies to be notified and indicate the specific conditions in which they require notification?
6. Does the WSD describe the primary and secondary notification system (i.e., list those agencies notified by the supporting OWS, and list the agencies that receive notification from another base/post agency in the notification chain)?
7. Does the WSD include a base warning notification pyramid structure diagram (IAW AFI 10-229, *Responding to Severe Weather Events*)?
8. Does the WSD include recall procedures for the local garrison command post to notify CWT standby personnel when operationally significant weather is occurring or forecast to occur (if applicable)?

KEY RELATIONSHIPS WITH COMMAND AGENCIES AND TENANT UNITS (RECIPROCAL SUPPORT)

1. Does the WSD describe the weather support provided to command agencies by the CWT? If not mandated in other directives, is reciprocal support to CWT from these agencies described?
2. Does the WSD describe the weather support provided to tenant units by the CWT? If not mandated in other directives, is reciprocal support provided to the CWT from these units?

NOTE: If the WSD is in the form of a Weather Support Plan, CWT leaders must ensure weather requirements are fully identified in the appropriate annexes, as required. Consult your wing/squadron or post plans office for guidance on preparing the annexes.

Figure A8.2. OWS Formal Agreement Preparation Items.

SECURITY CLASSIFICATION, AUTHORITY, AND ADMINISTRATIVE INSTRUCTIONS

1. **Classification:** Does the MOA include the proper security classification and reproduction instructions, if applicable?
2. **Authority:** Does the MOA list the Authority documents by which the MOA was developed (i.e., DoDI 4000.19 and Air Force Weather (AFW) Reengineering directives)? List the authority documents in the Reference List.
3. **OPSEC:** Does the MOA include applicable OPSEC instructions and protection instructions, of applicable?
4. **Precedence:** Does the MOA include the precedence of the document? This will be NONE for initial agreements, or list the superseded version.
5. **Agreement and Administration:** Does the MOA explain the agreement and administrative procedures (i.e., effective date, review instructions and the initiator, termination terms)?
6. **Office of Primary Responsibility (OPR):** Does the MOA identify the OPR and provide change instructions? The OPR will typically be the OWS Training and Standardization Flight.
7. **Record of Changes:** Does the MOA include a Record of Changes (i.e., Change/Supplement #, Date Posted, Posted By)?
8. **Record of Review:** Does the MOA include a Record of Review (i.e., Reviewed By, Date Reviewed, Remarks)?

PURPOSE AND SCOPE

1. **Purpose:** Does the MOA have a purpose statement, which is to define mutually agreed upon weather operations responsibilities, policies, and procedures the OWS-CWT team will follow to develop and deliver information, products, and services to the base/post customers?
2. **Background:** Does the MOA provide background information on reengineered weather operations and describe how the OWS-CWT team will carry out the intent and vision of the Air Force Weather Strategic Plan?
3. **Scope:** Does the MOA explain that the scope is to provide guidance and document agreement on weather information, products, and services for the OWS-CWT team operations in support of base/post activities? Does it explain that the actions and agreements in the MOA complement existing weather regulations, instructions, plans, agreements, or similar directives and apply only to the participating parties?

4. Requirements: Does the MOA state that the requirements established between the OWS-CWT team and applicable agencies are based on valid requirements for weather information, products, and services? Valid requirements are those linked to instructions, manuals, mission orders, or similar directives and, as such, exist out of mission necessity. A MOA will not include non-substantiated support requests.

5. Assumptions: Does the MOA assume that adequate resources and communications will be available to execute the MOA and that sufficient weather intelligence will be available from various sources on which to base weather operations and production?

GENERAL INFORMATION

1. OWS Mission: Does the MOA describe the OWS mission?

2. OWS Location: Does it include the full address of the OWS?

3. OWS Operating Hours: Are the operating hours and telephone numbers of the OWS Staff provided? Are the operating hours and telephone numbers of the OWS Weather personnel provided?

4. OWS Duty Priorities: Does the MOA include a list of the OWS duty priorities along with explanatory verbiage, if used?

5. CWT Mission: Does the MOA describe the CWT mission?

6. CWT Location: Does the MOA include the full address of the CWT?

7. CWT Operating Hours: Are the operating hours and telephone numbers of the CWT Staff provided? Are the operating hours and telephone numbers of the CWT Weather personnel provided?

8. CWT Duty Priorities: Does the MOA include a list of the CWT duty priorities along with explanatory verbiage, if used?

RESPONSIBILITIES (Include only those responsibilities not mandated in other higher-level directives.)

1. OWS Responsibilities: Does the MOA fully describe the applicable OWS responsibilities in providing weather support to the base/post?

2. CWT Responsibilities: Does the MOA fully describe the applicable CWT responsibilities in providing weather support to the base/post?

3. Team Assignments and Specific Responsibilities: Does the MOA fully describe task responsibilities and specify (if necessary) when the OWS and the CWT are required to assume responsibility? There are a variety of tasks that require the OWS and the CWT to work together (e.g., metrics, resource protection, ground/aircraft mishap). This section spells out who does what and when.

WEATHER FORECAST OPERATIONS

1. Aerodrome Forecast (TAF): Does the MOA include the OWS procedures for issuing and disseminating the TAF? Does the MOA state that, unless otherwise specified, the forecast elements in the main body of the TAF will apply to the area within a 5 statute mile radius of the base/post airfield complex? Are any non-standard specification/amendment criteria defined?

2. OWS Flight Weather MEF Briefings: Does the MOA describe how the OWS will provide and document flight weather MEF briefings and include any applicable web page addresses and instructions for accessing the OWS briefing information? Does the MOA state that aircrews should request routine flight weather briefings a minimum time prior to briefing time to give the OWS adequate time to examine the weather conditions and complete the required documentation? Does the MOA include all telephone numbers, fax numbers, web pages, etc., aircrews can use to request routine briefings? The MOA should state that the OWS will complete no-notice and short-notice briefings as time permits depending on the current workload, available manpower, and duty priorities. The MOA should also state that the OWS will priori-

tize no-notice flight weather briefing requests behind existing requests unless special circumstances warrant a higher priority (e.g., alert, search and rescue, medical evacuation).

3. Regional and Operational-Level Weather Products and Information: Does the MOA describe the regional and operational-level products and information produced by OWS as agreed upon by the OWS-CWT team? The OWS-produced regional and operational-level products and information must support the CWT in their development of tactical-level MEFs for specific points and areas, such as drop zones, landing zones, air refueling routes. If not listed in the MOA or included as an attachment, does the MOA reference where the OWS products and information are listed and described?

4. Tactical-Level Weather Mission Execution Forecast (MEF) Products and Information: Does the MOA state that tactical-level MEFs are provided by the unit where command and control resides for the mission (normally the supporting CWT)? Does it explain situations in which the OWS will produce tactical-level MEFs for the supported CWT's operators/war-fighters?

5. Space Weather Support: Does the MOA describe space weather products provided or tailored by the OWS as agreed upon by OWS-CWT team members?

WEATHER WATCHES, WARNINGS, AND ADVISORIES

1. Forecast Weather Watches: Does the MOA provide the criteria and desired lead-times of the forecast weather watches that the OWS will issue for the base/post agencies, as mutually agreed upon by the CWT, the supporting OWS, and all base/post customers? Are the watch areas of coverage defined?

2. Forecast Weather Warnings: Does the MOA provide the criteria and desired lead-times of the forecast weather warnings that the OWS will issue for the base/post agencies, as mutually agreed upon by the CWT, the supporting OWS, and all base/post customers? Does it explain the CWT's authority to issue or supersede OWS-issued weather warnings when imminent weather conditions are or could impact operations, or pose a hazard to life and property? Are the forecast warning areas of coverage defined?

3. Observed Weather Warnings: Does the MOA provide the criteria (minimum lighting) of the observed weather warnings that the CWT will issue for the base/post agencies? Does it explain situations in which the OWS will assume responsibility for issuing observed warnings for the supported CWT's base/post agencies? The OWS must have remote sensing capability to provide this support. Are the observed warning areas of coverage defined?

4. Forecast Weather Advisories: Does the MOA provide the criteria and desired lead-times of the forecast weather advisories that the OWS will issue for the base/post agencies, as mutually agreed upon by the CWT, the supporting OWS, and all base/post customers? Does it explain the CWT's authority to issue or supersede OWS-issued weather advisories when mission-limiting, non-severe weather conditions are or could affect operations, or pose a hazard to life and property? Are the forecast advisory areas of coverage defined?

5. Observed Weather Advisories: Does the MOA provide the criteria of the observed weather advisories that the CWT will issue for the base/post agencies? Does it explain situations in which the OWS will assume responsibility for issuing observed advisories for the supported CWT's base/post agencies? The OWS must have remote sensing capability to provide this support. Are the observed advisory areas of coverage defined?

6. Weather Watch, Warning, and Advisory Numbering and Text: Does the MOA describe the numbering system the OWS-CWT team will use for forecast weather watches, warnings, advisories, and observed weather warnings and advisories?

7. Dissemination of Weather Watches, Warnings, and Advisories: Does the MOA describe the primary dissemination system the OWS-CWT team will use to notify base/post agencies of weather watches, warnings, and advisories? Does it list the key agencies (if required) that will receive back-up calls by the

OWS-CWT team to verify receipt? Does the MOA include the notification chain (i.e., flow chart or diagram) as an attachment to the MOA?

WARTIME, CONTINGENCY, AND EXERCISE WEATHER OPERATIONS (Include only if not described in other higher-level directives, OPLANs, etc.).

Does the MOA describe the information, products, and services the OWS will provide a team deployed from the supported CWT during wartime, contingency, and exercise operations? The following is an example of the information, products, and services the OWS may be required to provide for CWT operations at a deployed location:

- a. TAFs.
- b. CMEFs.
- c. MOAFs.
- d. Forecast weather watches, weather warnings, and advisories.
- e. Short-term regional and operational-level weather products and information.
- f. Area familiarization briefings (if required).
- g. Outlook forecasts for planning.
- h. Climatology.

CWT SUPPORT DURING OWS OUTAGES/EVACUATIONS (Do not include OWS and CWT responsibilities already defined in OWS Back-up Plans).

1. Does it list the critical products and services the CWT requires during an OWS outage? (See **Chapter 9, Back-up Support.**)
2. Does it state the sources of the products and services?

Figure A8.3. Sample Table of Contents-Weather Support Plan (WSP) Format.**SAMPLE ONLY**

(AFMAN 10-401 V1, *Operation Plan and Concept Plan Development and Implementation*)
 (AFMAN 10-401 V2, *Planning Formats and Guidance*)

HEADQUARTERS XXTH WING
 Sample Air Force Base, USA
 XX Month XXXX

SAMPLE AFB OPLAN 15-XXTABLE OF CONTENTSCONTENTS

Administrative and Security Instructions	i
Plan Summary	ii
Table of Contents	v
Weather Support Plan	1
ANNEX A - Tasked Organizations	A-1
ANNEX B - G (Not Used)	
ANNEX H – Weather Operations	H-1
Appendix 1 – OWS and CWT Duty Priorities	H-1-1
Appendix 2 - Observing Services	H-2-1
Tab A - Special Observation Criteria	H-2-A-1
Tab B - Local Observation Criteria	H-2-B-1
Tab C - Observation Formats and Dissemination	H-2-C-1
Appendix 3 - Forecasting Services	H-3-1
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Tab B - Flight Weather MEFs and Other MEF products	H-3-B-1
Tab C – Dissemination Procedures	H-3-C-1

Appendix 4 - Weather Watches and Warnings	H-4-1
Tab A – Criteria	H-4-A-1
Tab B – Dissemination Procedures	H-4-B-1
Appendix 5 - Weather Advisories	H-5-1
Tab A – Criteria	H-5-A-1
Tab B – Dissemination Procedures	H-5-B-1
Appendix 6 - Space Weather Supported Services	H-6-1
Tab A – Criteria	H-6-A-1
Tab B – Dissemination Procedures	H-6-B-1
Appendix 7 - Key Relationships within XX WG	H-7-1
Tab A - Support to and from XX WG Command Post	H-7-A-1
Tab B - Support to and from XX OSS/OSA	H-7-B-1
Tab C - Support to and from XX OSS/OSAT	H-7-C-1
Tab D - Support from XX OSS/OSO	H-7-D-1
Appendix 8 - Key Relationships with Tenant Units	H-8-1
Tab A - Support to and from Unit 1	H-8-A-1
Tab B - Support to and from Unit 2	H-8-B-1
Tab C - Support to and from Unit 3	H-8-C-1
ANNEX K - COMMAND, CONTROL, AND COMMUNICATIONS SYSTEMS	K-1
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Figure A8.4. Sample Table of Contents-Weather Support Instruction (WSI) Format.**SAMPLE ONLY**(AFI 33-360 V1, *Publications Management Program*)

**BY ORDER OF THE COMMANDER
 HQ XXXTH AIRLIFT WING
 SAMPLE AIR FORCE BASE USA**

**SAFBI 15-XXX
 XX Month XXXX**

**Weather
 WEATHER SUPPORT**

This instruction implements Air Force Policy Directive (AFPD) 15-1, *Atmospheric and Space Environmental Support, Air Force Strategic Plan on Weather Reengineering* (8 Aug 97); Air Force Instruction (AFI) 10-229, *Responding to Severe Weather Events*; AFI 15-114, *Functional Resource and Weather Technical Performance Evaluation*; AFI 15-128, *Aerospace Weather Operations – Roles and Responsibilities*; Air Force Manual (AFMAN) 15-111, *Surface Weather Observations*; AFMAN 15-124, *Meteorological Codes*; AFMAN 15-129, *Aerospace Weather Operations – Processes and Procedures*; and AFMAN 15-135, *Combat Weather Team Operations*. It establishes responsibilities and weather support procedures. It provides general information for weather services, including weather observations and forecasts; weather warnings, watches, and advisories; space weather supported services and dissemination of information and reciprocal support. It applies to units assigned to the XXXth and XXXth Airlift Wings and subordinate units, and units assigned or attached to, or supported by Sample Air Force Base.

SUMMARY OF CHANGES

This revision of Sample Air Force Base Instruction (SAFBI) 15-XXX deletes references to off-station support to the Air Force and Army National Guard and AF Reserve units. The XXth Operational Weather Squadron (OWS) assumed the responsibility for National Guard and Reserve support. Also included are changes in weather warning, watch, and advisory criteria; notification and reciprocal support; and organizational information and weather nomenclature.

Chapter 1 - General Information

General	1.1
Concept of Operations (OWS-WF Team)	1.2
Operational Support Requirements	1.3
Alternate Weather Operations Site	1.4

Chapter 2 - Weather Observing

General	2.1
Limitations	2.2

Meteorological Equipment Locations and Limitations	2.3
Observations	2.4
Chapter 3 - Weather Forecasting	
General	3.1
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Aerodrome Forecast (TAF)	3.3
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DD Form 175-1, Flight Weather Briefing

Attachments

1. Glossary of References
2. Abbreviations and Acronyms
3. Terms
4. Weather Watch, Warning, and Advisory Notification System

Supersedes: SAFBI 15-XXX, XX Month XXXX
 OPR: XXX OSS/OSW (Major XXXXX)

Certified by: XXX OSS/CC (Lt Col XXXXX)
 Pages: 24/Distribution: F;X
 (HQ XXX/XXX)

Figure A8.5. Sample MOA Cover Page, Table of Contents, and Coordination Letter.

SAMPLE ONLY
(AFI 25-201, *Support Agreement Procedures*)

MEMORANDUM OF AGREEMENT XX-X

BETWEEN

**XXth Operations Support Squadron
XXX Sample St
Sample Air Force Base USA**

AND

**XXth Operational Weather Squadron
XXX Nameless Dr
OWS Air Force Base USA**

FOR

**Reciprocal weather information, products, and services to support the operations of Sample AFB
and associated agencies.**

XX Month XXXX

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- 9.1. XX OWS weather information, products, and services back-up dissemination procedures
- 9.2. CWT weather information, products, and services back-up dissemination procedures

10.0. CWT SUPPORT DURING OWS OUTAGES/EVACUATIONS

- 10.1 CWT required products and services
- 10.2 Sources of products and services to CWTs

Attachments

- 1. Reference List
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DISTRIBUTION

<u>Organization</u>	<u>Number of Copies</u>
MAJCOM/DOW	1
XX OSS/CC	1
XX OWS/CC	1
Other Sample AFB associated agencies	1



DEPARTMENT OF THE AIR FORCE
HEADQUARTERSXX AIR FORCE (MAJCOM)
OWS AIR FORCE BASE USA

Date

MEMORANDUM FOR XXth OSS/CC

FROM: XXth OWS/CC

SUBJECT: Memorandum of Agreement (MOA) XX-X

1. This MOA provides guidance concerning weather operations and the development and delivery of associated weather information, products, and services between the XXth OSS Weather Flight and the XXth Operational Weather Squadron. This MOA is implemented IAW Air Force Instructions and is in support of the Air Force Strategic Plan on Weather Reengineering dated 8 August 1997. The undersigned representatives of the XXth OSS and the XXth OWS have reviewed and agreed on the conditions set forth in this MOA. This MOA becomes effective on the date of the second signature below.

2. This MOA does not supersede any existing agreements between CWT and flying units not collocated on CWT base/post. XX OWS will coordinate an agreement with each non-collocated flying unit. Final coordination of agreements with non-collocated units will transition corresponding responsibilities to the XX OWS.

FIRST MI. LAST, RANK, USAF
 Commander
 XXth Operations Support Squadron

FIRST MI. LAST, RANK, USAF
 Commander
 XXth Operational Weather Squadron

Date: _____

Date: _____

cc:
 See Distribution

Attachment 9

STANDARD CONTROLLING MEF (CMEF) AND MILITARY OPERATING AREA FORECASTS (MOAFS)

A9.1. General. **Figure A9.1.**, **Figure A9.2.**, and **Figure A9.3.** illustrate standard CMEFs used for different missions. The CMEF in **Figure A9.1.** contains several different MOAFs for specific missions conducted within one large multiple-unit operation. In this example, the individual MOAFs are combined to form the official CMEF developed by the lead weather unit. The lead weather unit aligned with the C2 element will coordinate the CMEF with all weather units supporting missions participating in the multiple-unit operation. These weather units will produce a MEF from the information in the CMEF.

A9.1.1. **Figure A9.2.** and **Figure A9.3.** provide examples of MOAFs functioning as the official CMEF for a multiple-unit operation. See **Chapter 5**, Coordinated Weather Support for detailed guidance.

Figure A9.1. Standard CMEF for an Operation with Multiple Missions.

FXUS 1 KXXX (if entered in the AWN).

CMEF FOR MISSION NUMBER & DEPARTURE STATION

PART 1. SYNOPTIC DISCUSSION: VT: XX/XXXXZ - XXXXZ JULY XXXX. A STATIONARY COLD FRONT EXTENDS FROM THE GREAT LAKES INTO CENTRAL IL, IA, AND SOUTH-CENTRAL NE AND REACHES WESTWARD TO A LOW IN CENTRAL CO. A HIGH PRESSURE RIDGE DOMINATES THE SOUTHEAST US.

PART 2. ROUTE X FORECAST: VT: XX/XXXXZ - XXXXZ JULY XXXX.
ALL FORECAST HEIGHTS MSL.

CLOUDS:	180	260
	FEW	BKN
	150	240
TURBC:	NONE	
ICING:	NONE	
TSTMS:	ISOLD, MAX TOPS 360	

PART 3. CLEAR TARGET DZ FORECAST: VT: XX/XXXXZ - XXXXZ JULY XXXX.
ALL FORECAST HEIGHTS AGL.

	WINDS:	TEMPS:
SFC:	28010/18	P23C
200 FT:	28011	P22C
500 FT:	28012	P21C
700 FT:	28012	P20C
1,000 FT:	28013	P19C
1,500 FT:	30014	P18C
2,000 FT:	32015	P17C
3,000 FT:	33017	P15C
SFC VIS/WX:	6 HZ	
TSTMS:	NONE	
ICING:	NONE	
TURBC:	NONE	
CLOUDS:	SKC	
MIN ALSTG:	29.92 INS	

PART 4. ORBIT X FORECAST: VT: XX/XXXXZ - XXXXZ JULY XXXX.
ALL FORECAST HEIGHTS AGL. (Low altitude example).

CLOUDS:	050
	BKN
	025
SFC VIS/WX:	4 HZ
WIND/TEMP:	2,500 FT AGL: 27019/P16C
TSTMS:	NONE
ICING:	NONE
TURBC:	OCNL LGT 030 TO 060

PART 5. AR XXX FORECAST: VT: XX/XXXXZ - XXXXZ JULY XXXX.
ALL FORECAST HEIGHTS MSL.

FLIGHT LEVEL 240 MSL

CLOUDS: 260 350
 SCT BKN
 180 300

VIS: 1 NM IN CLD, 7+ OUT

FL WINDS: 25030KTS

TSTMS: ISOLD, MAX TOPS 380

ICING: LGT MXD 180 TO 220

TURBC: LGT TURBC 180 TO 240 WESTERN 1/3 OF
 TRACK

PART 6. CONFIRMATION: PLEASE ACKNOWLEDGE RECEIPT BY PHONE (DSN
XXX-XXXX), E-MAIL, FAX, OR SERVICE MESSAGE.

Figure A9.2. Standard CMEF for a JA/ATT Mission.

JA/ATT CMEF FOR MSN NUMBER XXX – KAAA (Mission Number & Departure Station).

1. MISSION DESCRIPTION: ON 17 JULY XXXX, ONE XXX AW C17 WILL DEPART KAAA AND FLY THE FOLLOWING ITINERARY.

2. ITINERARY: ALL DATES JULY XXXX/ALL TIMES UTC.

ARRIVAL	STATION	DEPARTURE	REMARKS
	KAAA	17/1500	ORIGIN
17/1900	FIRST TARGET DZ PA	17/1950	DROP
17/2020	KBBB	17/2235	OFF LOAD
17/2335	KCCC	19/1400	REST
19/1500	KDDD	19/1715	LOAD
19/2200	SECOND TARGET DZ NJ	19/2230	DROP
19/2300	KEEE	20/2230	REST
20/2359	KFFF	21/0215	LOAD
21/0300	THIRD TARGET DZ NY	21/0340	DROP
21/0410	KFFF	21/2140	REST
22/0310	KAAA		TERMINATE

3. COORDINATION:

A. KAAA: WILL PROVIDE INITIAL CREW BRIEFING TO FIRST TARGET DZ AND KBBB.

B. KBBB: PLEASE PROVIDE FIRST TARGET DZ FORECAST TO KAAA WITH INFO COPIES TO KCCC NLT 17/1300Z AND CREW BRIEF TO KCCC.

C. KCCC: PLEASE PROVIDE CREW BRIEFING TO KDDD, SECOND TARGET DZ, AND KEEE.

D. KEEE: PLEASE PROVIDE FORECAST FOR SECOND TARGET DZ TO KCCC WITH INFO COPIES TO KAAA AND KDDD NLT 19/1200Z AND CREW BRIEF TO KFFF.

E. KFFF: PLEASE PROVIDE CREW BRIEFING TO THIRD TARGET DZ, AND RETURN MISSION BRIEF TO KAAA.

F. KGGG: PLEASE PROVIDE THIRDTARGET DZ FORECAST TO KFFF WITH INFO COPIES TO KAAA AND KDDD NLT 20/2215Z.

4. MISSION PRODUCTS:

(1). FIRST TARGET DZ FORECAST – KBBB.
3X.XXN 9X.XXW (Lat/Long).
TOT: 17/1950Z DROP ALTITUDE 1000 AGL.
VT: 17/1850Z - 2050Z JULY XXXX.

(2). SECOND TARGET DZ – KEEE.
3X.XXN 7X.XXW.
TOT: 19/2230Z DROP ALTITUDE 800 AGL.
VT: 19/2130Z - 2330Z JULY XXXX.

(3). THIRD TARGET DZ – KGGG.
4X.XXN 7X.XXW.
TOT: 21/0300Z DROP ALTITUDE 800 AGL.
VT: 21/0200Z - 0400Z JULY XXXX.

5. POINTS OF CONTACT:

- A. 12 OSS/OSW (KAAA): TSGT DOE, DSN 123-4567.
- B. 45 OSS/OSW (KBBB): SSGT RAY, DSN 234-5678.
- C. 67 OSS/OSW (KCCC): MSGT MEE, DSN 345-6789.
- D. 89 OSS/OSW (KDDD): TSGT FAAH, DSN 456-7890.
- E. 101 OSS/OSW (KEEE): 1 LT SOW, DSN 567-8910.
- F. 68 OSS/OSW (KFFF): SSGT LAAH, DSN 678-9101.
- G. 15 OSS/OSW (KGGG): 2 LT TEA, DSN 789-1011.

6. REMARKS: PLEASE NOTIFY KAAA POC OF ANY PROBLEMS IN PROVIDING SUPPORT TO THIS MISSION. 12 OSS/OSW SENDS, 2 LT GREEN.

Figure A9.3. STANDARD CMEF FOR RANGE CONTROL

VALID TIME VT: XX/XXXXZ - XXXXZ JULY XXXX.
ALL FORECAST HEIGHTS AGL.

AVERAGE RANGE SURFACE ELEVATION: +190 FEET MSL.

CLOUDS:	040	120
	SCT	BKN
	020	070 (LYRD)
AFT 17Z:	040	120
	BKN	OVC
	020	070 (SOLID)
SFC VIS/WX:	7+/NONE	
SFC WINDS:	32008KTS	
MIN ALSTG:	30.02INS	
TSTMS:	ISOLD, MAX TOPS 350	
TURBC:	LGT SFC TO 130	
ICING:	LGT RIME 070 TO 120	
LLWS:	NONE	
MAX/MIN TEMP:	P21C/P18C	
REMARKS:	NONE	

WINDS/TEMPS ALOFT:

200 FT:	28010KTS/P16C	3,000 FT:	33030KTS/P09C
500 FT:	30010KTS/P15C	5,000 FT:	34035KTS/P03C
700 FT:	31015KTS/P14C	7,000 FT:	35040KTS/00C
1,000 FT:	32015KTS/P13C	9,000 FT:	35045KTS/M03C
1,500 FT:	34020KTS/P12C	11,000 FT:	35050KTS/M06C
2,000 FT:	33025KTS/P11C	13,000 FT:	35055KTS/M09C

NEAREST METAR SITE: KXXX (4 NM W).

FCSTR: TSGT CARES, QA: 1LT CHECKS.
DSN 321-5678, EXT 222.

Attachment 10**EXAMPLE SUPPORT ASSISTANCE REQUEST (SAR)**

A10.1. General. **Figure A10.1.** contains an example of the elements requesting agencies should include in a SAR.

Figure A10.1. Example SAR.

FROM: Office symbol and address of requesting agency.

SUBJECT: SAR.

TO: AFWA, AFCCC, or servicing OWS.

1. Support Name: Name of operation, exercise, contingency, other.

2. SAR Status: Recurring support, one-time request, implement pre-positioned SAR, etc.

3. Supported Agency: Self-explanatory.

4. Mission Category/Impact: Category A, B, or C. State requirement and impact to mission if the support is not provided.

5. Point of Contact: Requestor's name, military rank (if appropriate), e-mail address, and DSN and/or commercial telephone number(s).

6. Delivery Medium: For example, as a bulletin on JAAWIN, JAAWIN-S), or an OWS web site; telephone; fax; e-mail; STU-III; etc).

7. Delivery Address/E-mail (if other than posted on JAAWIN, JAAWIN-S, or an OWS web site): For example, unclassified or secure e-mail).

8. Security Classification: Self explanatory.

9. Type of Support: For example, 24-hour TAF, drop-zone forecast, climatology, point-display model, etc.).

10. Start Date/Time: Self-explanatory.

11. Transmit and Valid Times: For example, transmit each day at 0900 and 2100 UTC. Forecast valid at 1200 and 0000 UTC each day.

12. Frequency: Self explanatory (e.g., every 12 hours).

13. Stop Date/Time: Self explanatory (e.g., until further notice, until ENDEX, etc.).

14. Data location: Site name, city/state or country, latitude/longitude, elevation (MSL), magnetic variation (if known).

15. Format of Output: For example, use bulletin header FXXX XXXX as discussed between agency providing support and the requestor.

16. Operational Problem Description: State purpose of the support.

17. Remarks: Self-explanatory. Expand on any previous information as needed.

18. Signature Block.