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SECRETARY OF THE AIR FORCE

AIR FORCE MANUAL 15-135

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Weather

COMBAT WEATHER TEAM OPERATIONS

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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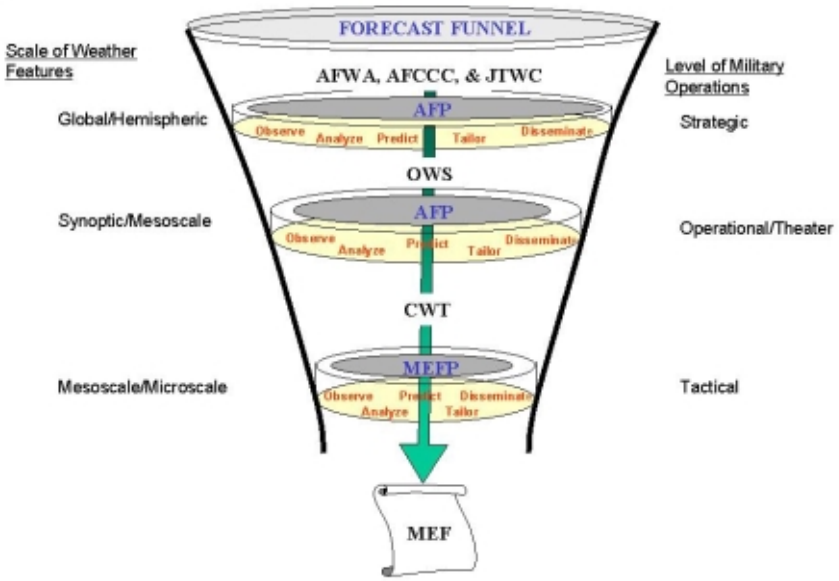
This manual implements HQ USAF Program Action Directive (PAD) 97-10, *Reengineered Action for Air Force Weather*; AFPD 15-1, *Atmospheric and Space Environmental Support*; AFI 15-128, *Aerospace Weather Operations - Roles and Responsibilities*; and AR 115-10/AFJI 15-157, *Weather Support for U.S. Army.* 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 Master Catalog 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.*

Chapter 1

CONCEPTS OF COMBAT WEATHER TEAM (CWT) OPERATIONS

1.1. The Advent of the CWT. In the late 1990s, Air Force Weather (AFW) embarked on an end-to-end reengineering effort. In order to ensure weather operations were conducted at the strategic, operational, and tactical levels, and provide more meaningful environmental information, products, and data to operational customers, AFW developed an integrated weather support structure. Under this structure, weather data is harvested at *strategic* weather centers (e.g., Air Force Weather Agency [AFWA]), formatted to provide theater-scale battlespace forecasts by *Operational* Weather Squadrons (OWSs), and tailored to create Mission Execution Forecasts (MEFs) at the *tactical* level by Combat Weather Teams (CWTs). Additionally, specialized weather-related products, such as mission-tailored space weather forecasts and climatological products, are provided by AFWAs Space Weather Operations Center (AFWA/XOGS-SPC) and the Air Force Combat Climatology Center (AFCCC), respectively. In summary, each level (strategic, operational, and tactical) of AFW is responsible for providing natural environmental information (both space and terrestrial) at the global/macroscale/synoptic scale (AFWA), synoptic/mesoscale/theater scale (OWS), and/or microscale/missionscale (CWT). **Figure 1.1.** illustrates the forecast funnel and summarizes the relationships in the integrated support structure. See Air Force Manual (AFMAN) 15-129, *Aerospace Weather Operations-Processes and Procedures,* para 1.3-1.4. for a more detailed discussion on the forecast funnel.

Figure 1.1. The Forecast Funnel.



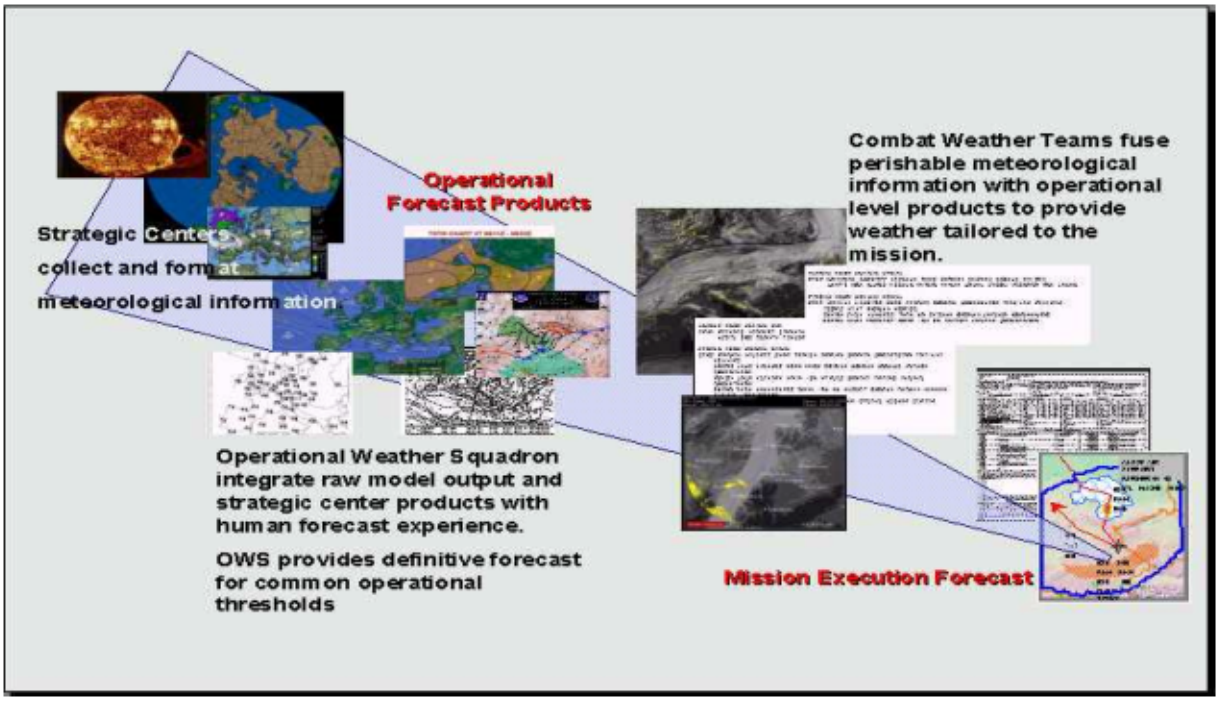
1.1.1. Integrated Weather Support System. Strategic centers provide large-scale planning and execution weather guidance and outlooks to support OWSs. These centers compile databases of observations, analyses, forecasts, and weather satellite information capable of supporting military aerospace and ground operations worldwide. OWSs combine the raw and modeled data with individuals forecast expertise to produce a variety of weather forecast products for their individual areas of operations. CWTs receive (via reach back or broadcast) information from the OWSs and fuse the operational level products with perishable meteorological data (e.g., radar, lightning strike plots) and their supported

weapons system requirements to provide a mission-tailored forecast for their operational customers. The MEF becomes the official forecast the customer will use to make operational decisions. The three forecast levels within the integrated support structure are highly interdependent; no single unit can function alone and still provide the same quality of support as the entire system. In essence, the information provided at each level is a component of the final MEF given to the customer.

1.1.2. CWTs provide dedicated meteorological support for their parent, host, or supported unit. *The CWT must provide or arrange for weather support wherever their customer goes*. Every CWT is different. Some weather units will be highly mobile and more fully integrated into their customers mission than others. Recognize that customers performing certain missions lend themselves more to flight dispatch or remote support and will be provided weather support according to their unique mission needs (e.g., Airlift and Tanker operations may receive weather from a centralized location). Under the AFW concept of operations, the integrated weather support system is responsive to the operator. Weather products and services will be provided at a time, place, and method preferred by the customer. This may be accomplished by weather personnel at a centralized location (e.g., at the traditional base weather station counter), via a web site, direct delivery to the customer at the unit, etc.

1.2. AFW Core Competencies and the Integrated Weather Support System. **Figure 1.2.** illustrates a notional method for MEF production focused on the Air Force Weather core competencies: weather data collection, data analysis, forecasting, product tailoring/warfighter applications, and dissemination. AFW Reengineering reinforces the core competencies and bridges the present day gap between the strategic and tactical levels, creating centers of regional meteorological expertise and focusing the application of meteorology on the CWT. All weather units collect, analyze, predict, tailor, and disseminate weather information as they fulfill their roles within the integrated weather support structure.

Figure 1.2. The AFW Integrated Weather Support Structure.



1.3. Key Concepts. To operate effectively in the integrated weather support structure, CWT leadership must understand and apply the following concepts:

1.3.1. Combat Weather Team (CWT). A CWT is any military weather organization providing direct operational weather support at the tactical level. In addition to designated CWTs, specialized sections in an OWS (e.g., flight weather briefing or contingency cells), the Pentagon (e.g., Weather Operations Division of the Air Force Operations Group), and AFWA (e.g., Special Support Operations Branch [SSOB]) also operate as CWTs.

1.3.1.1. The CWT performs in a fluid and dynamic environment and must be internally reorganized to succeed in the reengineered state. CWTs no longer organize themselves functionally with a separate observing and forecasting section. They must be flexible to meet the mission needs of their supported customer without relying on a fixed base of operations as the primary means of providing weather support.

1.3.1.2. CWTs assigned to deployable Air Force (AF) and Army units will normally remain with their operational customers and deploy with them during exercises, contingencies, and conflicts. Emphasis will shift from in-garrison operations to an expeditionary focus; however, non-deployed CWT members will continue to sustain home station operations. The focus will be the “mission,” not the weather station. CWT resources will be employed by the local Air Force/ Army commander to optimally support the operational mission. Meteorological equipment will be the same in peace and war to the maximum extent possible, to ensure people train the way they fight. To ensure operator and CWT weather support requirements are met by the OWS, a Memorandum of Agreement (MOA) or similar agreement will be established between the CWT and the supporting OWS. See AFMAN 15-129, Chapter 11, *Weather Support Documents, Formal Agreements & Standing Operating Procedures,* for MOA preparation instructions.

1.3.1.3. CWT Mission. CWTs provide MEFs to support military operations by their host or parent organization, in-garrison or deployed. Operational meteorological products from the supporting OWS, or the designated Joint METOC Forecast Unit (JMFU) during joint/combined operations, form the basis for all MEFs generated by CWTs. CWTs use these products and then apply their understanding of the current weather situation (i.e., radar, satellite, surface observations, pilot reports, mission debriefings).

1.3.1.4. Along with MEF support, CWTs support operations at fixed or expeditionary locations by providing surface weather observations, observed weather warnings and advisories, and mission meteorological watch (MISSIONWATCH). CWTs provide staff weather support to commanders at fixed, expeditionary and field locations, and to all Army echelons during field maneuvers.

1.3.2. Relationships to Major Commands (MAJCOMs), AFWA, and the OWS.

1.3.2.1. CWTs interact with their MAJCOM functional manager directly or indirectly. The MAJCOM functional manager fulfills responsibilities to organize, train, and equip subordinate units while the parent unit employs the resources provided by MAJCOMs to effectively and efficiently accomplish the mission. CWTs will ensure issues concerning the availability, use, and employment of resources (e.g., people and systems) are addressed through the operational chain to the MAJCOM. Specific MAJCOM responsibilities with respect to CWT operations are found in AFI 15-128, *Aerospace Weather Operations-Roles and Responsibilities.*

1.3.2.2. CWTs interact with AFWA indirectly through their MAJCOM or directly through the AFWA's products and services. Working with MAJCOMs, AFWA plans, programs, and budgets for standardized equipment and training; develops and maintains standardized technical procedures for CWTs; plans and manages end-to-end, worldwide AFW communications networks; and assists with CWT technical health evaluation. At the top of the forecast funnel, AFWA produces global-scale weather products and centralized space weather products for CWTs and supports standardized weather systems through the AFWA Consolidated Help Desk. In addition, AFWA provides dedicated strategic weather and space environment forecast support to Special Operations and National Programs.

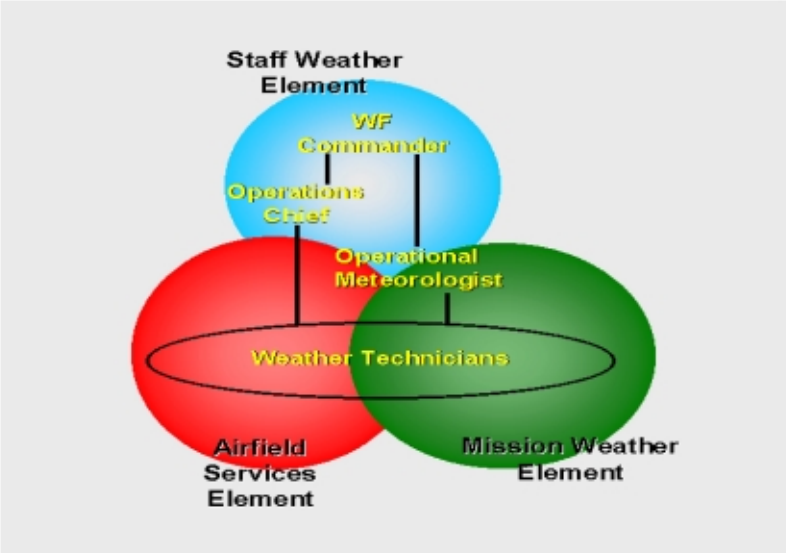
1.3.2.3. CWTs interact directly with every OWS in order to provide or arrange weather service to their customers. The OWS provides theater-scale battlespace forecasts, drop zone/range/AR forecasts, fine-scale target forecasts, and issue weather warnings and terminal forecasts for CWTs within their area of responsibility (AOR). As a customer within the AOR, CWTs directly interact with their supporting OWS for their terminal weather forecasts and resource protection. When a CWT's customer operates through or within any OWS' AOR, the CWTs will directly interact with all appropriate OWSs regarding their operational products.

1.3.2.4. CWTs interact directly with other CWTs when their customers jointly or cooperatively conduct missions together.

1.4. Task Organization of the Combat Weather Team. The modeled unit in **Figure 1.3.** is typical of a CWT at a fixed installation, such as an Air Force Base, Army Post, or expeditionary location. The typical CWT has an Airfield Services Element (e.g., providing direct support to air traffic control and flying operations); maintains a Mission Weather Element (e.g., providing mission execution forecasts for sortie gen-

eration or Intelligence Preparation of the Battlefield [IPB]), and has a Staff Weather Element to interact with base or post command personnel.

Figure 1.3. Task Organization of an Idealized CWT.



1.4.1. Specialized units or expeditionary weather units may not fulfill all three of these functions. For example, weather personnel supporting an Army Division Headquarters (HQ) and staff would focus on the Mission Weather and Staff Weather elements to accomplish their mission and would be called upon to provide only limited airfield support. Sometimes the division/corps and its aviation brigade are located together; at the very least the respective Tactical Operations Centers (TOCs) will have a helipad requiring support. On the other hand, a weather technician deployed to a Forward Armament Refueling Point (FARP) would focus almost entirely on airfield support. However, technicians deploying with an Air Force squadron operating from an established base would concentrate almost entirely on the mission weather element functions if host nation or host base weather personnel are providing weather observing support.

1.4.1.1. In some cases one person will be accomplishing the mission weather and airfield services mission simultaneously.

1.4.2. Staff Weather Element. The Officer-in-Charge (OIC) and Non-commissioned Officer-in Charge (NCOIC) are expected to perform both the operational and staff weather functions. In addition to leadership and management of unit activities, these unit members will function as a direct interface with the host or parent unit's commander and staff, and provide direct support to command, control, and planning functions. Weather technicians will be integrated into the staff weather element when possible.

1.4.3. Mission Weather Element. CWT personnel providing MEFs for the operational decision cycle of their host or parent unit function as a mission weather element. CWTs with Air Force flying customers will provide MEFs for sortie planning, generation, and execution. CWTs supporting Army operations will provide weather intelligence information at critical decision points within the Military Decision Making Process (MDMP) during IPB, Course of Action (COA) development and decision, Targeting Methodology Cycle, and Operational Decision Cycle (e.g., Battle Update Briefings [BUB]). As much as possible, technicians performing mission weather support will deploy forward with their

operational customer. CWT personnel will fully understand their customers mission and tactics in order to be able to anticipate and exploit the weather. **Chapter 2**, *CWT Roles and Special Missions*, fully defines guidelines and responsibilities.

1.4.4. Airfield Services Element. Airfield services expand the traditional observing function at the airfield, landing zone, or assault strip by infusing elements of the meteorological watch and resource protection roles. The airfield services element will function as the "eyes forward" for the servicing OWS and in many cases will serve as the primary point of contact for the collaborative forecast effort to include resource protection for an installation. Army and Air Force flight operations involving Supervisors of Flying (SOF), or their equivalent, rely heavily on the airfield support element for operational decisions. During certain meteorological conditions, weather personnel may collocate with a SOF or operations officer to assist in the launch and recovery of aircraft if possible. CWTs are responsible for taking and disseminating observations IAW AFI 15-128, *Aerospace Weather Operations-Roles and Responsibilities*, Chapter 4, unless the field has an automated observing system, or support is provided by host nation or another federal agency (e.g., National Weather Service).

1.4.4.1. Newly assigned personnel will be given a thorough orientation to include visits to the meteorological equipment on the airfield complex, air traffic control facilities, supported customers and their weapon systems, SOF duty sections, the command post, and other key operational locations. This orientation gives a solid foundation of how local weather products and services fit into the base/post overall mission. Orientation should also cover equipment limitations and local weather effects, such as how something as simple as a wind shift/runway change can impact operations. The airfield services element will function as the "eyes forward" for the servicing OWS and in many cases will serve as the primary point of contact for the collaborative forecast effort to include resource protection for an installation.

1.5. "Provide" or "Arrange For" Concept. CWTs may not always deploy with their customer, but they must ensure customers receive weather support to accomplish their mission. This process is not unique to the weather career field. Operational United States Air Force (USAF) flying wings have been coordinating multi-element off-station support for years under the "provide or arrange for" concept. CWTs can no longer be certain another CWT can provide support to their customer when they are off-station or transiting/staging through another base; therefore, CWTs must either provide the support themselves or arrange for someone else to provide the support. CWTs supporting Army Aviation and USAF flying wings are most affected by this policy.

1.5.1. The "provide" side of the equation can be handled by having the customer reach back to the CWT or by the CWT forwarding MEFs to their customers when off station.

1.5.2. The concept of "arrange for" may cross a broad range of options. CWTs may simply ensure the deploying customer knows which OWS to contact for weather support (i.e., flight weather briefings and planning information), they may arrange for a deployed or other CWT to provide mission support, or they may provide support from home station. For staged/deployed operations, CWTs must coordinate with the supporting unit (e.g., OWS or alternate CWT) prior to the mission departing to ensure support is available.

1.5.3. Tactical Army echelons not having a deployed CWT for direct support receive products through the Joint Common Database of the Army Battle Command System (ABCS) (when fully implemented) or by looking at the nearest CWT or OWS web page over tactical communications (e.g., Mobile Subscriber Equipment [MSE]).

1.6. "Eyes Forward." The "eyes forward" concept is crucial to the success of reengineering. CWTs will relay critical, time-sensitive meteorological information back to the technicians conducting terminal forecasting and meteorological watch (METWATCH) operations at the OWS. The success of "eyes forward" hinges on the ability of the CWT to integrate the current state of the atmosphere into an understanding of the future impact on forecast conditions *and* the ability to communicate that information to the technicians at the servicing OWS. Through the continuous interaction of the CWT and their servicing OWS, forecast accuracy improves, resources remain protected, and CWTs gain the necessary situational awareness to conduct portions of their mission execution forecast processes.

1.6.1. When deployed it is imperative that CWTs relay to the JMFU, Joint METOC Officer (JMO), and servicing OWS all possible observations, tactical radar information, upper air soundings, and any other meteorological information that might enhance OWS support and populate the weather database. Deployed Army support CWTs may have access to observations from the battlefield (Forward Area Limited Observation Program [FALOP] and Artillery Meteorological [ARTYMET]). They must, however, check with their Army customer as to security classification of the observations. That will determine whether the observations are “sharable” with the JMFU and OWS as well as the communications path back to the JMFU and OWS.

1.7. Mission Execution Forecast (MEF). The cornerstone of the CWT is the MEF, which is any forecast applied to effect a decision regarding the commitment of military forces. Flight weather briefings are basic MEFs. CWTs fully integrated with their flying community will yield more detailed and relevant flight weather information not normally contained on a DD Form 175-1 or other briefing form. MEFs apply to both flying and non-flying missions. Other examples might include bubble charts, stop light charts, or Integrated Weather Effects Decision Aid (IWEDA) visualization overlays of weather effects for the Army customers missions that day.

1.8. MISSIONWATCH. CWT members will understand customers critical decision points as their military operation unfolds and how updated forecast information can successfully impact that operation. For example, a CWT member should be in the TOC watching weather as the mission occurs. If the operators run into a problem, the CWT advises the decision-makers real time where they can go to accomplish the mission, or advises which secondary targets have usable weather. CWTs supporting Army operations with access to the ABCS are able to maintain situational awareness of friendly and enemy force distributions (order of battle) through digital displays on the Common Tactical Picture (CTP).

1.8.1. MISSIONWATCHs close companion is the post-mission analysis; both of these processes provide direct feedback to CWT leadership and should be used to improve the MEF process (MEFP). Additionally, forecasting skills will improve as a dividend of MISSIONWATCH. **Chapter 5** contains additional MISSIONWATCH information.

1.9. Utilization of Manpower. CWT personnel perform a critical wartime and flight safety function. CWT personnel performing mission-essential tasks need to remain in their work center to maintain proper support to installation assets. They will not be assigned duties conflicting with their assigned responsibilities. Mission-essential tasks include communicating with the OWS, taking weather observations for airfield operations, issuing MEFs, and providing support during severe weather conditions. CWT personnel will not be designated as augmentees for other base functions during wartime, contingencies, or exercises.

Chapter 2

CWT ROLES AND SPECIAL MISSIONS

2.1. General. Every CWT has unique characteristics based on the customer supported, geographical location, level of command, etc. There are, however, general guidelines CWTs should follow as applicable to the supported mission. This chapter defines CWT roles and responsibilities, and concludes with discussions on how CWTs support special military operations. During contingency operations or theater war, weather support will be orchestrated by the unified command Director of Operations (J3) with consult and input from the Senior METOC Officer (SMO) on staff. In such cases, CWT support will follow general guidelines specified in Joint Publication 3-59, *Joint Doctrine, Tactics, Techniques, and Procedures for Meteorological and Oceanographic Operations,* and theater METOC directives. CWTs will conduct coordinated weather operations IAW AFMAN 15-129, *Aerospace Weather Operations--Processes and Procedures,* Chapter 5.

2.2. CWTs Supporting Combat Air Forces (CAF). The CWT continually interacts and communicates with the flying squadrons and may perform forecast duties in the flying squadron. CWT personnel interact with schedulers to help determine upcoming missions. Great value is added by effective mission planning. Alternate routes and times can be suggested well in advance to operators to prevent wasted resources. The CWT applies expertise to individual missions during flight planning by tailoring the forecast towards weapon and aircraft sensitivities. The CWT updates the weather (take-off, enroute, target areas, and landing) as needed after the initial briefing, but prior to takeoff. The CWT prepares Electro-Optical Tactical Decision Aids (EOTDAs) for the crews as needed, as well as low-level routes, and Visual Route (VR) and/or Instrument Route (IR) forecasts. During the mission, the CWT performs intense MISSIONWATCH and notifies the mission command and control element (Supervisor of Flying [SOF], Mission Director, Command Post, or any agency that has direct contact or control of flight). The CWT receives a thorough weather debrief as part of the mass debrief which CAF squadrons conduct. CWTs supporting more than one flying squadron must have procedures in place to ensure consistency between weather support provided and briefed by different CWT technicians, including the airfield services element.

2.3. CWTs Supporting Air Force Command and Control, Intelligence, Surveillance, and Reconnaissance Forces (C2ISR). The CWT continually interacts and communicates with the flying squadrons and may perform forecast duties in the flying squadron area. CWT technicians perform all the functions as described for those supporting a CAF, but also prepare orbit forecasts at flight altitude. CWTs MISSIONWATCH each flight but may be presented with the additional challenge of covering long-range missions which can last 24 hours or more. C2ISR units are particularly sensitive to space weather effects. CWTs will be familiar with space weather and its impacts to C2ISR forces.

2.4. CWTs Supporting Mobility Air Forces (MAF). CWTs support MAF missions using a variety of approaches. At times, mission services may operate from a squadron, from the base weather station or other centralized briefing point, or as a function of a dispatch agency. In any situation, there will be procedures in place ensuring consistency between weather support provided and briefed by different CWT technicians, including the airfield services element. CWTs will be intimately knowledgeable of mission profiles and parameters to guarantee success and increase efficiencies by taking into account cargo, fuel, mission routing, and timing. Particular emphasis is placed on minimal disruption of aircraft/cargo flow based on the enroute structure and/or GLOBAL REACH laydown. CWTs supporting MAF missions will

use CMEF products provided by lead weather units as described in AFMAN 15-129, Chapter 5. During mission execution, CWTs perform MISSIONWATCH for theater and training missions and notify the appropriate Command and Control (C2) agency (e.g., Command Post, Air Mobility Operations Command and Control) when weather conditions require adjustments to aircraft routing and timing. The Tanker Airlift Control Center (TACC) will provide MISSIONWATCH for strategic mobility missions. Due to the transient nature of MAF missions, it is imperative CWTs provide and/or arrange follow-on support for their aircrews to include objective verification/feedback of weather support.

2.4.1. CORONET, GLOBAL REACH, and GLOBAL POWER Missions. Tanker forces engaged in CORONET and GLOBAL POWER missions are supporting Air Combat Command (ACC), Air National Guard (ANG), or Air Force Reserve Command (AFRC) forces deploying to, or conducting operations outside, the CONUS under the operational control of HQ Air Combat Command. Command and control resides at the ACC Air Operations Squadron, therefore the ACC Weather Support Flight is the lead weather unit.

2.4.1.1. The ACC Weather Support Flight will issue and maintain a MISSIONWATCH, and if necessary, amend the CMEF for the CORONET or GLOBAL POWER missions. Technicians supporting tankers connected to these operations will access the CMEF from the ACC Weather Support Flight web site or pre-arrange for delivery by some other means. The ACC Weather Support Flight will coordinate any differences between operational and strategic forecast products with the issuing agency.

2.4.1.2. Tanker and airlift forces engaged in GLOBAL REACH missions support forces deploying to, or conducting operations outside, the CONUS under the operational control of HQ Air Mobility Command. The command and control of these missions resides at the Tanker Airlift Control Center (TACC); therefore, the TACC Global Mobility Weather Flight at the 15th OWS is the lead Weather unit. The TACC Global Mobility Weather Flight will issue, maintain a MISSIONWATCH, and if necessary, amend CMEFs connected with the GLOBAL REACH missions. Technicians supporting tankers connected with these operations will access the CMEF and include it in the MEF given to the aircrews.

2.4.2. Other MAF Missions. CWTs supporting missions others than those mentioned above will base their MEFs on strategic products from AFWA and operational level forecast products provided by the OWS servicing the region. CWTs must coordinate any deviation from the operational level forecast that crosses an operationally significant threshold (i.e., forecasting severe turbulence where moderate is indicated on the products) with the agency responsible for that forecast. If functioning as the lead weather unit, CWTs will ensure that all participating units receive the CMEF for the common mission element (e.g., refueling track or drop zone), maintain a MISSIONWATCH, and amend the product as necessary. All CWTs supporting the air-refueling mission maintain MISSIONWATCH and keep the lead weather unit abreast of impacting weather before and during the mission with a total Air Force team focus.

2.5. CWTs Supporting Army Combat Forces. The mission weather element in Army support is performed in many locations around the battlefield. Depending on the order of battle and Army echelons supported, elements of Army CWTs will operate out of the Main Tactical Operations Center (TOC), Intel Center, Rear/Jump TOC, Deep OPS Cell, Aviation Brigades, and tactical airfields and landing zones. CWTs supporting the Army are sized and structured based on doctrine. This information can be found in the *USAF War and Mobilization Plan, Volume 1, Planning Factors, Annex CC, Weather*. All changes to

this doctrine must be coordinated with the Headquarters Department of the Army, Battlespace, Surveillance, and Operations Division.

2.5.1. Army support CWTs use the Integrated Meteorological System (IMETS) in or adjacent to the TOC of the supported echelon to provide digital weather products and support to the commander and staff of tactical units for all Battlefield Operating Systems (BOS). The Army performs its mission primarily in the lowest levels of the atmosphere, the planetary boundary layer where natural- and battle-induced environmental phenomena affect the performance of man and machine. The Army CWT also:

2.5.1.1. Provides timely, digitized weather; battlefield visualization; environmental effects forecasts; observations; and decision aid information.

2.5.1.2. Supports Battlefield Functional Areas (BFAs) of the ABCS at echelons using overlays on the Common Tactical Picture (CTP), the Armys version of the Common Operating Picture (COP).

2.5.1.3. Supports other ABCS systems through formatted messages and other tools (e.g., PowerPoint briefing slides) when users either cannot exploit the CTP or require other weather information formats.

2.5.1.4. Is the focal point for collection of perishable battlefield weather data, including data from ARTYMET teams, Forward Area Limited Observing Program (FALOP), Tactical Unmanned Aerial Vehicles (T-UAVs), and other BFAs that collect such information.

2.5.1.5. Is the communications gateway for AFWA products and data being passed to Army BFAs. IMETS provides the interface between the AF CWTs supporting Army units, the ABCS C4ISR infrastructure in the field, OWSs, and AFWA. More detailed Army CWT functions are described in the rest of this chapter.

2.5.2. The Staff Weather Officer (SWO) Function. The SWO is the senior weather officer or noncommissioned officer (NCO) when no officers are assigned to a CWT. As a member of the Army commander's special staff, the SWO has broad latitude to work across staff sections to ensure weather is integrated into all Army operations prior to, during, and after mission execution. The SWO will:

2.5.2.1. Coordinate directly with the commander and staff on weather and weather service issues, including changes in the composition or location of the weather support force to meet mission requirements.

2.5.2.2. Provide weather effects information, forecasts, and briefings to the commander and staff planners with emphasis on critical threshold values which limit weapon systems, tactics, and operations.

2.5.2.3. Coordinate with J3/G3/S3 (Operations) to ensure weather products are specifically tailored to support planning for, decisions on, and execution of missions.

2.5.2.4. Coordinate with J2/G2/S2 (Intel) to ensure weather products are tailored for terrain analysis and to support the IPB process.

2.5.2.5. Provide planning, decision, and execution weather briefs to collocated weather teams and aircrews.

2.5.2.6. Integrate with operations to incorporate environmental impacts in the mission planning process.

2.5.2.7. Provide climatological studies and analyses in support of operations including exercises and contingencies, and prepare inputs for weather annexes to plans and operations orders of the supported command, review weather annexes of subordinate commands, and ensure weather support requirements are met.

2.5.2.8. Arrange weather support for subordinate units and monitor the quality and effectiveness of the support provided. Assist the command in requesting weather support to meet new or unfilled requirements.

2.5.2.9. Advise the commander on joint service weather capabilities, support limitations, and the ways weather information can enhance or detract from operations.

2.5.2.10. Develop weather operations procedures and train Army customers to use and understand weather information. SWOs will arrange training to take and disseminate limited weather observations as required and work with the commanders and staff to ensure forward area observations are passed in a timely manner.

2.5.2.11. Represent the commander on weather-related matters with higher echelon weather elements. The SWO will monitor the overall weather support mission for the commander and acts as the commander's agent to identify and resolve weather support responsibilities.

2.5.2.12. Manage the operations of the CWT.

2.5.2.13. Coordinate communications support for passing weather data and ensure weather communications requirements are documented.

2.5.3. CWTs Supporting Echelons Above Corps (EAC)/Theater-level Army Operations.

2.5.3.1. The EAC CWT comes from the theater Army weather support unit. The theater Army SWO may be dual hatted as the EAC SWO and the Army Forces (ARFOR) SWO. Most theater weather units will require augmentation to support a full CWT.

2.5.3.2. In joint/combined operations, the CWT provides weather services to the ARFOR formed from the Army Service Component Command (ASCC) or to the Joint Force Land Component Commander (JFLCC), if the JTF is comprised of functional components. See Joint Pub 3-59, *Joint Doctrine, Tactics, Techniques, and Procedures for Meteorological and Oceanographic Operations (METOC),* for METOC doctrine in joint/combined operations.

2.5.3.3. The theater Army CWT is the center for weather support to a multi-corps operation. Using centralized products from DoD METOC centers or other military services (e.g., NATO, Japan, Korea), the CWT prepares and tailors products to meet the needs of the EAC commander, staff, and subordinate elements. The CWT may employ the IMETS. The theater Army CWT also provides or arranges for the services in **Table 2.1.**

Table 2.1. EAC/Theater-level CWT Services.

1. 24-hour SWO support to Main and Rear Command Posts (CPs).

2. Main TOC duties include, but are not limited to, the following:

a. Coordination with lower/higher echelons and MAJCOM/DOW for manpower, equipment, and operational issues.

b. Providing support to the commander and staff, the targeting board, deep operations, and shift-change briefings.

c. Acting as SWO to ARFOR when designated and coordinating weather support to joint/combined land operations.

d. Planning/managing Army theater weather sensing strategy.

e. Coordinating IPB products and supporting deep target planning.

f. Managing army theater weather communications, KQ identifiers, and data flow from lower to higher echelons.

g. Coordinating digital weather displays on EAC Command & Control (C2) systems.

h. Providing inputs to Operation Orders (OPORDs), Operation Plans (OPLANs), Letters of Instructions (LOIs), and Tactics, Techniques, and Procedures (TTPs).

i. Generating and tailoring 48-120 hour planning products based on OWS/Joint METOC

Forecast Unit (JMFU) guidance products.

j. Building weather situational templates for EAC battle maps.

k. Building, maintaining, and disseminating EAC tailored products.

l. Producing weather effects guidance products for deep target planning cells.

m. Providing digital weather displays on EAC C2 systems.

n. Solving lower echelon equipment problems.

o. Providing and disseminating information and data from lower echelons to EAC and strategic centers.

p. Managing and running EAC IMETS and Joint Task Force Satellite Terminal (JTFST).

q. Coordinating with the G2 (Intelligence) NCO for non-weather related tasks.

r. Take limited observations at the landing zone (LZ) as required.

s. Updating and maintaining lower echelon CWT locations.

t. Tailoring support and products to EAC Nuclear, Biological, and Chemical (NBC) personnel and engineers.

u. Tailoring support and products to the Army Missile Defense Warning System.

v. Performing Intelligence Center (EACIC) duties.

w. Tailoring weather effects products for Area of Operation/Area of Interest (AO/AI) (e.g., planning forecasts for Imagery Intelligence (IMINT), Signal Intelligence (SIGINT), and Measurement and Signature Intelligence [MASINT]).

x. Providing tailored products for collection management planning (e.g., Unmanned Aerial Vehicles [UAV] platforms 00-120 hour briefings).

y. Providing flight weather briefings for aerial exploitation for Brigades (BDE) and Battalions (BN).

z. Preparing IPB tailored products.

aa. Coordinating, obtaining, and interpreting climatology tailored to maneuver support, aerial exploitation at BDE/BN, and Cloud Free Line of Sight (CFLOS).

bb. Preparing weather for theater operations wargaming.

3. EAC Rear TOC duties include:

a. Briefing weather to Theater Army Area Commander (TAACOM) and staff.

b. Coordinating TAACOM requirements with the supporting OWS.

c. Providing tailored products for staff on road/rail, Aerial Port of Debarkation (APODS), Sea Port of Debarkation (SPODS) maritime routes, and intertheater operations.

2.5.4. CWTs Supporting a Corps Main. CWTs supporting a Corps Main are responsible for the duties listed in **Table 2.2.**

Table 2.2. CWTs Supporting a Corps Main.

-Coordinating customer support with Corps staff functions.

-Advising the commander on weather support for combat operations and its limitations.

-Coordinating and monitoring direct and indirect weather support within AO.

Monitoring consistency of weather support products within the AO/AIs.

-Providing briefings to command and staff out to 120 hours (IPB products).

-Supporting Deep Operations (DOCC) and the Targeting Cell.

-Providing mission planning forecasts for UAVs and Aviation Engagement Areas.

-Providing weather effects based on critical thresholds.

-Contributing to development of weather effects on operations.

-Developing annexes to plans.

-Developing local weather support procedures.

-Advising G2 on the need for Army provided weather observations.

-Performing METWATCH of AO/AI (e.g., avenues of approach, Forward Area Refueling Points [FARP]).

-Coordinating communication requirements.

-Coordinating with Artillery Meteorology (ARTYMET) to receive observations.

-Ensuring operator maintenance of Army-supplied equipment is accomplished.

-Interfacing between EAC and Division CWTs.

-Developing and maintaining web site and web technology.

-Preparing situation reports (SITREPs).

-Interpreting, refining, and tailoring weather databases and products from the OWS .

-Establishing and maintaining life support.

-Providing aviation briefings.

-Collecting and forwarding to higher echelons and components any local weather data.

-Performing METWATCH for specific routes and target locations.

-Coordinating forecasts with other CWTs.

-Preparing and disseminating forecasts as needed, such as LZ/DZ/Chemical Downwind Messages (CDM)/fallout messages, solar and lunar data, climatology, oceanography, and illumination data.

-Maintaining site security, performing site setup and tear down, and managing Modified Table of Organization & Equipment (MTOE) equipment.

-Operating Upper Air (e.g., MARWIN) and Tactical Weather Radar (TWR) equipment.

-Resolving communication problems.

-Serving as system administrator and maintainer of weather web technology.

-Overseeing local site logistics (e.g., supplies, procuring fuel).

-Maintaining voice, Local Area Network (LAN), and client-server communication circuits.

-Monitoring and operating weather equipment (e.g., N-TFS, T-VSAT, STT, IMETS, and TACMET).

-Maintaining COMSEC material and keys encryption devices.

-Maintaining weapons and ammunition.

2.5.5. CWTs Supporting an Army Division. CWTs supporting an Army Division are responsible for the duties listed in **Table 2.3.**

Table 2.3. CWTs Supporting an Army Division.

-Maintaining appropriate standards for Survival-Life Sustainment (food, water, life support area, sanitation, etc.).
-Maintaining appropriate standards for Survival--Operational Sustainment/Maintenance (vehicle, power, communications, site, etc.).
-Performing Army Tactical (Field) Operations, such as site selection and setup/tear-down, site security, convoy operations, etc.
-Coordination with the Headquarters Headquarters Company (HHC) Commander/Command Sergeant Major (CSM)/First Sergeant (e.g., meal cards, transportation).
-Coordinating with higher and lower echelon CWTs (i.e., synchronization).
-Providing commander and staff briefing support.
-Providing customer Operational Concept Awareness.
-Providing support for Targeting (FSE) & Deep Operations Coordination Cell (DOCC).
-Performing collection management (e.g., asset scheduling to include UAVs).
-Providing IPB support by tailoring products and databases.
-Assisting with mission analysis/reanalysis, Course of Action (COA) development, and COA selection.

2.5.6. CWTs Supporting an Aviation Brigade (EAC/Corps/Division). CWTs supporting an Aviation Brigade (EAC/Corps/Division) are responsible for the duties listed in **Table 2.4.**

Table 2.4. CWTs Supporting an Aviation Brigade.

-Performing IMETS/N-TFS/T-VSAT operations.
-Observing at BDE LZs.
-Providing situational awareness weather products (IPB).
-Generating and presenting flight weather briefings.
-Performing Pilot-to-Metro-Service (PMSV) support.
-Planning coordination routes (e.g., ingress/egress, target forecasts, and lift operations).
-Supporting BN jump operations.
-METWATCHING route/target/FARP/LZs/DZs.
-Providing commander and staff briefings.
-Developing Tactical Decision Aids (TDA).
-Providing Nuclear Biological and Chemical (NBC) support.
-Coordinating with lower echelon CWTs.
-Coordinating with the OWS and higher echelon CWTs.
-Performing all Army-unique combat support field duties.

2.5.7. CWTs Supporting an Armored Cavalry Regiment (ACR) or a Regimental Aviation Squadron (RAS). CWTs supporting an Armored Cavalry Regiment (ACR) are responsible for the duties listed in **Table 2.5.**

Table 2.5. CWTs Supporting an ACR/RAS.

-Performing IMETS/N-TFS/T-VSAT operations.
-Observing at BDE LZs.
-Providing situational awareness (IPB).
-Generating flight weather briefings.
-Performing PMSV support via Single Channel Ground and Airborne Radio System (SINCGARS).
-Planning coordination routes (e.g., ingress/egress, target forecasts, and lift operations).
-Supporting BN jump operations.
-METWATCHING route/target/FARP/LZs/DZs.
-Tailoring weather effects products to support mission planning and execution.
-Providing broad area EOTDAs for ground and AIR CAV systems.
-Providing standard EOTDA support.
-Providing command and staff briefings.
-Developing Tactical Decision Aids (TDA).
-Providing NBC support.
-Coordinating with BN CWTs.
-Coordinating with the OWS and higher echelon CWTs.
-Providing terrain impact forecasts to the terrain team.
-Performing all Army unique combat support field duties.

2.5.8. CWTs Supporting an Interim Brigade Combat Team (IBCT). The IBCT is a full spectrum combat force. It has utility, confirmed through extensive analysis, in all operational environments against all projected future threats. However, it is designed and optimized primarily for employment in small-scale contingency operations (SSCO) in complex and urban terrain, confronting low-end and mid-range threats that may employ both conventional and asymmetric capabilities. The IBCT deploys very rapidly, executes early entry, and conducts effective combat operations immediately on arrival to prevent, contain, stabilize, or resolve a conflict through shaping and decisive operations. With augmentation, the IBCT participates in a variety of possible roles in Major Theater War (MTW) as a subordinate maneuver component within a division or corps. The IBCT also participates, with appropriate augmentation, in stability and security operations (SASO) as an initial entry force and/or as a guarantor to provide security for stability forces by means of its extensive combat capabilities.

2.5.8.1. Composed of more than 3,000 personnel, the IBCT is capable of sustained, autonomous combat operations 24-hours a day 7-days a week (24/7) for up to 10 days (240 hours). Its initial area of operations (AO) is 50km X 50km, expandable to 100km X 100km, with augmentation. The IBCT has a 96-hours “from first aircraft wheels up” requirement to get to the AO. It will

deploy under a parent Headquarters (i.e., Division, Corps, Joint Task Force, or Army Force [ARFOR]) depending on the scenario.

2.5.8.2. IBCT mission success is extremely physical-environmental dependent. For the IBCT to execute early entry and conduct effective combat operations immediately on arrival, all the IBCT functional areas must have current, tailored high-resolution weather intelligence information upon demand. Though the IBCT will rely heavily on "reach-back" for intelligence and weather support, it will require local tailoring of weather products by on-site weather people using IMETS Light. A deployed CWT will be inside the decision making process loop at the IBCT-level and will be ready to recommend alternative ingress, egress, or courses of action to exploit weather intelligence as a force multiplier.

2.5.8.3. General Requirements. Accurate, timely, and reliable meteorological support is essential to all facets of IBCT force planning, training, deployment, employment, and evaluation.

2.5.8.3.1. In-garrison Requirements. In order for weather personnel to adequately support the IBCT, the supporting CWT will require extensive training with, and immersion in, that unit. Garrison time will be used to train on the IMETS Light and learn what weather intelligence the IBCT will need, how often, and how fast. The CWT will educate the customer on the limits of what weather can do for them. Shortfalls will be identified, and elevated for resolution. They will work details of weather intelligence dissemination (hardware and software), as well as the various weather data sources available to the IBCT.

2.5.8.3.2. Deployed Requirements. The IBCT requires tailored forecasts and weather intelligence 24/7. Continual jump operations will mandate a minimum of equipment set up/tear down by the IBCT CWT. IBCT CWT will depend on the Military Intelligence Company or IBCT TOC for electrical power. **Table 2.6.** summarizes some (not all) general weather product requirements based on current doctrine. (Note: These requirements are for the "basic" IBCT. Additional augmentation by other sections will require additional weather support.) Most Battlefield Functional Areas (BFAs) will also require a host of IMETS-produced graphical overlays that depict weather and weather effects on the Common Tactical Picture (CTP). New sensor technologies, pushed down to the lowest level will result in vast amounts of combat information. Graphical representations are becoming the norm and will significantly speed analysts ability to assimilate weather intelligence into the full battlefield picture.

Table 2.6. General IBCT Weather Requirements.

IBCT Functional Area	General Weather Requirements
Headquarters and Headquarters Company (HHC)	1. Briefing support. 2. Pre-deployment long range forecasts. 3. Chemical and effective downwind messages. 4. Resource protection advisories. 5. High resolution satellite imagery.
Military Intelligence (MI) Company	1. Briefing support. 2. Receipt of weather products generated for other BFAs. 3. Cloud cover/layer heights. 4. Density/humidity profiles. 5. Icing/turbulence. 6. Illumination (light and NVG) data. 7. Precipitation (rain/snow/thunder). 8. Temperature. 9. Visibility/lock-on ranges. 10. Chemical and effective downwind messages. 11. High resolution METSAT imagery. 12. Resource protection advisories.
Brigade Signal Company	1. Space weather effects on communication systems. 2. Precipitation (rain/snow/thunder). 3. Surface winds. 4. Weather input to trafficability forecasts. 5. Illumination (light and NVG) data. 6. Resource protection advisories.
Mechanized Infantry Battalions (3 each)	1. Weather input to trafficability forecasts. 2. Target acquisition forecasts. 3. Visibility. 4. Cloud cover/layer heights. 5. Precipitation (rain/snow/thunder). 6. Surface temperatures. 7. Surface winds. 8. Illumination (light and NVG) data. 9. Thermal stress indices for dismounted infantry. 10. Resource protection advisories.

IBCT Functional Area	General Weather Requirements
Anti Tank Company	1. Weather input to trafficability forecasts. 2. Target acquisition forecasts. 3. Visibility. 4. Precipitation (rain/snow/thunder). 5. Surface temperatures. 6. Surface winds. 7. Illumination (light and NVG) data. 8. Resource protection advisories. 9. Clouds cover/layer heights.
Reconnaissance, Surveillance & Target Acquisition	1. Weather input to trafficability forecasts. 2. Target acquisition forecasts. 3. High resolution satellite imagery. 4. Visibility. 5. Precipitation (rain/snow/thunder). 6. Surface temperatures. 7. Surface and upper level winds. 8. Illumination (light and NVG) data. 9. Icing and turbulence. 10. Space weather effects on collection and communications platforms. 11. Cloud free line-of-sight forecasts. 12. Chemical and effective downwind messages. 13. UAV MISSIONWATCH for dynamic re-tasking/ alternative ingress/egress. 14. Automated surface observations from UAV launch site. 15. UAV “pilot” reports. 16. UAV takeoff/recovery forecasts. 17. Resource protection advisories.
High Mobility Artillery Rocket System Battery (HIMARS) (Note: HIMARS will act as surrogate artillery until an Intermediate Armored Vehicle (IAV) mounted 155mm Howitzer is fielded. See below.)	1. Precipitation (rain/snow/thunder). 2. Surface temperatures. 3. Surface and upper air winds. 4. Air density forecasts. 5. Radar propagation forecasts. 6. Illumination (light and NVG) data. 7. Resource protection advisories.

IBCT Functional Area	General Weather Requirements
155mm Self-propelled Howitzer Battery	1. Precipitation (rain/snow/thunder). 2. Surface temperatures. 3. Surface and upper air winds. 4. Air density/humidity forecasts. 5. Radar propagation forecasts. 6. Weather input to trafficability forecasts. 7. Illumination (light and NVG) data. 8. Resource protection advisories. 9. Visibility.
Engineer Company	1. Weather input to trafficability forecasts. 2. Visibility. 3. Precipitation (rain/snow/thunder). 4. Surface temperatures. 5. Surface winds. 6. Illumination (light and NVG) data. 7. Thermal stress indices for dismounted infantry. 8. Resource protection advisories.
Base Support Battalion	1. Weather input to trafficability forecasts. 2. Visibility. 3. Precipitation (rain/snow/thunder). 4. Surface temperatures. 5. Surface winds. 6. Illumination (light and NVG) data. 7. Back-brief forecasts for APOE/SPOE and enroute air and sea operations. 8. Medical evacuation helicopter forecasts. 9. Resource protection advisories. 10. Thermal stress indices for dismounted infantry.

2.5.9. CWTs Supporting an Army Transportation Group. CWTs supporting an Army Transportation Group are responsible for the duties in **Table 2.7.**

Table 2.7. CWTs Supporting an Army Transportation Group.

1. Providing weather briefings before departure, while in transit, and at destination port.
2. Providing briefing and planning support to BN commander and staff while collocated in the Main.
3. Providing logistics for over-the-shore operations weather support.
4. Providing forecast support for port activities (e.g., construction, cargo transfer).
5. Providing weather for ship-to-shore Petroleum, Oil and Lubricants (POL) transfer operations.

2.5.10. CWTs Supporting an Army Transportation Battalion. CWTs supporting an Army Transportation Battalion are responsible for the following duties:

2.5.10.1. Providing briefing and planning support to the BN commander and staff at non-collocated BNs and/or collocated BNs at the Main.

2.5.10.2. Performing Army unique duties at Group HQ and geographically separated BNs to include site setup (e.g., tents, camouflage, and trenching), Army equipment setup (e.g., radios and generators), maintaining and driving vehicles with a two-driver rule, radio operations, life support functions, and maintaining weapons.

2.5.10.3. Performing observing duties at three BNs (where two are geographically separated). Observations will include 24-hour surf observations, tidal data, water way wind and direction, water level, sea state (open ocean and surf zones), and water temperature.

2.6. CWTs Supporting Army Special Operations Forces (ARSOF).

2.6.1. Operational Weather Doctrine for ARSOF. Special Operations Forces (SOF) activities span the entire spectrum of conflict and are called upon to perform critical missions that support day-to-day peacetime as well as wartime campaign strategies of the geographical Commanders-in-Chiefs (CINCs). As a result, Special Operations (SO) weather forces have a unique peacetime mission in support of theater and theater augmentation SOF.

2.6.1.1. SO weather forces are airborne qualified Air Force personnel who provide specialized METOC, and environmental services for worldwide employment of joint SOF. As an ancillary mission, SO weather forces also have the capability to deploy forward to provide METOC information in data denied areas. This requires the SO weather forces to possess unique skills to move, shoot, and communicate with their supported SOF element as a team member, not a liability. As a result, select Combat Weather Team (Airborne) (CWT[A])members are trained in maritime operations, mountain, arctic, jungle, desert warfare, military free fall, water infiltration, and in foreign language proficiency as required by their SOF commander.

2.6.1.2. In addition to these capabilities, CWT(A)s require small, lightweight, secure, reliable tactical weather and communications equipment. Tactical communications is an Army responsibility and is satisfied by the United States Army Special Operations Command for ARSOF weather support forces. CWT(A)s are typically employed at the Special Forces (SF) Group/Ranger Regiment and SF/Ranger battalion levels. CWT(A)s employed with SO aviation elements typically deploy to the company or flight level since SO aviation forces typically operate in small independent elements in support of other SOF.

2.6.2. Tactical Weather Doctrine for ARSOF. There are four distinct mission areas of ARSOF:

2.6.2.1. Army Special Forces (SF) are theater-oriented soldiers taught to train, advise, and assist host nation military or paramilitary forces. SF soldiers are highly skilled operators, trainers, and teachers. Regionally oriented, these soldiers are specially trained in their respective areas native languages and cultures.

2.6.2.2. The 160th Special Operations Aviation Regiment (Airborne) [160 SOAR(A)] provides heliborne lift and attack capabilities in a wide range of mission profiles, including force insertion and extraction, aerial security, armed attack, medical evacuation, electronic warfare, mine dispersal, and command and control support.

2.6.2.3. The Rangers provide a responsive strike force and fight primarily at night. They rely on elements of surprise, teamwork, and basic soldiering skills to plan and conduct special missions in support of U.S. policy and objectives. Doctrinal weather support to these mission areas is charac-

terized by flexibility of employment for SO weather forces to satisfy ARSOF operational requirements.

2.6.2.4. CWTs Supporting Psychological Operations (PSYOP). The purpose of PSYOP is to modify or influence the behavior of people in foreign countries to meet U.S. objectives. Selected information is fed to foreign audiences to influence their emotions, motives, reasoning, and ultimately their behavior.

2.6.3. ARSOF CWT(A)s. ARSOF CWT(A)s can support unilateral or joint air, ground, and maritime SOF with staff weather functions including briefings, weather impacts of METOC conditions on current and planned missions, mission tailored forecasts, and observations of current conditions. ARSOF CWT(A)s can provide critical weather observations in data sparse areas to aid the commanders decision making process and to enhance pinpoint target forecast accuracy. They can conduct these operations independently in permissive and semi-permissive environments, or as augmentation to SO teams in non-permissive environments. ARSOF CWT(A)s can operate with SO teams conducting training for indigenous populations in permissive, semi-permissive, and non-permissive environments. During these operations, ARSOF CWT(A)s can train indigenous forces to operate and maintain a weather observation network to act as a force multiplier for indigenous and United States forces.

2.7. CWT Support to Special Missions. CWTs may be called upon to perform duties out of the ordinary. The following sections include descriptions of some of the more common missions and the support requirements.

2.7.1. CWTs Supporting Military Operations Other Than War (MOOTW). CWTs participate as a key element of joint and multinational MOOTW. They provide timely and accurate weather forecasts that enable commanders to direct forces at the right time and with the correct level of effort for each type of MOOTW. Virtually all forces that conduct or support MOOTW are influenced by the weather. Therefore, knowing how weather affects operations enhances the effectiveness of aerospace forces engaged in MOOTW.

2.7.1.1. Weather information is considered in every facet of MOOTW planning, deployment, employment, and redeployment. Commanders may seize a tactical advantage by effectively using information about weather conditions to successfully complete their missions. Weather information is critical to the safety of Air Force air and ground activities during natural disasters, especially when communications infrastructure may be crippled or nonexistent.

2.7.1.2. Flexibility is the key to successful CWT operations during MOOTW. Personnel tasked to perform MOOTW will be familiar with limited data forecasting techniques. Limited Data forecasting training is available via AFWAs Qualification Training Package (QTP).

2.7.2. CWTs Supporting Military Operations in Urban Terrain (MOUT). MOUT operations encompass any maneuvers on or against objectives on a topographical complex and its adjacent natural terrain where manmade construction and density of noncombatants are the dominant features. In other words, MOUT can occur in any populated city or town.

2.7.2.1. CWTs add value in a MOUT environment particularly in the planning stages of the mission. Once the battle is joined, the local commander will probably not have the time or communications to talk to the CWT, but may be able to access the forecasts, warnings and gridded weather data available on the Joint Common Database (JCDB). After the fight starts, many of the limitations will be a function of the building shape and orientation (i.e., wind channeling) and the pace

and weapons used in the battle (e.g., explosions and smoke). Some of the planning sensitivities CWTs should consider and be prepared to provide the customer are:

2.7.2.1.1. Solar and lunar event times (e.g., illumination, Night Vision Goggle) for the timing of the operation.

2.7.2.1.2. Primary users of wind speed and direction forecasts in the opening actions are likely to be artillery. Engineers will use smoke to obscure the opening attack and will need surface winds to optimally place the smoke. CWTs will adjust synoptic or mesoscale winds for local terrain and vegetation effects based on the scale of the operation.

2.7.2.1.3. Temperature, humidity, and surface winds are needed to support the dismounted soldiers and airmen to determine heat stress, wind chill, and water use.

2.7.2.1.4. Low cloud ceilings, visibility, and precipitation may limit the air support the unit can expect, to include UAV surveillance (friendly or enemy).

2.7.2.1.4.1. Visibility must be very low to limit rifle and small arms effectiveness.

2.7.2.1.4.2. If roads are slick with rain, snow, or ice, it may slow logistics and resupply, as well as casualty evacuation.

2.7.3. CWTs Supporting Tactical Unmanned Aerial Vehicle (T-UAV) Operations. The Army requires weather intelligence to support both in-garrison and deployed T-UAV operations. This includes potential of weather to adversely impact the airframe and ground support troops and equipment, as well as weather intelligence that enables T-UAV operators to optimize mission payloads and flight paths. The T-UAV air vehicle is extremely weather sensitive, and on-board sensors have a narrow window of favorable weather conditions in which their capabilities are optimal. Accurate, timely, and reliable meteorological support is therefore essential to every facet of T-UAV force planning, training, simulation, deployment, employment, and evaluation.

2.7.3.1. Each ground maneuver brigade within the division, including the Interim Brigade Combat Teams (IBCTs), will have a baseline T-UAV assigned through direct support Military Intelligence (MI) companies of the divisional MI battalion. Under Army Transformation, by FY06 all Army divisions and ACRs will have T-UAV elements. Note: In this context, each UAV "baseline" consists of Army personnel, ground control and receiving equipment, sensor payloads, and three UAV air vehicles.

2.7.3.2. Scope of Operations. The T-UAV baseline allows for 12/7 (12 hours per 24-hour period, 7 days per week) operations, with an objective of 18/7 operations. CWTs can expect 1200-1500 flight hours per year per baseline for combined garrison and exercise operations. In many instances, the T-UAV unit will achieve a large percentage of these hours in a relatively short period of time (e.g., contingency and combat training center deployments), requiring temporary surges in weather support. The Shadow 200 T-UAV must cover at least a 50 kilometer (km) radius, with an objective to cover up to a 200 km radius. Tasked CWTs supporting T-UAV operations will:

2.7.3.2.1. Know all system weather sensitivities in order to provide the analysis of their potential impact on operations. Where possible, these thresholds should be entered into the IWEDA program using the IWEDA Rules Editor.

2.7.3.2.2. Prepare and issue fine-scale current and forecast weather intelligence and brief T-UAV operators on demand and in real-time.

2.7.3.2.3. Perform MISSIONWATCH of T-UAV operations. T-UAVs will have a remote automated surface observation capability at all launch/recovery sites to assist in the process. These systems will include the ability to sense present weather (including visibility) and cloud base height. CWTs will ensure they have access to these observations for inclusion in the MISSIONWATCH process.

2.7.3.2.4. Perform post mission reviews to validate forecasts and gain further insight into mission requirements.

2.7.3.2.5. Act as liaison for weather issues. CWTs will coordinate with and request assistance from MAJCOM and higher headquarters as necessary.

2.7.3.3. CWTs supporting the Army are issued both Air Force and Army equipment. Regardless of the provider, the teams weather sensing and communications equipment must be able to transmit and receive weather intelligence and mission planning information at the Secret High level. CWTs use Army-provided communications and intelligence display equipment.

2.7.3.4. In order for weather support to be effective, the CWT must be provided both general Army mission planning information and specific T-UAV mission planning data. T-UAVs are likely to be retasked on the fly. This requires real-time notification to the CWT so that revised weather intelligence can, in turn, be provided back to the operators in real time. In-garrison operations must mimic deployed operations as closely as possible. This applies to the products CWTs generate for the T-UAV customer, as well as the communications systems used to move them. **Table 2.8.** summarizes the general weather intelligence required for T-UAV operations.

Table 2.8. General T-UAV Weather Intelligence Requirements.

Functional Area (Location)	Product
Platoon Crew (Launch & Recovery site) MI Company (Man. Bde. TOC) MI Company (Div. TOC)	1. Accurate, tailored flight weather MEF: Atmospheric contaminants, density, clouds, humidity profile, icing, turbulence, illumination, precipitation, temperature, and visibility 2. MISSIONWATCH
MI Company (Man. Bde. TOC) MI Company (Div. TOC)	Graphical composite depictions of the weather that can be overlaid onto the COP.
MI Company (Man. Bde. TOC) MI Company (Div. TOC)	Weather effects decision aids (for mission planning) that depict impacts of environmental parameters on airframe and mission payload.

2.7.4. Military Support to Civilian Authorities (MSCA). Department of Defense (DoD) Directive 3025.1, *Military Support to Civil Authorities*, describes general military support to civilian authorities. Generally, DoD resources are provided only when response or recovery requirements are beyond the capabilities of civil authorities as determined by the Federal Emergency Management Agency (FEMA) or another lead Federal agency for emergency response. Emergency response situations can include firefighting support, any natural disaster (e.g., tornadoes, earthquakes, and hurricanes), and terrorism events.

2.7.4.1. It is impossible to list the broad range of potential disasters and events to which CWTs might be tasked to provide weather support. The following examples provide a general overview of the types of support and forecast products that might be required.

2.7.4.1.1. Example 1. Rescue, evacuation, and emergency medical treatment of casualties, maintenance or restoration of emergency medical capabilities, and safeguarding the public health. Potential forecast products may include MEF support for rescue aircraft/vehicles (to include civil air patrol), solar/lunar data for mission planning, and force protection advisories (e.g., thunderstorm, heat, and windchill advisories).

2.7.4.1.2. Example 2. Emergency restoration of essential public services (e.g., fire fighting, water, communications, transportation, power, and fuel). Forecast support might include precipitation forecasts and atmospheric stability, as well as prevailing wind directions and speeds for firefighting operations.

2.7.4.1.3. Example 3. Emergency clearance of debris, rubble, and explosive ordnance from public facilities and other areas to permit rescue or movement of people and restoration of essential services. This may involve monitoring and decontaminating radiological, chemical, and biological effects; controlling contaminated areas; and reporting through national warning and hazard control systems. Forecast support may involve Chemical Downwind Messages (CDM) and Effective Downwind Messages (EDM), sea tide and current effects on survivors as well as response personnel and vehicles, roadway movement control and planning, weather effects on surface vehicle movement, potential road icing, and weather effects on cross-country mobility.

2.7.4.1.4. Example 4. Safeguarding, collecting, and distributing food, essential supplies, and materiel on the basis of critical priorities. Possible support might include MEFs for supply aircraft/vehicles and weather effects on cross country movement.

2.7.4.1.5. Example 5. Damage assessment. Weather support might include forecasts for cloud free line-of-sight (CFLOS) and surface and slant range visibilities for assessment aircraft.

2.7.4.2. The lead CWT will develop a letter of instruction detailing which products are required, by whom, when, and the method of delivery of those products. Deployed team composition and forecast tools will be tailored to the specific tasked mission. The supporting OWS must be notified as soon as possible to ensure specialized support begins immediately. CWTs will submit Situational Reports (SITREPs) and after action reports (AARs) IAW AFMAN 10-206, *Operational Reporting,* and procedures listed in Chapter 10 of this publication.

2.7.4.3. When National Weather Service (NWS) employs an on-site NWS Incident Meteorologist (IMET), CWTs do not provide the official forecast. Instead, they provide information to the IMET upon request who determines the forecast and disseminates it to the appropriate users. CWTs serve in a support capacity to the IMET. Examples of this support include providing upper air observations (e.g., MARWIN), taking surface observations, accessing products via JAAWIN and OWS web pages, providing flight weather MEFs, etc.

Chapter 3

IMPLEMENTING A MISSION EXECUTION FORECAST PROCESS

3.1. Mission Execution Forecast Process (MEFP) Defined. The MEFP is a systematic and consistent approach to weather forecasting for the tactical/local customer. The process specifies techniques and tools used to forecast individual weather elements, and how to best apply them to the warfighters platforms or requirements. The MEFP is supported by a locally developed set of instructions, information, and guidance that tells CWT personnel what products to use, how to analyze or prepare them, how to apply the derived forecast, and the preferred sequence of events to produce the MEF. The process is a never-ending cycle and changes based on customer needs and feedback. The MEFP works in conjunction with Forecast Reference Notebook (FRN) guidance and shift change/meteorological discussions, and requires constant interaction with customers. **Table 3.1.** lists the specific steps in the MEFP. The rest of this chapter provides guidelines and supplementary material to assist in implementing a MEFP and covers interrelated topics CWTs must consider during the entire process.

Table 3.1. Specific Tasks in the MEFP.

STEP 1 - Determine Mission of the Day (what, when, where, who & how)
1. Mission type (e.g., flying missions: air refueling, troop transport, low-level, drop zone; non-flying missions: resource protection, convoy, maintenance and sortie generation).
2. Mission objective (e.g., air strike, training, jump, and camp).
3. Mission execution times (e.g., aircraft take-off, drop time, airfield opens, AR time, convoy checkpoints).
4. Mission location (e.g., aircraft route, convoy route, designated DZ/AR).
5. Mission tactics (e.g., intelligence, weapons systems, and evasion).
6. Mission profile (e.g., electro-optics, helicopter, NVG, NBC).
7. Mission and supported unit focus (i.e., operator definition of mission success).
8. Mission briefing/decision time.
9. Mission alternatives (e.g., primary, secondary, tertiary routes or targets).
10. Mission support (e.g., AF Communications, SATCOM).
STEP 2 - Define Weather Thresholds
1. Important mission-limiting terrestrial and space weather parameters for specific mission “Know your customers mission and understand their requirements.”
2. Critical “Go/No Go” threshold values for weather parameters (i.e., based on mission, weapon system, aircraft, and pilots).
3. Where are these parameters applied (i.e., airfields, ranges, DZs, ARs, low-fly routes, and communications).
4. Terrestrial and space weather elements that can be exploited to accomplish mission.
Incorporate training requirements.
STEP 3 - Define Products, Services, and Data Types
1. Products, data & services needed and available from OWS, AFWA, AFWA/Space, AFCCC, other units.
2. DoD, public, and indigenous sources.
3. Weather data available in area of operation.

4. Available climatology and sources.

5. Space weather data.

6. Tactical decision aids.

STEP 4 Coordinate Weather Support

1. Determine Lead Unit (multi-units ops) if required.

2. Coordinate MEF issuance times and criteria.

3. Issue Letter of Instruction, if required.

4. Request special terrestrial, climatic, and space weather products IAW AFI 15-118.

STEP 5 Obtain Weather Situational Awareness

1. Understand the "aerospace weather regime."

2. Review Strategic Center products and OWS analysis & forecast products (e.g., hemispheric, synoptic, mesoscale patterns and key parameters, TAFs, METWATCH products).

3. Collaborate with OWS Team (METCONs and discussion bulletins) and provide feedback.

4. Consider geography-related forecast challenges.

5. Exploit other DoD, public, and indigenous sources.

STEP 6 - Conduct Mission-Scale Analysis

1. Focus on mission execution areas.

2. Apply real-time data (i.e., PIREPs, radar, satellite imagery, surface observations, geomagnetic conditions, energetic particles, ionospheric observations).

3. Perform time & space interpolation between OWS & Strategic center products.

4. Integrate geographic, terrain, and vegetation impacts on weather and mission.

STEP 7 Predict Mission Execution Weather Parameters:

1. Apply specific forecast techniques (e.g., icing, turbulence, contrails and local rules of thumb/studies).

2. Integrate information gathered from Steps 1 through 6 to mission forecast.

STEP 8 - Tailor Forecast Parameters to Mission

1. Use TAWS, NOWS, IWEDA, and other tactical decision aids and specialized tools to determine terrestrial and space weather effects to mission.

2. Create threshold-specific output focused on mission impact.

3. Produce MEF in supported unit defined formats.

4. Focus on critical operational thresholds & mission parameters.

STEP 9 - Disseminate MEF

1. Deliver, send, host on LAN/Web page, post, or otherwise make MEF available to customers and all weather units involved.

2. Present MEF (e.g., mass briefing, flight weather briefing, crisis action briefing).

3. Optimize use of MEF and gathered information for other support requirements.

STEP 10 Conduct Mission Watch

1. Continuously monitor mission routes, areas, installation, etc., for significant changes to MEF.
2. Focus on supported unit defined mission-limiting weather thresholds for specific mission.

STEP 11 Update MEF

1. Notify customers of weather parameters crossing mission-limiting thresholds.
2. Provide alternatives to exploit mission weatherobjective is mission success.
3. Update MEFloop back to continuous MEF process.
4. Coordinate with OWS, if required.

STEP 12 Conduct Mission Verification

1. Implement systematic debriefing procedures to analyze and measure MEF performance.
2. Debrief customers using face-to-face feedback.
3. Pass weather debriefs and PIREPs to OWS and other weather team members.
4. Perform technical verification (evaluate forecast skills, under/over forecast, bias, etc.).
5. Conduct operations verification on “Go/No Go” established thresholds.
6. Develop and apply metrics to MEFP improvement, rules of thumb, and lessons learned.
7. Accomplish, document, train with, and crossfeed MEF reviews.

3.1.1. The MEFP will focus on methods to fuse perishable meteorological data, climatology, and CWT expertise with strategic- and operational-level products and information to produce a mission-centered forecast. AFWA supplies strategic-level products and the meteorological databases, while the OWS supplies the raw meteorology and a suite of operational-level forecast products for their theater. CWTs will document data sources (primary and backup) and products used in the MEFP and modify those products as needed to fit the mission and delivery of weather intelligence to the customer.

3.1.2. CWT leadership will develop and continually refine the MEFP to ensure repeatable and measurable outcomes to meet their customers needs. The MEFP must identify methods of forecasting mission-critical weather elements anywhere in the world and whenever the customer needs the information. The process is a never-ending cycle and changes based on customer needs and feedback. The illustration in **Figure 3.1.** provides an overview of the key processes and how they interrelate in managing and developing a MEF.

Figure 3.1. The MEFP.

3.2. The MEF Management Process. MEF management establishes the basic framework for producing, verifying, and improving the unit's forecasts and contains five major objectives (see **Table 3.2.**). The first three objectives establish the structure for MEF development. These objectives determine which weather elements will be emphasized in the CWT's forecast, when and where they will be applied, and the timing and format for delivery to the customer. The remaining two management objectives are geared towards ensuring constant improvement.

Table 3.2. MEF Management Objectives.

1. Define the weather thresholds critical to the mission.
2. Define the area of operations.
3. Define the customer's needs.
4. Compile and analyze metrics.
5. Improve the MEFP.

3.2.1. CWT leadership will understand and document the meteorological impacts on their customers operations, their operational decision making processes, and how the timely infusion of weather forecast information will favorably impact the outcome of the mission. Based on a full understanding of the weather impacts and employment methods, CWT leadership will develop procedures to produce weather forecast products meeting the decision-maker's needs in both the planning and execution phases of their operations.

3.2.2. For recurring missions, CWTs will document these procedures in standing operating procedures (SOPs). **Attachment 4** is a benchmark SOP that shows how one CWT documented their MEFP

to optimize efficiency for recurring missions. A less formal process may be used to handle short-term or one-time requests for weather forecasts.

3.2.3. To develop the MEFP and effectively manage the process, CWT leadership must address the following items and ensure the information is integrated into MEF procedures:

3.2.3.1. Customers of the MEF. Although the warfighter is normally the CWTs primary customer, other base/post personnel require weather support to accomplish their missions. For example, transportation, maintenance, civil engineering, and logistics activities are affected by certain weather conditions. CWTs must know *all* of their customers to develop MEFs that meets their needs.

3.2.3.2. Mission-Limiting Meteorological Parameters of Supported Weapons Systems. Every military operation will be impacted in some fashion by the state of the atmosphere. Weather (including space weather) conditions will impact execution decisions by dictating tactics or the weapon system employed. CWTs must know all of their customers requirements and what their sensitivities are so that weather support provided meets *all* customer needs.

3.2.3.2.1. Sources of Weather Sensitivities. The Army Research Lab (ARL) and the 88th Weather Squadron develop Army and Air Force aircraft and weapons sensitivities. These sensitivities, are on the Operations Weather Limiters (OWL) Network located on the web page of each OWS, AFCCC, and AFWA/XOP, Field Support Division (located on the AFWA web page.) Space weather impacts on systems are listed in **Attachment 2**. CWTs will reference these sensitivities and continuously develop and document their own list of supported customer sensitivities in the MEFP. This documentation will include the unit or activity supported, the mission or operation involved, the impact of the critical weather threshold on that mission or operation, the action the customer takes when threshold values of critical elements are observed or forecast, and the desired lead-time of notification if applicable.

3.2.3.2.1.1. During joint or combined operations, the CINC SMO or JMO (as designated) will refine and tailor critical thresholds to meet the mission as specified by the joint force commander. These are normally published in the applicable METOC Letter of Instruction or posted on secure web pages.

3.2.3.2.1.2. Some CWTs supporting Army operations may find collecting sensitivities from the various battlefield functional areas a problem. Army Field Manual 34-81-1, *Battlefield Weather Effects*, provides some of the more common, critical weather effects on Army activities. If CWT leadership is having trouble overcoming a reluctance to provide this information, they should seek help from the Army J2/G2/S2.

3.2.3.2.1.2.1. Army support CWTs will be familiar with the Intelligence Preparation of the Battlefield (IPB) process and incorporate it into their MEFP. Army Field Manual 34-130, *Intelligence Preparation of the Battlefield*, provides guidance and will be available for technicians to reference both in-garrison and while deployed. Air Weather Service Technical Note 85/002, *Intelligence Preparation of the Battlefield, A Staff Weather Officers Guid*e, (although dated) contains a summary of IPB and describes several techniques for identifying and applying weather thresholds for Army customers. CWTs can order Technical Note 85/002 from the Air Force Weather Technical Library (AFWTL).

3.2.3.2.2. Weapons System Weather Experts. CWT personnel will be the weapons systems weather experts applying forecasts to known limitations of a particular weapons system. Operations have weather limits that may be more restrictive than the weapons system. For example, there are normally different thresholds for offensive counter air and defensive counter air, even though they are both conducted by F-15Cs. Remember that soldiers and airmen also are weapons systems and have well defined thresholds. Therefore, understand how the weather impacts *all* weapons systems in order to provide more meaningful support. Combat services and support, maintenance, security, and logistics operations are heavily impacted by human comfort factors (e.g., wind chill and heat stress) and safety requirements (e.g., lightning or high surface winds).

3.2.3.2.3. Go/No-Go (red/yellow/green) versus Risk Management. A majority of the mission-limiting weather parameters are based on peacetime safety of flight or training thresholds. During contingency, wartime or any other conflict, CWTs must look at weather limitations as part of a risk management analysis. Depending on the importance of the mission, target planners will have to determine the number of aircraft, tanks, helicopters, UAVs, etc., needed to get the desired damage or mission success based on the weather conditions. For example, a brigade is scheduled to cross a river at a given date/time. As part of the crossing preparations, the Air Force has been tasked to reduce the enemy armor forces in the AOR no later than 3 hours prior to the crossing commencing. With low ceilings and reduced visibility forecast, air planners have to schedule additional sorties to reduce the enemy as requested by the CINC. In this case, a Go/No-Go forecast would not work. Planners need to know that they will have less than optimal conditions to work with. The commander must assess the risk of trying a mission in inclement weather. He or she may be forced to lower the “GO” weather threshold to accomplish the mission.

3.2.3.2.4. Sensitivity Documentation and Training. Customer sensitivity documentation will be reviewed/updated for accuracy at least annually. If unclassified, it will be maintained in a location easily accessible to all personnel. This locally derived customer weather sensitivity information should also be passed, and updated as necessary, to the OWS.

3.2.3.2.4.1. CWTs will conduct initial training on the identified sensitivities and weather impacts and conduct refresher training, at minimum, annually and when known changes occur. Document initial certification training in the appropriate training records and record refresher as part of the units Continuation Training (CT) program.

3.2.3.3. Customers Mission and Operating Areas. Operational units with their associated weapons systems usually train in predictable locations (i.e., ranges, Military Operating Areas and drop zones), but deploy and go to war in less predictable locations. CWTs will be extremely familiar with their customer's training sites and have a close working relationship with the intelligence community to permit gathering information critical to supporting the mission of the parent or host unit when it deploys. The Expeditionary Aerospace Force (EAF) concept adds more predictability to the "go to war" side of the equation, presenting opportunities to know in advance where and how your customers may be employed. CWT leadership will ensure that all unit members are familiar with their customers Operation Plan (OPLAN) tasked Area of Operations (AO), as well as the OWS tasked to support that AO. Understanding what products are available and how to access and use them will facilitate an easy transition from peacetime to wartime.

3.2.3.3.1. Anticipate and Exploit. A properly developed and executed MEFP will enable a CWT to move from a "cope and avoid" to an "anticipate and exploit" operations philosophy. This can only be accomplished by understanding all aspects of the customers mission and actively applying all weather impacts. CWTs must work as a team with their respective customers Army and Air Force air, ground, space operations, schedulers, and planners to establish pre-execution, "mission-check" time points to cross-check forecast mission-impacting weather criteria with upcoming missions. CWTs then need to document these time points within their MEFP to "anticipate and exploit" the environment. Similarly, Army CWT leadership must interface with planners to interject tailored weather inputs at the proper time points within the Armys decision making process cycle. Effective, mission-enhancing CWT staff and operational weather support starts well before mission execution. Methods of anticipating and exploiting terrestrial and space weather are as follows:

3.2.3.3.1.1. Using historical weather information for planning, staging, and executing worldwide military operations. In many cases, especially in the Third World, climatological data provides the only meteorological information available. Such information includes, but is not limited to, summarized historical information, derived environmental impacts on weapon systems, and tailored narrative studies. Exploiting this information can allow the warfighter to take advantage of favorable meteorological conditions, minimize impacts of adverse conditions, or use unfavorable conditions to gain advantage. For example: knowing the high probability of dust storms in Southwest Asia during the US hostage rescue mission in Iran, may have improved the likelihood for success in the operation. The location may have been altered or the number of assets could be adjusted.

3.2.3.3.1.2. Providing a commander with knowledge of types and levels of possible degradation to communications, radar, and navigation systems due to solar and geomagnetic disturbances that can cause mission impacts. CWTs should interpret and extract relevant space weather information from OWSs and AFWA and provide it to supported commanders to mitigate the problems to friendly forces or exploit the space environment to gain an advantage over adversaries. For example: knowing a solar flare would hamper communications capability between enroute aircraft and C2, back-up communications plans (e.g., timing and mode) and special communication outage procedures could be planned.

3.2.3.3.1.3. Providing a commander with knowledge of weather impacts to operations can alter the success of the mission. For example, when airfields are constrained by the number of aircraft on the ground at one time, knowledge of impending thunderstorms and their affect on transient aircraft will be useful in determining mission launch/recovery schedules, crew rest schedules, and aerial port operations. Timing of airlift flow and availability of cargo handling assets may be adjusted to ensure departure reliability and on-time delivery.

3.2.3.3.1.4. CWTs must not restrict the calculations of weather effects on weapons systems to U.S., Allied, Coalition, or friendly forces only, but also concentrate on enemy weapons systems. Ideally, CWTs would help friendly forces anticipate favorable weather while simultaneously taking advantage of the enemys unfavorable weather. CWTs must know the differences between friendly forces weather restrictions and enemy weather restrictions. CWTs need to work closely with their respective Army and Air Force intelligence personnel to identify key warfighter thresholds.

3.2.3.3.1.4.1. When radars or other C4ISR systems have to be off during hazardous weather conditions, CWTs should let planners and operators know when their systems are vulnerable. Working with intelligence personnel, CWTs would determine if weather impacting enemy weapons systems would increase or decrease this vulnerability. This allows operators plan to have alternate systems available or determine alternate courses of action.

3.2.3.3.1.4.2. On D-Day, based on weather forecasts, commanders chose a time favorable for the invasion. Foggy weather provided favorable cover for invading forces, but at the same time it was unfavorable for the enemy because conditions were too poor for enemy aircraft to operate on the first day to provide close air support.

3.2.3.4. The CWTs Role in Customer Operations. For multi-unit operations, a designated unit will function as mission lead. Lead weather units are those units supporting the command and control element of a particular multi-unit operation. The lead weather unit provides a CMEF for the common mission area to the participating units. Coordination of the MEF is done to ensure the forecast is delivered in a timely manner. The lead weather unit may be a CWT, an OWS, or a specialized forecast unit such as a MAJCOM weather support unit. In general, the weather unit supporting the missions command and control element is the lead weather unit. AFMAN 15-129, Chapter 5, *Aerospace Weather Operations - Processes and Procedures*, provides specific rules for determining the lead weather unit and paragraph **2.4.** of this manual provide examples of lead weather unit and CWT interaction. Other participating CWTs will follow the lead/direction of the lead weather unit. Army CWT leadership should identify roles and missions with their parent Division and Corps weather teams.

3.2.3.5. MEF Format. The MEF is customer-focused and not dependent upon a set format. CWTs will work with customers to determine the contents and format of the MEF. Examples of MEF developed by other CWTs can be viewed from the AFWA Field Support Branch web page. Unless specifically requested by a customer, CWTs should present the effects of the weather, not the dynamics causing the weather. A MEF could include, but is not limited to, a traditional DD 175-1 flight weather briefing.

3.2.3.5.1. Red/Green/Yellow stoplight products work best early in the decision cycle, while later in the cycle customers require more detailed products. CWTs can use software programs such as Integrated Weather Effects Decision Aid (IWEDA), Weather Impact Decision Aid (WIDA), Infrared Target-Scene Simulation Software (IRTSS) when available, Night Vision Goggle Operational Weather Software (NOWS), and Target Acquisition Weather Software (TAWS) to present the forecast and its impacts in a format useful to the customer.

3.2.3.6. MEF Delivery. CWT leadership will meet with their customers to tailor the MEF delivery method and timing to fit mission requirements. Examples of MEF delivery include in-person delivery, e-mail, File Transfer Protocol (FTP), post to a web site, access to IMETS visualization or web site products via the ABCS, fax to the customer, etc. CWTs will tailor MEF delivery to critical decision points within the operational cycle where a weather forecast would provide the maximum benefit to the successful outcome of the mission.

3.2.3.6.1. CWTs supporting an Air Force Wing will typically prepare forecasts for sortie allocation 48 to 72 hours before mission initiation. Aircrews generally begin flight planning 24 to 48 hours before takeoff and receive a flight weather briefing 1 to 3 hours before take-off. The

maintenance operations center has unique forecast requirements and timelines in order to prepare an aircraft for flight. Fuels and logistics have similar timelines and unique forecast needs.

3.2.3.6.2. CWTs supporting an Army Corps will typically prepare forecasts for the AO (500-by-500 miles) out to 96 hours. They are more concerned with the big picture to coordinate operations and arranging logistic support to maneuver forces. At the opposite end of the spectrum are CWTs supporting an aviation brigade, which is in "execution-mode." The aviation brigade will likely need highly detailed weather forecasts for the next 6-12 hours from takeoff to target and back.

3.3. Developing the MEF. This is the most challenging segment of the MEFP. CWT leadership must ensure technicians have the proper tools to accurately forecast the mission-limiting meteorological parameters and support all customers identified during MEFP management phase. CWTs will have a defined methodology to use climatology, perishable weather data, strategic- and operational-level forecast products, forecasting techniques, and a logical, verifiable process to produce a meaningful MEF. Data sources must be identified, forecast methods must be documented, and methods of obtaining weather situational awareness must be described.

3.3.1. The methods and procedures used to develop the MEF must be repeatable and verifiable. **Table 3.3.** contains the basic objectives of MEF development.

Table 3.3. MEF Development Objectives.

1. Determine the mission(s) of the day.
2. Obtain data.
3. Gain weather situational awareness.
4. Conduct mission analysis to determine forecast challenges.
5. Tailor the forecast(s)
6. Disseminate the MEF(s) and update/adjust as needed.

3.3.1.1. Other critical elements of MEF development include, but are not limited to, the following:

3.3.1.1.1. Performing a terrain analysis for impact on mission-scale meteorology (i.e., upslope/downslope effects, moisture sources, and lake/sea breeze effects).

3.3.1.1.2. Using climatology to gauge expected conditions for a forecast region.

3.3.1.1.3. Interpreting and applying operational- and strategic-level weather products for mission-specific time and location and acquiring operational-level weather databases (i.e., FRNs and regime studies).

3.3.1.1.4. Obtaining and applying perishable meteorological data (e.g., radar data and lightning strike plots).

3.3.1.1.5. Applying meteorological rules-of-thumb or documented forecast methods to determine mission-limiting meteorological parameter(s).

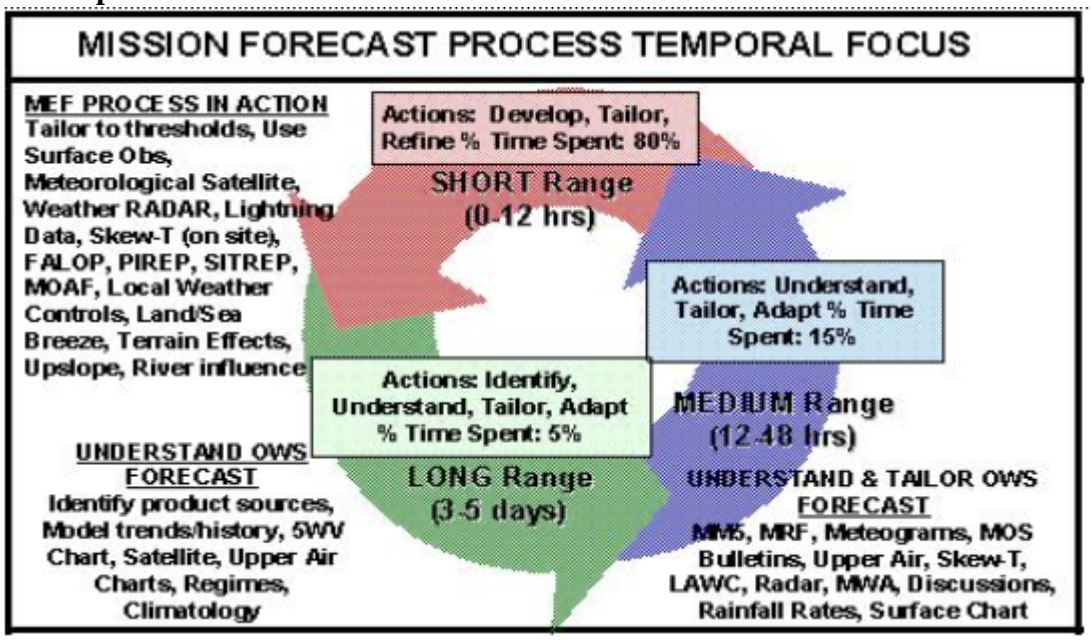
3.3.2. AFWA Technical Note (TN) 98/002, *Meteorological Techniques*, will be fully incorporated into the MEFP, and be used as a baseline for best practices for forecasting techniques.

3.3.3. CWTs will identify rules-of-thumb and local forecasting techniques to enhance MEF accuracy and applicability to the customers needs. CWTs will locate established rules-of-thumb (ROTs) for deployed AOs for which their customers are tasked.

3.3.4. CWTs will maintain consistency with OWS-issued products as they develop their MEFs. CWTs may supplement the TAF, MOAF, or maneuver area forecast as necessary in MEFs to meet the requirements of supported agencies. However, the CWT will not provide a MEF that crosses standard operational thresholds (i.e., TAF and MOAF amendment criteria, WW & WA criteria) without first coordinating the change with the supporting OWS, unless it is critical to flight safety or when weather conditions are rapidly changing and prior coordination is not possible. Coordination will also facilitate the understanding of meteorological reasoning and improve mission specific forecasts. During joint/combined operations, CWTs will maintain consistency with JMFU and JMO operational guidance.

3.3.5. A MEF may support more than one mission. For example, a single MEF could support base/post operations and local flying. It could also serve as a stand-up briefing product for commanders briefings. **Figure 3.2.** shows the relationship of integrated actions during MEF development. **NOTE:** The averages of time spent will differ for Army support CWTs. Time spent on each piece of the process will be a function of the echelon and mission that the CWT supports.

Figure 3.2. Temporal View of the MEFP.



3.3.6. For CWTs supporting the tactical Army, the MEF development is accomplished in the following manner:

3.3.6.1. The IMETS ingests data through the T-VSAT or tactical SIPRNET sources when available. The IMETS also ingests local supplemental information such as FALOP, ARTYMET, and UAV data to enhance preparation of the forecast and the subsequent products which are derived for the Army Battle Command System (ABCS).

3.3.6.1.1. IMETS products are disseminated through client-server applications, such as the Integrated Weather Effects Decision Aid (IWEDA) and Weather Feature, as overlays on the Common Tactical Picture (CTP), and as webpage graphics and text products. IMETS also dis-

seminates products as US Message Test Format (USMTF) messages (e.g., weather warnings) and as specialized SWO briefings, such as the BUB and Deep Cell planning briefs.

3.3.6.2. The missions of the day are determined from the OPORD available through the ABCS software and through personal contact between the Staff Weather Officer (SWO) and the J3/G3/S3 and J3/G2/S2 staff (e.g., during BUBs). Situation awareness is maintained digitally using the CTP displays.

3.3.6.3. Mission analysis is accomplished in a variety of ways. Using the surface data editor, the CWT can display current data on the CTP using the same map backgrounds common to all ABCS users. Forecast conditions can be displayed out to 48 hours using the Gridded Met Display feature. A four-dimensional depiction of atmospheric phenomena such as icing, turbulence, and wind fields can be rendered using the IMETS Vis5D application.

3.3.6.3.1. The CTP provides the SWO with an automatically updated view of the Order of Battle (disposition of friendly and threat forces) over common map backgrounds over the AOR. Mission analysis is further enhanced through direct interaction with the J3/G3/S3 and J3/G2/S2 and digital interaction with the other Battlefield Functional Area (BFA) operators in the TOC.

3.3.6.4. The forecast is tailored by combining local weather reports from all sources into the continuously updated NOWCAST generated on the IMETS and by the transmission of model data from the supporting OWS. This combination results in the customer support products, mirrored beyond the 12-hour point at the OWS. Appropriate portions of the model data are used to automatically populate the Joint Common Database (JCDB) from which weather products can be derived at echelons not having direct CWT/IMETS support.

3.3.7. MEF Worksheets/Checklists. The MEF worksheet or checklist is a tool to document, track, and evaluate MEF production. It may contain forecast rules-of-thumb, question and answer discriminators, decision-logic trees, etc., to help develop a MEF. A good worksheet/checklist will help organize thought processes and guide CWT technicians toward production of a quality, customer-focused product. CWTs will develop MEF worksheets based on their production cycle, missions of the day, and critical meteorological thresholds. One worksheet may be used for multiple missions if the mission profile/weapon systems are the same. MEF worksheets are not required for Flight Weather MEFs prepared on DD Form 175-1 (or MAJCOM equivalent) forms. A MEFP worksheet/checklist should:

3.3.7.1. Provide a logical step-by step sequence of events.

3.3.7.2. Aid in reviewing and collating essential information.

3.3.7.3. Promote evaluation of data as it is received.

3.3.7.4. Depict data in a format that is easily derived, rapidly entered, and quickly digested.

3.3.7.5. Minimize rechecks of data evaluated earlier.

3.3.7.6. Minimize overlooking significant parameters by focusing attention on key elements.

3.3.7.7. Provide detailed information on timing and significance of expected changes.

3.3.7.8. Flag times and critical thresholds for intensifying MISSIONWATCH.

3.3.7.9. Aid in identification of procedural or training problems.

3.3.7.10. Foster continual improvement of the MEFP.

3.4. MISSIONWATCH. Ideally, for greatest mission benefit, CWTs will conduct a MISSIONWATCH from the beginning to the end of every customers mission. The MISSIONWATCH will target the supported customers defined mission-limiting meteorological parameters, windows of opportunity to affect mission success, and a communications capability to deliver information to the customer. CWTs interacting with the mission controllers or decision-makers (e.g., customers operations section, G3/S3, T-UAV controllers, command post, Air Traffic Controllers, and/or the Supervisor of Flying) at key intervals enable units to fully "anticipate and exploit" the weather. More details on MISSIONWATCH are located in **Chapter 5** of this manual.

3.5. Post-Mission Analysis and Verification. Meaningful feedback of mission forecasts is critical to the continuous improvement and success of the CWT. CWTs will establish procedures to evaluate their MEF products and obtain customer feedback based on customer defined thresholds, critical points of mission failure, and elements of quality assurance (e.g., timeliness, effectiveness, accuracy) concerning the effectiveness of weather services. Additional information is found in **Chapter 6** and AFI 15-114, *Weather Support Evaluation*.

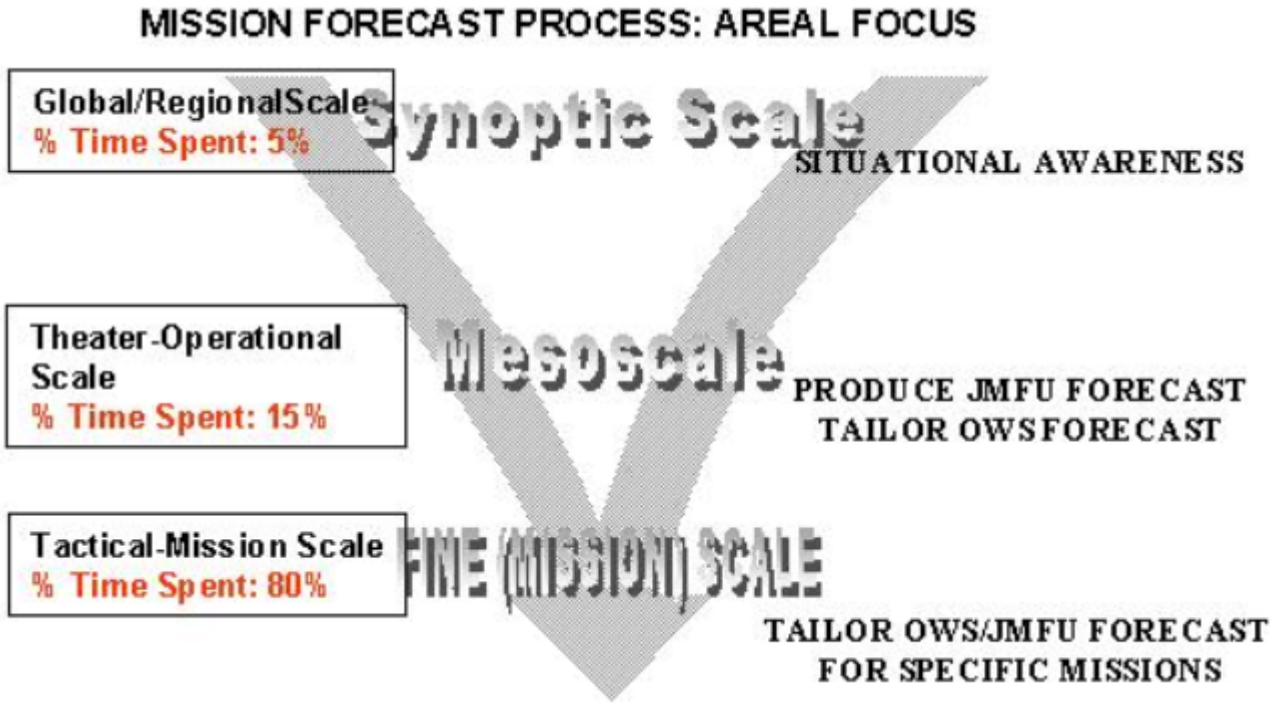
3.5.1. Compile Metrics. CWTs will establish procedures to compile metrics information from the evaluation of products. Procedures will include steps to advise customers on the status of weather support, inefficiencies in operations that could be mitigated based on additional weather information, and potential opportunities for improvement. CWTs will ensure information is forwarded to MAJCOMs as appropriate. Additional information is found in **Chapter 6** and AFI 15-114, *Weather Support Evaluation.*

Chapter 4

APPLICATION OF FORECAST PRODUCTS TO THE MEFP

4.1. General. CWTs are the experts in the application of meteorology to customers weapons systems and missions of the day. CWTs collect and analyze data to predict the state of the atmosphere by fusing perishable meteorological data with strategic-level forecast products from AFWA and operational-level forecast products from an OWS or a Joint Meteorological Forecast Unit (JMFU). They tailor the product for the customer by customizing the forecast based on mission-limiting meteorological parameters and then disseminate the MEF in a customer-focused format. **Figure 4.1.**. depicts the areal focus of the MEFP.

Figure 4.1. Areal Focus of the MEFP.



4.1.1. Establishing Meteorological Situational Awareness. CWTs will develop procedures to establish meteorological situational awareness using AFWA-generated strategic products and OWS-generated operational products. This baseline awareness provides the foundation of MEF development and subsequent product generation.

4.1.1.1. At the top of the forecast funnel, strategic products provide threat assessments of hemispheric/synoptic phenomena, provide forecasts of meteorological events for time scales at 72-240 hours, and cover voids in OWS coverage. Strategic products will provide a general synopsis of the hemispheric/synoptic patterns, major/minor systems, and indicators of weather threats (e.g., thunderstorms, turbulence, icing, low clouds). Local procedures will specify which products and forecast periods to review based on the missions of the day.

4.1.1.2. OWSs generate products covering their AOR to satisfy meteorological and operational customers. Based on missions of the day, CWT procedures will specify the OWS analysis and forecast products required for establishing meteorological baseline awareness. At the simplest level, the baseline will provide an understanding or the current/forecast regime and weather ele-

ments (e.g., sky condition, precipitation, and hazards). Once the CWT establishes situational awareness, CWT procedures will specify the OWS operational products required to develop more specific forecasts (e.g., 2BKN 5OVC, RASH, LGT TURBC SFC-050) for the MEF.

4.2. Integration of Products in the MEFP. Once CWT personnel achieve situational awareness and acquire the operational products from the OWS, they will integrate real-time information to determine the location, movement, and development of weather features. Then they will forecast how meteorological features will impact the mission. CWTs will develop procedures for using data in the MEFP as outlined below:

4.2.1. Pilot Reports (PIREPs), Air Reports (AIREPs), and Significant Meteorological Information (SIGMETs). CWTs will actively monitor and apply PIREPs, AIREPs, and SIGMETs in areas where local customers are operating. PIREPs, AIREPs, and SIGMETs may be obtained over the Pilot-to-Metro Service (PMSV) Radio, via the Automated Weather Network (AWN), from debriefs or from various Internet sites, and tactical operations center radio traffic. CWTs will coordinate with Air Traffic Control (ATC) personnel on the development of local procedures to ensure weather personnel receive PIREPs. SIGMETs will also be obtained from the National Weather Services (NWS) Aviation Weather Centers (AWC) Internet site, as well as the AWN. OCONUS CWTs can access variations of SIGMETs via coalitional and foreign national meteorological services. CWTs will apply information gleaned from these sources to their MEF. In wartime, comparable information is obtained through appropriate secure methods such as post-mission debriefs, Target Weather Indicators (TARWIs), Special Weather Intelligence (SWI), etc.

4.2.2. Radar. CWTs will use radar information to visually identify and monitor mission significant weather.

4.2.3. Satellite Imagery. CWTs will use meteorological satellite (METSAT) imagery analysis to enhance understanding of the location, movement, and development of weather features, and as a briefing tool.

4.2.3.1. CWTs will ensure imagery is best suited for current situations (e.g., IR for cloud top measurement, visual for outflows, Defense Meteorological Satellite Program [DMSP] night visual for fog, Environmental Data Records [EDRs] to support Engineer trafficability products and sectorized imagery for microscale).

4.2.4. Lightning. When available, CWTs will monitor current lightning display systems to enhance “eyes forward” support, aid in MISSIONWATCH, and refine the MEF.

4.2.5. Weather Observations. CWTs will ensure current observations are used to develop their MEF. CWTs will decrease areal observation coverage but increase the frequency of review as the operator moves closer to mission execution.

4.2.6. Mesonets. Mesonet is the combination of words, “mesoscale” and “network.” In effect, a mesonet monitors weather conditions in a network size ranging from a few kilometers to a few hundred kilometers. CWTs with mesonets in their customers operating locations should integrate such information into their MEFP and MISSIONWATCH procedures. This may require implementation of a Memorandum of Agreement between the CWT and data collectors.

4.2.7. VideoCams. Many VideoCams exist throughout the world that present live footage of sky conditions. VideoCams are easily accessible via various Internet web sites. CWTs should monitor applicable sites as pertinent to their customers operating areas. CWTs should also consider installing a

VideoCam at the airfield to enhance METWATCH and “eyes forward” support. However, VideoCams should be installed with Operations Security (OPSEC) in mind; i.e., orient them in such a way that they dont reflect the number of aircraft on the ramp or the tempo of flight line activity.

4.2.8. Unmanned Arial Vehicles (UAV). CWTs supporting UAV operations can glean valuable forward area weather intelligence from the on-board visual UAV cameras. CWT leadership should have access to the readout in the UAV cell if at all possible.

4.2.9. Spotters. CONUS CWTs will research availability of, and if possible, glean information from local spotters. The county Emergency Management Agency (EMA) is typically the focal point for organizing spotting activities. CWTs can also call the nearest NWS office. The Warning and Coordination Manager (WCM) can provide information on accessing spotter information. Whenever CWTs receive severe weather information, after ensuring all Weather Warnings (WWs) have been issued (see **Chapter 7**), they will pass all severe weather information to their supporting OWS.

4.2.10. NOAA Weather Radio. CWTs in the CONUS, Alaska, Hawaii and the U.S. Pacific Territories should monitor National Oceanic and Atmospheric Administration (NOAA) weather radio broadcasts for NWS issued warnings, watches, and other hazard information. CWT leadership should consider having access to NOAA weather radio broadcasts after normal duty hours.

4.2.11. CWTs will monitor and integrate surface and upper-air observations produced by Army personnel.

4.2.11.1. Forward Area Limited Observing Program (FALOP). Doctrinally, the Army is responsible for collecting weather and environmental data forward of the division main command post in support of Army operations. For this reason, a FALOP, a weather data collection program forward of the brigade is required. The S2 at brigade/battalion transmits the FALOP observations to the division/brigade. If necessary, CWT leadership should engage the G2/S2 to buy the appropriate equipment and to ensure the soldiers are motivated to cooperate. The FALOP code can be located in AFMAN 15-124, *Meteorological Codes*.

4.2.11.2. Artillery Meteorological (ARTYMET). ARTYMET sections provide meteorological data for artillery firing units. They also provide upper-air observations and artillery limited surface observations (ALSOs) to CWTs.

4.2.12. Upper-Air Sounding Data. CWTs 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. CWTs may use the Integrated METEOGRAM and SKEW-T (IMaST) program provided by the Joint Air Force and Army Weather Information Network (JAAWIN), New Tactical Forecast System (N-TFS), or IMETS to build METEOGRAMS and SKEW-Ts. 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).

4.2.12.1. CWTs will perform specialized analysis (e.g., analysis of radar refractivity to identify ducting) to provide specific mission support.

4.2.12.2. AWS TN-79/006, *Use of the Skew-T, Log P Diagram in Analysis and Forecasting,* describes techniques for analyzing atmospheric soundings.

4.2.13. Climatology. CWTs will apply climatological data to the MEF as appropriate using available data. If data is unavailable, CWTs will submit a request to AFCCC for the product in accordance with (IAW) Air Force Instruction (AFI) 15-118, *Requesting Specialized Weather Support*.

4.2.14. Space Weather Products. OWSs will post AFWA space products on their web site for easy access by CWTs or transmit to tactical units using T-VSAT. CWTs may contact AFWA Space Operations Center directly for product clarification or tailoring. CWTs whose customers are impacted by space weather (e.g., Army communicators) will integrate applicable space products into their MEFP and MISSIONWATCH process. See **Chapter 8** for further information on space weather and space weather products.

4.3. Use of Department of Defense (DoD) Weather Products. A CWT will use the products created by the OWS supporting their AOR in conjunction with products posted to the Joint Air Force and Army Weather Information Network (JAAWIN). Operational products available from the Tanker Airlift Control Center (TACC), the ACC Weather Support Unit (ACC WSU), or other DoD units as part of a combined or joint mission will be designated by the SMO and/or JMO and used as appropriate for the respective mission. U.S. Navy products (e.g., those posted to Joint METOC Viewer [JMV]) will be leveraged by CWTs.

4.3.1. Other METOC Sources. Appendix D of Joint Pub 3-59, *Joint Doctrine, Tactics, Techniques, and Procedures for Meteorological and Oceanographic Operations*, references data sources available from non-METOC operations within the DoD. All CWTs will be knowledgeable of these sources and apply the data to the MEFP for their respective missions, as applicable. For joint/combined operations, the SMO and/or JMO will designate applicable sources in the METOC LOI pertinent to the operation.

4.4. Use of Non-DoD Weather Products. Some federal and host nation weather agencies post products on their web sites that provide useful tools for CWTs. For example, the NWSAviation Weather Center (AWC) provides civilian SIGMETs and the Storm Prediction Center (SPC) provides severe weather reports. Products obtained from non-U.S. but International Civil Aviation Organization (ICAO) authorized production centers (e.g., Japan Meteorology Agency) may be used. CWTs may access and apply these products as they deem necessary, but must understand the timeliness, strengths and weaknesses, and accuracy of the products being used. Preferably, CWTs will use these products in conjunction with DoD products, not as stand alone guidance.

4.4.1. CWTs may use real-time satellite imagery and lightning/radar composites produced by educational institutions (e.g., University of Wisconsin), but only as a back-up to primary DoD sources. CWTs will access Canadian lightning/radar composites to brief aircrews transiting Canadian airspace. Canadian lightning and radar composites are located on JAAWIN and through Canadas Environment Canada (EC) web site. Note that the lightning strike data on the EC web site is “near” real-time.

4.4.2. Commercial web sites (e.g., Weather Underground and The Weather Channel) do not provide products or services that AFW CWTs use for operational military customers. They may however be used as backup sites to access satellite imagery, etc., when all other sources are unavailable.

4.4.3. CWTs will guard against building deployed weather support around non-DOD web sites, as security restrictions may not allow their use during contingencies (only SIPRNET may be available).

4.5. Product Tailoring. CWTs will obtain, examine, and if necessary, modify significant meteorological parameters from products issued by strategic centers and OWSs to suit the requirements of the MEF being developed. For example, the OWS may issue a forecast Horizontal Weather Depiction (HWD) for the AOR. A CWT producing a MEF for an Army helicopter brigade training in the mountains will need to adjust the OWS forecast ceilings in the MEF as the mission traverses from valleys to peaks. Tactical Army CWTs produce the majority of customer products from the IMETS.

4.5.1. To produce a MEF, CWTs will mission tailor all products used for terrain, local effects, and diurnal changes, while considering the thresholds of critical importance to the supported customer. This tailoring may be accomplished physically on a computer or through mental and visual interpolation.

4.5.1.1. To assist with product interpretation, CWTs will employ the following guidelines to ensure consistency:

4.5.1.1.1. AFWA products will be used as the baseline barring availability of OWS products. When AFWA and an OWS provide products for a specific AOR, the OWS product will be used as a baseline.

4.5.1.1.2. CWTs will use products from the OWS having primary responsibility for the AOR. When OWSs include areas outside their AOR in a product, CWTs will consider the meteorological reasoning and contact the primary OWS for clarification.

4.5.1.1.3. When using OWS products, CWTs will weight finer scale, more mission-focused forecasts over broader scale, less mission-focused forecasts when producing the MEF. For example, one would normally weight a TAF in the mission area over a broad regional forecast and a point-in-time product near the mission execution time over a time-phased product. CWTs will use basic meteorological forecasting techniques to determine/interpolate mission impacting weather between forecast time steps and between standardized weather thresholds. OWS model analysis and top-of-the-funnel discussion products serve as a basis for applying forecasting techniques.

4.5.2. CWTs will develop procedures to notify AFWA, OWSs, or other CWTs when product contents cross operational thresholds and require adjustments. CWTs will notify their MAJCOM/DOW when there are indications of systemic problems with achieving/maintaining product consistency between units.

4.6. OWS Products. OWSs provide standardized two- and three-dimensional mesoscale forecast products of such resolution that CWTs can glean the information needed to support a specific military operation. These products are a mixture of alphanumeric bulletins, forecaster-machine graphics, and automated visualizations. CWTs will use OWS products to the maximum extent possible and incorporate the basic products into their MEFP.

4.6.1. IMETS Gridded Data Cubes. AFWA transmits the Mesoscale Model Version 5 (MM5) in the form of gridded numerical model output via the Tactical Very Small Aperture Terminal (T-VSAT) to IMETS deployed in theater. After post-processing on the IMETS, CWTs will use that data cube, together with locally derived information, to develop and tailor subsequent weather intelligence products for its customers.

4.6.2. "Push" Products. OWSs will automatically push the products listed in **Table 4.1.** to CWTs as they are produced and amended. CWTs will apply these products to the MEFP and tailor as necessary.

Deployed CWTs will receive the same suite of pushed products although bandwidth restrictions and communication limitations may require some adjustments to the suite. The CWT will coordinate delivery of products with the supporting OWS.

4.6.2.1. IMETS "Push" Products. OWSs will upload selected bulletins to AFWA for retransmission via T-VSAT to Army support CWTs. CWTs will apply these products to the MEFP and tailor as necessary. For example, CWTs using IMETS will have the ability to tailor the data cubes with local observations to create tailored, high-resolution products for their customers.

Table 4.1. Products Pushed to CWTs from OWSs.

Meteorological Satellite (METSAT) Products.
Location-specific Mission-scale Visualizations.
Theater Icing Forecasts (6,12,18, 24, 36, 48, 72 hour).
Theater Turbulence Forecasts (6, 12, 18, 24, 36, 48, 72 hour).
Horizontal Weather Depictions (6, 12, 18, 24, 36, 48, 72 hour).
Theater Surface Pressure and Fronts (6, 12, 18, 24, 36, 48, 72 hour).
Military Weather Advisories and Amendments.
Space Weather Products.
Four-dimensional Gridded Model Data (IMETS only).
All Alphanumeric Products (TAFs, WWs, WAs, Watches, Discussion Bulletins, Space Weather, and MOAFs).

4.6.3. "Pull" Products. OWS products not pushed to the CWT will be posted on the OWS web site for personnel to access in a pull method. The minimum suite of products each OWS will produce is listed in Chapter 2 in AFMAN 15-129, *Aerospace Weather Operations - Processes and Procedures.*

4.6.3.1. CWTs may also pull products from JAAWIN or other sources using guidance in paragraphs **4.3.** and **4.4.** in this chapter.

4.7. Mission-Scale Visualizations. OWSs will produce and disseminate mission-scale (i.e., a scale so small that valleys are differentiated from surrounding hills) visualizations for CWTs in their AORs. These visualizations are generated from the MM5 and provide a "postage stamp size" (e.g., 500 km by 500 km) 3-dimensional resolution of meteorological parameters over a specified period of time. CWTs will analyze these visualizations, adjust for terrain and local effects, and apply the information to the MEFP. CWTs will use appropriate visualizations when briefing operational customers. Tactical Army CWTs produce visualizations, supplemented by the near-term (0-12hr) forecast produced by the local mesoscale model resident on the IMETS. As well, the client-server applications on the IMETS allow the ABCS operators to create their own weather visualizations.

4.8. Military Operating Area Forecast (MOAF). CWTs will at times issue MOAFs or use MOAFs produced by the OWS. MOAFs are alphanumeric products providing weather data needed in the MEFP. MOAFs may be routinely issued for high use Military Operating Areas (e.g., Air Refueling [AR], Drop Zone [DZ], Landing Zone [LZ], training areas) and can also be issued for a specific mission or operation. **Table 4.2.** defines the minimum weather parameters included in the MOAF. Additional weather parameters and different thresholds can be used to support specific operations. When locally produced products

(e.g., IWEDA) differ significantly from the MOAF, the CWT must communicate (when tactical communications permit) with the supporting OWS to resolve differences.

Table 4.2. Minimum Weather Parameters Included in a MOAF.

Type of MOAF	Minimum Weather Parameters
Aerial Refueling (AR) Tracks Air Combat Maneuver/Training (ACM/T) Area.	- Cloud cover (broken or overcast), height of base and top of layer. - Visibility at flight level. - Flight hazards (moderate or greater icing and turbulence, and amount of thunderstorms as described in Table 2.7 in AFMAN 15-129). - Current and forecast High Frequency (HF) radio conditions.
Drop Zone (DZ), Landing Zone (LZ), Forward Area Refueling Point (FARP), Training Ranges (e.g., Nellis Range, Eglin Range, National Training Center at Ft Irwin), Extraction Zones (EZ), Target Areas, IFR Military Training Routes (IR), VFR Military Training Routes (VR), and Slowspeed Low Altitude Training Routes (SR).	- Cloud cover (broken or overcast), height of cloud base. - Surface visibility and weather. - Surface winds, 200, 500, 700, 1000, 1,500, 2,000, and 3,000 feet up to 10,000 or a specified drop altitude (Above Ground Level). - Flight hazards (light [CAT II] or greater turbulence and light or greater icing.) - Minimum altimeter. - Current and forecast HF radio conditions.

4.8.1. MOAFs will be amended when conditions listed in **Table 4.3.** occur.

Table 4.3. MOAF Amendment Criteria.

1. Parameters listed in **Table 4.2.** incorrectly forecast that impact a MEF as coordinated by the lead CWT with the OWS for amendment.
2. Incorrectly forecast vertical extent by 2000 ft. or greater.
3. Incorrectly forecast horizontal extent by 90 nautical miles or greater in any direction.
4. Representativeness.

4.8.2. CWTs will follow forecast guidance in MOAFs and will not cross MOAF amendment criteria while preparing the MEF without first coordinating with the originating unit unless flight operational safety is an immediate factor. OWSs also amend for criteria listed in AFMAN 15-129, **Table 2.12. and 2.13.**

4.8.3. OWSs may produce additional products to meet requirements of CWTs based on specific operational necessities or unique weather regimes in their AOR. CWTs may request additional products from the OWS to meet valid operational requirements.

4.9. Controlling MEF (CMEF). A single CMEF 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. Likewise, a paradrop mission where one unit supplies the aircraft (e.g., Pope

AFB) and another unit supplies the people and equipment jumping (e.g., Ft Bragg) will use a single CMEF. (Note: for determining which unit will develop the CMEF, see AFMAN 15-129, paragraph 5.3.2.)

4.9.1. The CWT issuing the CMEF will use existing AFWA or OWS products, to include MOAFs, issued for the specific area of operations. When a MOAF is all inclusive of the operation, it becomes the CMEF and all supporting personnel will use it as the CMEF. The CMEF (either unclassified or classified) may be a collection of the AFWA and OWS products or a separate product depending on the mission. The originator of the CMEF has final authority on the content of the product. When the IMETS-derived, short-term forecast differs significantly (**Table 4.3.**) from the CMEF, the CWT must coordinate (when tactical communications permit) with the originator of the CMEF.

4.9.2. All weather units supporting the mission must use the CMEF to develop the MEF for their supported unit and apply perishable data such as lightning data or satellite imagery prior to dissemination.

4.10. Tactical Decision Aids (TDA). While meteorological information itself is very important, it is generally of more value to tactical decision-makers if it is presented in a tactically relevant form. TDAs such as Target Acquisition Weather Software (TAWS) and Night Vision Goggle (NVG) Operations Weather Software (NOWS) use physics-based weather impacts to provide guidance in a manner which makes it as easy as possible to use. Decision-makers may require this weather intelligence for both friendly and threat platforms.

4.10.1. CWTs will leverage the following TDAs (as applicable/available) to provide their customers user-friendly analyses and forecasts to properly plan and effectively execute tactical operations:

4.10.1.1. Infrared (IR) Target-Scene Simulation Software (IRTSS). IRTSS (when fielded) produces "through-the-sensor" IR target scenes to aid pilots in mission planning and for developing situational awareness for the mission that they will fly. IRTSS uses physics and engineering models to predict weather and time of day impacts in the 8-12 micrometer infrared band for a variety of Precision Guided Missiles (PGMs) and Target Acquisition Systems. It also produces high-fidelity (<10 meter resolution) visualizations of targets and their backgrounds, as well as what the scene will look like and cues to locate the target. IRTSS uses real-time weather feeds to produce scenes for up to 24 hours in the future for any attack altitude or azimuth.

4.10.1.2. Integrated Weather Effects Decision Aid (IWEDA). IWEDA is a rules-based TDA that supports both Army and Air Force systems, improves interoperability, and minimizes the amount of training necessary for weather technicians. IWEDA uses artificial intelligence techniques and knowledge of atmospheric effects with model data to enhance and expand current weather decision capabilities. It allows commanders to compare weather-based advantages/disadvantages of friendly and enemy systems.

4.10.1.2.1. IWEDA rules can be tailored to allow for local differences in tactics based on threat systems. Whenever the local CWT changes the thresholds, they should notify the OWS to preclude confusion. For example, peacetime training thresholds for Close Air Support (CAS) are 2000 feet/4800 meters. But in Bosnia, CAS routinely operated above 15,000 feet due to use of air-defense missiles by threat forces.

4.10.1.3. Night Vision Goggles (NVG) Operations Weather Software (NOWS). NOWS is designed to support forces performing operations using NVGs by predicting the impact of weather on NVG detection range. It provides NVG performance predictions for a specified mission (e.g., helicopter refueling, target acquisition/detection, search and rescue) and forecast local conditions.

These performance predictions can be used by mission planners to make "go/no go" decisions, to modify mission execution tactics, or to evaluate the general suitability of environmental conditions for NVGs. Operators use the performance predictions to prepare for expected conditions during a mission or training exercise.

4.10.1.4. Target Acquisition Weather Software (TAWS). TAWS predicts the maximum detection or lock-on range of air-to-ground electro-optical weapon and navigation systems. TAWS determines: (1) the time of sunrise/sunset for a particular mission date and location, (2) the detection/lock-on range for a target as a function of time and altitude, (3) the detection range for a series of key locations along a mission route as a function of time, and (4) the times of thermal crossover for a target against its background. For the weather input, TAWS can use real-time, model weather data downloaded directly from either AFWA or the Navy Tactical Environmental Data Server (TEDS). If used, the CWT will then edit and validate the downloaded model weather data, as needed, and input any further data in order to make the most accurate information available to the software. In addition to its use by AFW personnel, TAWS is incorporated into the Pilot Flight Planning System (PFPS) for use by pilots in mission planning.

4.10.1.5. Weather Impacts Decision Aids (WIDA). WIDA translates weather forecasts into system performance impacts. It consists of IRTSS, NOWS, TAWS, Weather Automated Mission Planning Software (WAMPS), and the Joint Environmental Exploitation Segment (JEES). WAMPS/JEES will allow force planners to automatically include the impact of weather in choosing weapons and times over target for allocation planning and replanning during mission execution.

4.10.1.6. (Tactical Army) Target Acquisition and Weather Software-Army (TAWS-A). This application on IMETS determines the detection and recognition ranges of a battlefield target for a variety of Army visible and IR sensors. Meteorological parameters are automatically derived. The user selects the sensor, target type and characteristics, aerosol type, target background from menus and the program produces red and green bargraphs of ranges at which the target can be detected and recognized.

4.10.1.7. (Tactical Army) Heat Stress TDA. This IMETS application creates gridded forecast values pertaining to heat stress based on clothing type (e.g., Battle Dress Uniform [BDU], Mission-Oriented Protection Posture [MOPP] 1-4 levels) and work rate (resting to heavy). Output graphics include water consumption (canteens consumed per hour), heat injury percent (percentage of troops temporarily disabled), wet bulb globe temperature, work/rest cycle, and maximum work time displayed on the CTP.

Chapter 5

MISSIONWATCH

5.1. General. CWTs will maintain a MISSIONWATCH, tailored to the mission(s) of the day. The purpose of MISSIONWATCH is twofold. Most importantly, it ensures the most accurate weather information is provided to the warfighter and second, it improves the mission execution forecast process.

5.1.1. CWTs will focus on mission limiting meteorological impacts to ongoing military operations. Upon detecting a significant unforecast change which may affect the operation, the CWT will amend the MEF, contact the customer, and then inform the OWS (if an OWS product contributed to the misforecast conditions).

5.2. Pre-Mission Forecast Updates. In any military operation, there is a time lapse between when the forecast is delivered and operations commence. CWTs will take advantage of that time lapse by continuing to study weather conditions carefully and updating the forecast as needed. CWTs can still improve the probability of success of a mission by notifying operational customers as changes occur. By understanding the operational decision cycle, CWT leadership will know when and where to insert updated weather information to achieve maximum benefit.

5.3. MISSIONWATCH Procedures. Weather units issuing MEFs will develop procedures to perform MISSIONWATCH during the entire mission. **Table 5.1.** contains the basic steps for MISSIONWATCH.

Table 5.1. Basic Steps for MISSIONWATCH.

Conduct MISSIONWATCH
Continuously monitor mission routes, areas, installation, etc., for significant changes to MEF.
Focus on supported unit defined mission-limiting weather thresholds for specific mission.
Army CWTs with IMETS and ABCS monitor the Order of Battle and other battlescale features using the CTP.
Update MEF
Notify customers of weather parameters crossing mission-limiting thresholds.
Provide alternatives to exploit mission weatherObjective is mission success.
Update MEFLoop back to continuous MEF process.
Coordinate with OWS, if required.

5.3.1. CWTs will define mission-critical parameters to MISSIONWATCH, per customer requirements. Reference paragraph **3.2.3.2.1.** of this manual for instructions on how to obtain and tailor mission-limiting parameters.

5.3.2. CWT leadership, in coordination with the customer, will determine the windows of opportunity in which updated weather information could influence the outcome of ongoing missions. These windows of opportunity will vary from mission to mission. Inter-theater airlift missions will likely have a narrow window, once command and control passes to another agency, whereas local training flights or forecasts provided for maintenance operations may have a window of opportunity extending through-

out the entire mission. Conversely, CWT leadership will identify missions for which a detailed MISSIONWATCH will not add value (e.g., transient aircrew flights). Tactical Army CWTs maintain situational awareness by using the Order of Battle information on the CTP.

5.3.3. Methods of Contacting Customers. CWTs will define who will contact the mission director or commander and the method of contact if significant changes occur or the MEF must be amended. Methods of contact may include but are not limited to a verbal relay of information to the SOF or mission commander, updating the MEF, a PMSV contact, a phone patch, use of L-Band or satellite communications (SATCOM), or by using command and control systems. The operations center mission director will probably have better communications with the mission executors than the CWT will.

5.3.4. Mission Forecast Updates. CWTs will inject changes to the MEF during mission execution when communications can be established between home station and the aircraft/ground forces and when the change critically impacts successful execution.

5.4. MISSIONWATCH Tools. CWTs will develop procedures ensuring AFWA and OWS-generated forecast products are integrated into the MISSIONWATCH function. As a baseline for the MEF, these products must be compared with real time data to evaluate the short-term and long-term effectiveness of MEF products. Data sources include:

5.4.1. PIREPs, AIREPS, AIRMETs and SIGMETs. CWTs will monitor all PIREPs, AIREPs, AIRMETs, and SIGMETs via alphanumeric products on the AWN, T-VSAT, or Internet that could effect the mission.

5.4.2. Meteorological Satellite (METSAT) and other Satellite Data. CWT procedures will identify the appropriate types of METSAT imagery (i.e., infrared [IR], visual [VIS], Water Vapor [WV], microwave) and satellite data (space environmental sensors) used to best perform the MISSIONWATCH function.

5.4.3. Weather Radar/Lightning Products. CWTs will integrate radar- and lightning-derived products into their MISSIONWATCH procedures when such information is available.

5.4.4. Real-Time Surface and Upper Air Data. CWT MISSIONWATCH procedures will specify what data sources are used to monitor the weather. For example, specify the alphanumeric products to monitor upstream conditions via FALOPs, PIREPs/AIREPs, SIGMETs, ARTYMET, visual Tactical-Unmanned Aerial Vehicle (T-UAV) data feeds to the UAV cell, Remote Weather Sensors, etc. The IMETS continually ingests local supplemental data to update the near-term forecast (i.e., NOWCAST).

5.4.5. Other Technology. CWTs will take maximum advantage of the latest standard AF technology in their MEFP and MISSIONWATCH procedures (e.g., tower cameras, on-line weather resources, MESONET data, and indigenous products). Units are encouraged to incorporate other non-standard technology that may be available to them. Reference **Chapter 4** for application of perishable data.

5.4.6. Other Data Sources. CWTs are encouraged to take advantage of non-standard data sources that may be available to them and useful to MISSIONWATCH. They will define how that data can add value or effect change when the mission is in progress. These data sources could be as simple as a telephone call from a crew chief prior to takeoff, a report from Civil Engineering, or reports on icy road conditions from Military Police. CWTs should be innovative in the quest for information. As well, Appendix D of Joint Pub 3-59, *Joint Doctrine, Tactics, Techniques, and Procedures for Meteorologi-*

cal and Oceanographic Operations, references weather data sources available from non-METOC operations within the DoD.

5.4.7. Army CWTs with access to the ABCS CTP (through IMETS) will maintain situation awareness in part by monitoring battlefield geometries and the order of battle on the CTP. Position of friendly forces are continuously updated from the Maneuver Control System (MCS) while enemy positions are updated by the All Source Analysis System (ASAS).

Chapter 6

POST-MISSION ANALYSIS

6.1. General. Post-mission analysis of the MEF is critical to determine capabilities and to identify areas for improvement. CWT leadership will identify key missions or establish a representative sample size for the debriefing and post mission analysis effort. Post-mission analysis may be both objective and subjective in nature. CWTs will use the steps in **Table 6.1.** to develop the units post-mission analysis processes.

Table 6.1. Post-Mission Analysis of the MEF.

Implement systematic debriefing procedures, whenever possible.
Debrief customers using face-to-face feedback, whenever possible; collect verification data.
Pass weather debrief data and PIREPs to OWS, JMFU or JMO, and other weather team members.
Apply objective and subjective verification, when necessary.
Conduct operational verification on “Go/No-Go” established mission success thresholds.
Analyze verification data and calculate technical metrics.
Perform technical metric analysis (evaluate forecast skills, under/over forecast, bias, etc.).
Apply feedback and metrics towards MEFP improvement, rules-of-thumb, and lessons learned.
Accomplish, document, train with, and crossfeed MEF reviews and forecast studies.
Assure overall quality and consistency through on-the-spot and after-the-fact QA.

6.2. Debriefings/MEF Verification. Customer debriefs are the most direct means of retrieving forecast accuracy feedback and operational verification (OPVER) of MEF data. Formal or informal debriefs can help identify areas where weather information is required in the decision cycle. Continued contact with the operators also alerts them to the capabilities of the CWT and promotes further interaction. Understand the customer’s mission execution process and select convenient times for formal or informal debriefs. CWTs should consider incorporating the weather debrief with the Intel debrief. The CWT not only receives input on forecast accuracy, but can also glean additional mission information that can assist with future missions (i.e., weapons effectiveness). If face-to-face feedback is not possible, investigate the possibility of automated, remote debriefing methods.

6.2.1. CWTs will debrief mission participants on aspects of the weather support provided whenever possible. This includes the accuracy of the weather information provided, as well as actual weather conditions. Units will crossfeed this information through all CWT members and back to the supporting OWS for immediate enhancement of forecast products and services. During joint/combined operations, CWTs will provide feedback to the JMFU and JMO. During debriefs, weather personnel will solicit and obtain the information required as input for the units metrics assessment program. Elements within the MEF that can be individually verified should be noted. They are normally associated with the specific goals of the mission.

6.2.2. The debriefing process may require a Memorandum of Agreement (MOA) between the CWT and the operators or may be documented in the Weather Support Document (WSD). If necessary, Army CWTs should seek J2/G2/S2 oversight to establish a viable debriefing process.

6.2.3. CWTs must evaluate the debriefing information carefully. Items to consider include where the aircraft (or person) was located, timing, altitude, etc.

6.3. Objective Verification. Where face-to-face debriefings are not possible, CWTs will maintain the verification process with an objective post-mission analysis of a representative sample of missions. This can be accomplished by collecting observations and comparing them to the forecasts. Targets of opportunity include the airfield, synoptic or automated observations at the start, enroute, and termination points of the mission, radar-derived wind profiles near drop zones, or PIREPs/AIREPs in the vicinity.

6.4. Subjective Verification. Other elements of the MEF may be subjectively verified by using radar, satellite, nearby surface observations, PIREPs, ARTYMET or other representative upper-air soundings, or other sources of valid weather information.

6.5. Metrics Program. Armed with data from the MISSIONWATCH and MEF Post-Mission Analysis, CWTs will develop metrics (measurements or statistics) to assess the MEFP and overall technical performance. Metrics are based on the AFW core competencies: weather data collection, data analysis, forecasting, product tailoring/warfighter application, and dissemination. Quality assurance processes address metrics for data collection and dissemination; therefore, CWTs focus metric efforts on the remaining three core competencies (i.e., analysis, forecasting, and product tailoring/warfighter application).

6.5.1. More elaborate collection means may yield more specific results. For instance, a single training mission at a fighter wing could contain multiple verification points such as launch, air refueling, low-level route, range, electro-optical lock-on range, and recovery at home station. Building MEF metrics for each mission element will help unit leadership to evaluate training needs and areas for improvement or recognition. CWT leadership must strive to measure those mission elements that impact their customers the most and generate the kind of metrics their customers would like to see.

6.5.2. Customer Focused Measures. Feedback measurements (metrics) should contain enough detail to spur improvement in how a CWT meets their customers needs. Despite varying CWT missions, there should always be a number of mission parameters that can be measured. As stated in AFI 15-114, *Functional Resource and Weather Technical Performance Evaluation*, CWT technical metrics primarily focus on their operational missions or sortie effectiveness. Through the MEF post-mission analysis process, a unit should be able to collect data, analyze it, assess their operational effectiveness for each mission, and disseminate the results in a format having meaning to their customers. A thorough metrics evaluation program will assist unit leadership by identifying their operational strengths, possible training opportunities, and areas for improvement.

6.5.3. Operational Verification (OPVER). For AFW, there are three main types of technical metrics that will be collected: TAF verification (TAFVER), weather warning verification (WARNVER), and operational verification (OPVER). TAFVER and WARNVER are the primary performance measurements for OWSs, although CWTs share ownership by performing the “eyes forward” function. OPVER of the MEF is the single most important mission-oriented, operational effectiveness assessment tool for CWTs. CWTs will apply MEF OPVER statistics towards improving customer support.

6.5.4. MEF Metrics Assessment. The collection of meaningful MEF OPVER metrics is paramount to maintaining a successful MEFP and defining a CWTs worth to the mission. For metric calculation, a simple binary assessment of the OPVER data from **Table 6.2.** may work best, as shown in **Figure 6.1.**.

In this type of verification scheme, all forecasts are weighed equally. Various forecast skill scores can then be computed from a simple binary or go/no-go assessment.

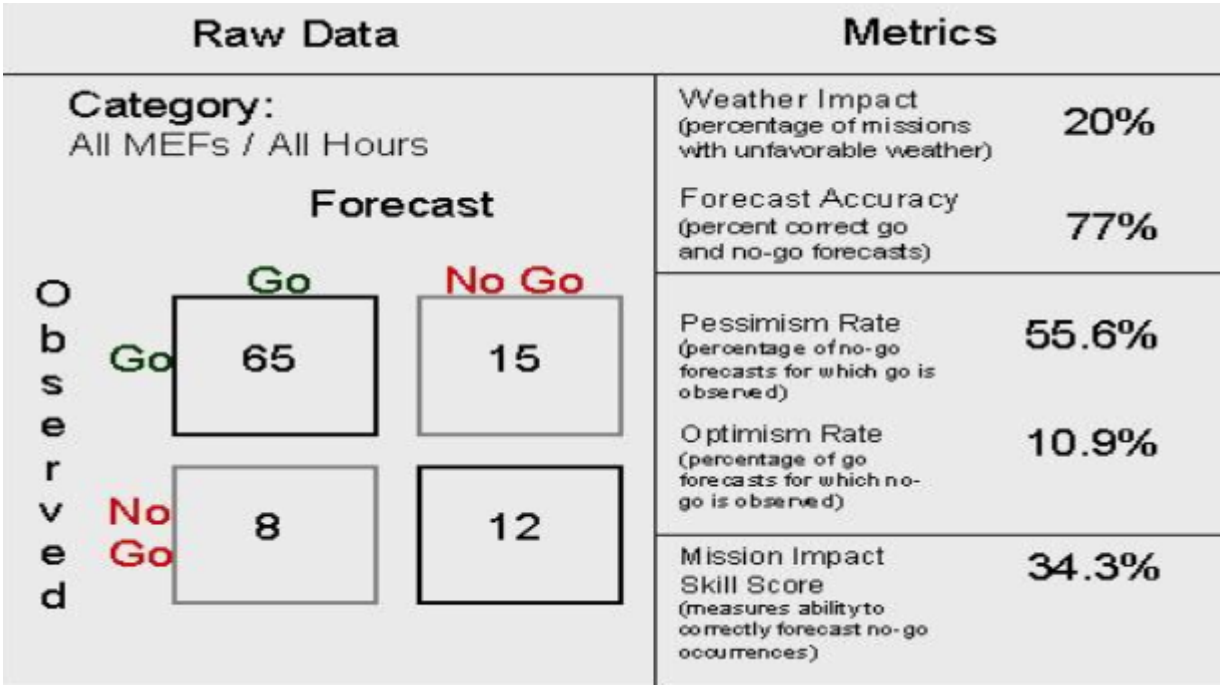
6.5.4.1. In some instances, the ability to adapt and overcome the forecast weather conditions is one goal of a mission. In this case, a binary mission metric might be to measure the accuracy of the briefed weather; either “as briefed” or “not as briefed”. There are many different metric collection opportunities for CWTs; do not limit your options when it comes to evaluating the support you provide the customer.

Table 6.2. MEF OPVER Data Collection.

1. Determine how many total scheduled and executed missions required MEFs.
2. Determine how many executed missions were and were not impacted by weather, as forecast in MEF. (Forecast Hits)
3. Determine how many executed missions were unsuccessful due to unforecast weather in MEF. (Forecast Miss/Missed Event)
4. Determine how many scheduled missions were not executed due to mission-aborting, but incorrectly forecast weather in MEF. (False Alarm)
5. For those executed missions that were impacted due to unforecast weather, CWTs should analyze what part of the mission was impacted. This will help focus the CWT and supporting OWS on possible deficiencies within the MEFP.
6. Determine how many missions were not attempted due to the weather forecast in MEF. This could show the value of saving mission preparation resources before-the-fact from a correct planning forecast. If correctly forecast, it is a Mission Save.

NOTE: This table assumes a go/no-go decision based on the MEF.

Figure 6.1. Metric Example.



6.5.5. Additional Metrics. In addition to MEF metrics, there are numerous other internal performance measures that a CWT should track. Some examples might include: field deployability and mobility readiness, equipment and training status, manning and personnel, extra weather support provided, briefings presented, SORTS requirements, etc. CWT leadership should make a concerted effort to capture supplementary self-worth and unit management statistics. MAJCOM/DOWs will dictate additional metrics, if needed, as required.

6.5.6. Metrics Reporting. Specific OPVER metrics for reporting will be defined by the directing MAJCOM. CWTs will report their technical metrics to their supporting OWS and MAJCOM/DOW on a consistent basis, as determined by MAJCOM directives.

6.5.6.1. Wartime Forecast Proficiency. During wartime or contingency periods, CWTs may be tasked by AF/XOW or their MAJCOM to closely track and report certain performance and forecast metrics in order to evaluate deployed and/or in-garrison CWT support. It will also serve to create a database of AFW support and value measures for a specific crisis, research areas for crisis-planning improvement, and evaluate needs for additional technological solutions or other crisis requirements.

6.6. MEF Reviews, Studies, and Seminars . Forecast reviews, studies, and seminars are done to improve the units forecast capability and process. CWTs must develop a process that meets this intent. The process must be documented, consistent, and lead to positive results.

6.6.1. Forecast Reviews. Forecast reviews should be simple to complete and be focused on the customers mission-critical thresholds and the overall forecast process. The forecast review briefly outlines the tools and reasoning used to produce the MEF and describes what could be done to improve the process or correctly repeat the success.

6.6.1.1. CWT leadership will determine which MEFs typically will be examined for potential review based on their importance to the customer and to the forecast process. Leadership will assess the need for reviews and assign those reviews. Generally the following areas are used to determine if a review is required:

6.6.1.1.1. Processes and Procedures. Are the processes and procedures adequate, clearly stated, and executable? Possible action: modify local processes and procedures, implement new technology, or work out data sharing agreements or other procedural changes with the supporting OWS.

6.6.1.1.2. Technical. Was sufficient data available in time to be of value? Was sound technical reasoning used? Were appropriate analysis and forecast processes, forecast techniques, tools, and rules-of-thumb 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 a forecast review.

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

6.6.1.1.4. Outstanding Forecast. Could the unit benefit from a review of the techniques used in forecasting a mission-impacting event properly? Was the forecast delivered and acted upon in such a way as to have a positive effect on mission accomplishment. Can a new technique or rule of thumb be developed based on this forecast?

6.6.2. Forecast Studies. Forecast studies are more detailed and longer term analysis of a specific event, type of phenomenon, or forecast challenge. Forecast studies may lead to new forecast techniques or rules-of-thumb.

6.6.2.1. CWTs will crossfeed significant forecast reviews and studies. In addition, the originator will determine whether to forward reviews and studies to their MAJCOM/DOW for further crossfeed to AFWA/DNT.

6.6.3. Forecast Seminars. CWT leadership will task personnel to develop and present forecast seminars as part of the Continuation Training (CT) program. Seminars should be focused on customer sensitivities and MEF production and geared towards overall understanding and improvement of the MEF process.

6.6.4. Lessons Learned. CWTs will incorporate lessons learned from reviews, studies, and seminars into the MEFP. Crossfeed significant lessons learned to the OWS.

6.6.5. OWS Reviews, Studies and Seminars. CWTs will have a process in place to ensure reviews, studies and seminars developed by the supporting OWS are available for CWT access. CWTs should use this information to refine their MEFP and enhance training.

6.7. Self-Assessments (SA). As a minimum, SAs will be performed on an annual basis. A new OIC/NCOIC will review the latest SA within 90 days to understand unit health and determine if portions need reassessment. More frequent SAs may need to be performed as missions and customers change. The SA should focus on support to the customer as opposed to internal management practices.

6.7.1. AFI 15-180, *Air Force Weather Standardization and Evaluation Program*, contains evaluation items CWTs will use to perform SAs. Additionally, CWTs will include any MAJCOM supplements or

other guidance in the SA process, and will tailor the checklists when customers require specialized support.

6.7.2. CWTs will document all SAs and maintain records for at least 1 year.

6.8. Quality Assurance (QA). A QA program is vital to evaluating the quality of forecast and observed products. CWTs will compare products to established standards (e.g., AFIs, AFMANs, and SOPs) to ensure customers are receiving viable, effective support. QA is divided into three types.

6.8.1. On-the-Spot QA. On-the-Spot QA is the responsibility of every member of a CWT, but the overall responsibility lies with the OIC/NCOIC. The primary goal is to correct mistakes prior to a customer receiving the product. The following are some examples of primary products that must receive comprehensive On-the-Spot QA:

6.8.1.1. Mission Execution Forecasts (MEFs).

6.8.1.2. Flight Weather MEFs.

6.8.1.3. Observed Weather Advisories (OWA).

6.8.1.4. Observations.

6.8.2. Horizontal Consistency. CWTs will perform On-the-Spot QA on all forecast products to ensure horizontal consistency between OWS-issued products (e.g., Weather Warnings, Weather Advisories, and TAFs) and other CWT products (e.g., surface observations and observed weather advisories).

6.8.3. After-the-Fact QA. CWTs will check samples of selected products for items that, in the eyes of the customer, would detract from the products usefulness. In addition to checking for obvious coding or dissemination errors, CWTs should evaluate the timeliness, accuracy, application of customers sensitivities, and the meteorological reasoning used to develop products.

6.8.3.1. Sample sizes for each product checked may vary from month to month, based on factors such as customer feedback, CWT workload, experience of personnel, number of errors found previously, and the overall importance of achieving the needed quality in the end product.

6.8.3.2. CWT leadership is responsible for evaluating and documenting the review of both On-the-Spot and After-the-Fact QA to identify problem areas where guidance or training is needed.

Chapter 7

BASE/POST SERVICES

7.1. Resource Protection. Resource protection is a three-tiered structure with AFWA, OWSs, and CWTs all playing significant and interactive roles. AFMAN 15-129, *Aerospace Weather Operations Processes and Procedures*, Chapter 3, describes the entire resource protection process. This chapter will specifically address the CWTs role in the process.

7.1.1. CWTs must develop flexible means to respond to significant weather events and provide enhanced support to both operational customers and the servicing OWS. By understanding the operational decision making processes at their installation, CWT personnel must be prepared to inject critical weather information impacting force protection and resource protection activities well in advance of the traditional weather watch (e.g., informing Civil Engineering of a weekend snow event days in advance).

7.2. "Eyes Forward." Each CWT will provide an "eyes forward" function. Regardless of who takes the official observation (i.e., collocated NWS locations, indigenous OCONUS locations), CWTs provide significant "eyes forward" information to the OWS concerning local area weather patterns and unforecast changes. During deployments, CWTs will use host nation observations (if available) and rely on customer-furnished communications (when possible) to relay weather information back to the OWS. CWTs will contact the OWS when:

7.2.1. Severe weather signatures on radar displays or METSAT imagery are identified that will affect the local installation or mission.

7.2.2. Warning/advisory criteria are occurring or forecast to occur and the OWS has yet to issue the warning/advisory. Units will also contact the OWS when warning/advisory criteria are forecast by the OWS and are not expected to occur. CWTs will ensure their supporting OWS receives all severe weather reports in the area of concern (e.g., from National Weather Service, local news media, and unit/base personnel).

7.2.3. When local weather phenomena are forecast to occur (next 30 minutes) and will affect OWS and CWT products (i.e., TAFs and MEFs). Units will also contact the OWS when significant forecast elements on OWS products are not expected to occur. Communication is to help the OWS technician anticipate changes and subsequently adjust forecast products.

7.2.4. When surface observations or other information (e.g., PIREPs) cause OWS-issued TAFs for the installation to be "out of category" or weather information indicates CWT-issued MEFs will cross operational thresholds.

7.2.4.1. In cases where the National Weather Service or other indigenous sources provide the TAF for the airfield, the CWT (nor the OWS) does not coordinate "out of category" changes with the issuing agency. The CWT, however, maintains "eyes forward" support for the OWS. CWTs should aggressively pursue educating post or base customers on the difference between the TAF and locally issued warnings, advisories, MEFs, etc. TAFs issued by other agencies will not necessarily be consistent with AFW products and procedures.

7.3. Coordinating with Customers. CWTs are responsible for coordinating supported units weather watch (WATCH) and weather warning (WW) requirements to include coordinating WATCH and WW criteria, desired lead-times (DLTs), and notification methods. CWTs must limit additional criteria to intense weather phenomena that threatens life or property, or causes supported units to take protective action or change operations, and it must fall within the OWS forecasting capabilities. CWT deviations (e.g., adding, excluding, and changing criteria) from **Table 7.1.** will be documented in appropriate Weather Support Documents (WSDs).

Table 7.1. Standard Criteria and Desired Lead-Times for Weather Watches/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 occurrence.	- 2 hours prior to occurrence.
Winds (≥ 35 - < 49 knots)	- Not required.	- 90 minutes prior to occurrence.
Hail (≥ ¾" diameter or local criteria)	- 4 hours prior to occurrence.	- 2 hours prior to occurrence.
Hail (≥ ½ " but < ¾"diameter)	- As potential warrants.	- 90 minutes prior to occurrence.
Heavy Rain or Snow (≥ 2" in 12 hours or local criteria) (See Note)	- As potential warrants.	- 90 minutes prior to start of event.
Freezing Precipitation	- As potential warrants.	- 90 minutes prior to occurrence.
Blizzard Conditions (See Note)	- As potential warrants.	- 90 minutes prior to occurrence.
Sandstorm (See Note)	- As potential warrants.	- 90 minutes prior to occurrence.
Lightning (within 5 nm)	- 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.

NOTE: AFW units will coordinate and establish the actual values for accumulative-type WATCHs/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 WATCHs and WWs, forecast the actual amount of expected accumulation and its duration versus simply repeating the criteria. Refer to AFMAN 15-129, Table 3.1. for full description of Blizzard Conditions and Sandstorms.

7.4. WATCHs, WWs, and Weather Advisories (WA). The CWT staff will work with their supporting communications agencies, OWS, MAJCOM or higher headquarters to establish requirements, communication restoral priorities, and procedures for dissemination of OWS-issued WATCHs, WWs, and WAs directly to the CWT and the installations command and control infrastructure (e.g., command post).

7.4.1. CWTs will use OWS-issued WATCHs and WWs in the MEFP, as well as for updating supported unit decision makers on what impact the weather may have on the installation and operations.

7.4.2. CWTs will issue WWs for observed phenomena (i.e., lightning) during duty hours. Upon the issuance and expiration of a WW for observed phenomena, the CWT will be responsible for the timely notification of supported units (IAW Air Force Occupational Safety and Health [AFOSH] Standards 91-66 & 91-100) and its supporting OWS (IAW OWS-CWT MOA). During non-duty hours, the supporting OWS will issue observed warnings where possible IAW AFMAN 15-129, paragraph 3.2.4.2. CWT customers need to be informed that the OWS uses radar and lightning display systems to issue and cancel observed lightning warnings; this technology may (in some cases) not be as timely or as accurate as an on-site technicians weather observations.

7.4.3. CWTs may issue WWs for forecast phenomena when imminent weather conditions pose a hazard to life and property, and notification to the supporting OWS is not practical or communications (especially in a deployed environment) do not allow.

7.4.3.1. If a CWT issues a forecast WW, it will be responsible for dissemination to local supported agencies. The CWT will contact the supporting OWS as soon as possible after local dissemination is made for the OWS to assume responsibility/accountability for the warning. When deployed, CWTs will rely on customer furnished communications to relay WW information back to the OWS.

7.4.4. CWTs issue observed lightning WWs separately from, and at times, concurrent with an OWS-issued warning for any other criteria. The observed lightning WW is the only criterion that can be issued separately from other warning criteria. Lightning WWs are issued when lightning is observed or detected within a minimum of 5 nautical miles of the CWT location. They are issued only for installations or deployed locations that can take protective measurements upon receipt of the WW. The CWT, or OWS when the CWT is not on duty, will cancel the lightning warning when thunderstorms have passed beyond the area covered by the warning. Include a statement in the cancellation message indicating its effect on any previously issued warnings, such as “WEATHER WARNING for Thunderstorms with 1-inch hail and 50-knot winds remains in effect.”

7.4.4.1. Army support CWTs or CWTs supporting off-base customers, will work with their supported agencies and their OWS to establish lightning support requirements, as necessary.

7.4.5. CWTs gather requirements for forecast and observed weather advisories from their supported units. These weather units coordinate with the supporting OWS to issue Forecast Weather Advisories (FWA) when possible. If an agency requires no lead-time, the advisory is an Observed Weather Advisories (OWA) (i.e., issued upon the first observed occurrence of the event). CWTs issue all OWAs while on duty.

7.4.5.1. CWTs must work with their supported units to reduce duplication of FWA criteria. They will examine and use existing data sources or products (e.g., MEF, web page, flimsy) that already provide the information needed by the supported unit. For example, the supported units may use the forecast low temperature for the day from a flimsy instead of receiving a FWA for freezing temperatures. CWTs work with the supported unit to determine the format of OWAs and the dissemination method.

7.4.5.2. Coordinate the desired lead-time based upon the agencys requirement and the units capability to provide such advance notice. A desired lead-time is not required for weather advisory

downgrades and extensions. CWTs will document these procedures in the units weather support document with the customer.

7.4.6. Tactical Army CWT Procedures. T-VSAT is the primary means for an OWS to communicate with Army CWTs in a tactical environment. Accordingly, OWS personnel issue weather warnings, advisories and watches via text messages on the T-VSAT which subsequently appear in the JAAWIN Viewer. Using IMETS, CWTs will, in turn, issue a corresponding US Message Text Format (USMTF) weather warning (C523) message or Freetext (advisories and watches) message to the Army Battle Command System (ABCS). In addition, the CWT posts weather warnings valid in the AOR in the appropriate directory of the Weather Feature application where they are automatically posted to the Weather Warning window of Weather Feature.

7.5. Severe Weather Action Procedures (SWAP). CWTs will develop SWAP ensuring sufficient personnel are available during potential/actual severe weather events or during meteorological/operational events critical to mission success.

7.5.1. The CWTs SWAP will define the events, personnel requirements, and operating procedures (e.g., “eyes forward” and customer interaction) required to meet the threat of severe/mission-limiting weather.

7.5.2. CWTs will conduct, review, and document a semi-annual exercise of the SWAP IAW AFI 10-229, *Responding to Severe Weather Events*. An actual severe weather event meets the intent of an exercise.

7.5.3. Unless formally waived in writing by host commanders, CWTs will implement SWAP when conditions are favorable for the development of severe weather and the unit is in a Red or Blue area on the Military Weather Advisory (MWA) or receives a severe weather watch from the OWS.

7.5.4. CWTs and OWSs will work as a team during severe weather events.

7.5.5. CWTs will ensure weather personnel can respond to severe or hazardous weather by maintaining proficiency in appropriate weather techniques (i.e., radar storm interrogation, identification of severe weather patterns, severe weather observing skills, icing/turbulence forecasting) important to supporting the operator's mission. Training should focus on the type of weather expected in the upcoming season (e.g., during the summer, training may focus on gusty winds; during autumn, training should focus on winter storms; by early spring, training should focus on severe thunderstorms). OWSs will provide training information for CWTs.

7.6. Forecast Consistency. When discussing and using OWS-issued WATCHs, WWs, and WAs, CWTs will maintain product consistency and convey the product *verbatim* to their supported units and in their MEFs. Under normal situations, local modification and/or supplementation will not be allowed on OWS-issued WATCHs, WWs, and WAs. CWT members are encouraged to contact their supporting OWS when significant disagreements exist over an OWS-issued WW/WA. The CWT may modify/supplement OWS WW/WAs *only* when required to preserve flight and ground safety.

7.7. Severe Weather Reporting . CWT leadership will develop procedures to report severe weather events or damage from weather events as defined in AFI 10-229, *Responding to Severe Weather Events*. These events are reported to the command agency of the supported location IAW Operational Report 3 (OPREP-3) reporting procedures in AFMAN 10-206, *Operational Reporting*. CWTs will ensure the OWS

and parent MAJCOM/DOW is aware of the OPREP-3 report. CWT leadership must develop procedures with their OWS to obtain weather data necessary for OPREP-3 reporting.

7.7.1. CWTs will also provide the supporting OWS severe weather reports not normally available through standard observations. These include reports from CONUS/OCONUS indigenous sources, local law enforcement, local news media, and unit personnel. These reports will be passed immediately after fulfilling any local distribution requirement (e.g., a special or local weather observation). If this is not possible, then pass the reports as soon as possible so the OWS can use the reports in post-analysis and verification.

7.8. Aircraft Mishaps. CWTs will notify the supporting OWS of any weather-related aircraft or ground mishaps requiring OPREP-3 reporting (or local requirements reporting) to initiate data-save procedures for OWS-produced products used by CWTs in preparing flight weather MEFs. CWTs will save the MEF and all associated data and products, to include those obtained via the Internet, used in the MEFP. CWTs with an IMETS will electronically save applicable products to disk, or at a minimum, print hard copies of those products.

7.9. Tropical Cyclone Procedures. 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. Pacific Air Forces Instruction (PACAFI) 15-102, *Tropical Cyclone Reconnaissance,* provides information for the Pacific Ocean westward from 180 degrees west and the Indian Ocean.

7.9.1. All AFW units will use the tropical cyclone forecasts issued by the designated tropical cyclone centers. No deviation from the official forecast position, track, movement, maximum wind speed, or intensity trend is authorized. The supporting OWS will perform the METWATCH and serve as the liaison between the Tropical Forecast Centers and the CWTs.

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

7.9.1.2. CWTs will use the MEFP to tailor and translate the official tropical cyclone forecast and OWS forecasts into a specific mission forecast for their supported units.

7.9.2. CWTs 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 (i.e., “a heads up”) only, and are subject to change. This notification must include the forecast error probability statements included in discussion bulletins or on the forecast products.

7.9.2.1. CWTs will provide the necessary support required for installation commanders to declare a Typhoon (or Tropical Cyclone) Condition of Readiness (TCOR) or (TCCOR) and Hurricane Condition (HURCON) as outlined in local OPLANs, and for making mission execution decisions such as evacuation and resource protection.

7.9.2.2. OWS and CWT staffs must ensure official tropical cyclone forecasts released to the general public are performed in accordance with the policies and procedures specified by the installation commander regarding the release of information to non-military organizations.

7.10. Flight Weather MEFs. CWTs will provide weather briefings to all supported units missions departing from their base/post/tactical airfield or coordinate briefing availability from another source

when personnel are not available to perform this function. Flight weather briefing support may be conducted in person, via an automated terminal, by telephone, etc., depending on local circumstances. Aircrews will be given instructions on how to obtain a flight weather briefing at their destination. OWSs normally provide flight weather briefings to transient aircrews (see paragraph **7.12.**).

7.10.1. CWTs use the MEFP to develop the flight weather MEFs. CWTs will document all flight weather MEF briefings. The DD Form 175-1, *Flight Weather Briefing,* is the standard flight weather briefing form and may be used in the MEF process (refer to AFMAN 15-129, *Aerospace Weather Operations - Processes and Procedures,* Attachment 6 for instructions on completing DD Form 175-1). A weather forecast flimsy may also be used. A primary consideration in developing flight weather MEFs is to use formats the customer needs and wants. Mandatory items to document along with the briefed MEF are briefing time, briefer initials, and aircrew call sign.

7.10.2. MEF products can be documented electronically on a file server. Use AFMAN 37-139, *Records Disposition Schedule*, 15-series Tables, for guidance concerning retention and disposition.

7.10.3. Present the general synoptic situation, current and forecast weather (including flight hazards and SIGMETs) for takeoff, enroute to/from destination, target (as applicable), destination, and alternates, with special emphasis on severe weather and flight hazards. A reasonable rule of thumb for Air Force aircrews 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. However, Attack or Air Assault helicopters may want to know the differences in weather conditions from one valley to the next. Details should therefore be worked with the customer.

7.10.3.1. Evaluate, interpret, and apply the contents of WATCHs, WWs, WAs, and forecasts to each individual flight weather MEF. Radar, satellite imagery, observed data and products, and forecast products will all be used to enhance briefings when available. Briefings will be operationally consistent with other applicable products, such as WWs, WAs, and the TAF. Ensure weather data used for the flight weather MEF is the most current. Always brief the current conditions at the departure location, target, enroute to/from destination, destination and alternates.

7.10.3.2. Give the original MEF to the aircrew and retain a duplicate copy in files. If weather is rebriefed, cross out incorrect data and enter the updated information on the MEF. 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 add the following statement: “UPDATE WEATHER BEFORE DEPARTURE.”

7.10.3.3. CWTs providing flight weather MEF briefings will develop procedures to retain (file) the briefing information. This includes briefing information disseminated over the Non-secure Internet Protocol Router Network (NIPRNET), Secret Internet Protocol Router Network (SIPRNET), or Internet (e.g., functional link from OWS and CWT web sites, or MEFs hosted on the local area network [LAN]). The retained information can be either in hardcopy or softcopy format.

7.10.3.4. Document all verbal briefings (e.g., local flights, telephone, and close-circuit television) on a locally developed, or a MAJCOM or higher headquarters prescribed worksheet.

7.10.3.5. Request aircrews provide PIREPs (and AIREPs when applicable) during takeoff, enroute, and upon destination arrival. Encode and disseminate PIREPs and AIREPs in accordance with AFMAN 15-124, *Meteorological Codes.*

7.10.4. MEFs supporting other missions. Refer to paragraph **3.2.3.2.1.** on where to locate sensitivity information and **Attachment 2**, Space Weather Sensitivities, for weather effects on other platforms and missions. CWT leadership will develop mission execution products to support those missions based on the weather that degrades them. Work with the customer on specific requirements.

7.11. Aero Club Support. CWTs and OWSs will provide flight weather briefing support to Aero Club members who are performing official Air Force operational duties. Examples are Civil Air Patrol and Initial Flying Training Programs. CWTs will provide or arrange for briefing support when such Aero Club flights are in a transient status through the appropriate OWS or Flight Service Station. Aero Club members performing official flight duties should be advised of Program Generation Scheduler/Server (PGS/S) remote and self-briefing capabilities.

7.12. Transient Aircrews (In-garrison). CWTs are not required to maintain a walk-in service for the specific purpose of handling transient aircraft; however, CWTs will never deny service to any customer walking in to the weather unit. Services for a transient aircraft may include submitting their briefing request to an OWS through their web page via PGS/S or referring the transient aircrew to a designated area equipped with a self-briefing area configured to allow them to contact the supporting OWS and accomplish flight weather MEF briefings. OWSs will be the primary source of flight weather MEFs to transient aircrews.

7.12.1. Transient aircrews may receive flight weather MEFs using computers and services available through the Internet. CWTs at the airfield will provide instructions for transient aircrews to contact the OWS responsible for the AOR and encourage them to provide the OWS a minimum of 2-hours advance notice before brief time when feasible. Medical Evacuation (MEDEVAC) flights and AETC training flights executing multi-stops are examples of missions where it is difficult for the aircrew to provide the OWS with the desired 2-hour advance notice. In these instances, the CWT may be best suited to provide the flight weather MEF.

7.12.2. Web-based Aircrew Briefing Terminals (In-garrison). CWTs will provide access and procedures to supported units for computer/Internet-based briefing applications. Specific sites, (e.g., Military Aircrew Information Service [MAIS] and OWS-maintained sites) provide a flight self-briefing capability. Intended for use by DoD aviators, these are designed to minimize the need to contact weather personnel for most Visual Flight Rule (VFR) missions.

7.12.2.1. 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. Notice to Airmen (NOTAM) summaries and hourly updates are available by the International Civil Aviation Organization (ICAO) directly from the Federal Aviation Administration (FAA) facility at Herndon, VA.

7.12.2.2. CWTs will provide and/or arrange for a designated area equipped with communication systems configured to facilitate contacting the supporting OWS to accomplish flight weather MEF briefings. 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:

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

7.12.2.2.2. Required briefing forms (e.g., DD Form 175-1), writing paper, and expendable supplies.

7.12.2.2.3. Pertinent information (i.e., web site instructions and OWS Briefing Cell phone numbers/instructions, AFVA 15-1 and 15-2) to assist the transient aircrews in completing their briefings.

7.12.2.2.4. CWTs should include information on how to access and use web-based PGS/S systems in the Instrument Refresher Course.

7.13. Instrument Refresher Course (IRC). CWTs will develop area indoctrination and IRC briefings for the supported flying units, IAW AFMAN 11-210, *Instrument Refresher Course (IRC) Program*. The host wing dictates the frequency of the briefings. CWT personnel should contact their installations IRC providers (e.g., at AF installations, the Operations Group or Operations Support Squadron is the point of contact [POC] for the IRC) to ensure weather personnel are scheduled to brief at each refresher course. Weather information presented at IRCs usually includes monthly/seasonal climatology, seasonal severe weather events, etc. CWTs should work with the installation IRC POC to finalize the weather agenda for each IRC. FYI 42, *Instrument Refresher Course*, provides a guide to IRC procedures and can be located on the AFWA Training Division (AFWA/DNT) web site.

7.13.1. Semi-Annual Weather Briefs. At Army CWTs that support Aviation assets, there will be semi-annual weather briefings for aviators. These briefings will include seasonal weather hazards, thunderstorm avoidance procedures, OWS support, weather warning, weather watch, and weather advisory criteria, and local services provided.

7.14. Aerodrome Forecasts (TAFs). Aerodrome forecasts, issued in TAF code, are forecast tools that facilitate flight planning in accordance with the World Meteorological Organization (WMO). OWSs will issue and amend TAFs for common flight planning thresholds described in AFMAN 15-129, *Aerospace Weather Operations Processes and Procedures*. CWTs will assist OWSs with "eyes forward" relay of changes in weather conditions.

7.14.1. CWTs use TAFs in conjunction with other OWS products and locally derived IMETS products as a basis for MEFs. Operational customers should rely upon the MEF for mission planning, and should rarely have reason to access the TAF issued by an OWS. CWTs should ensure the TAF is only routed to Air Traffic Control and personnel who have an operational need to see the TAF. Mission-specific, customer-focused weather information will be provided by the CWT in the form of a MEF.

7.14.2. MEF products use the TAF as a basis for takeoff, landing, and alternate airfield information. The MEF takes into account takeoff and landing weather thresholds for specific aircraft, pilot category, and mission. The airfield forecast in the MEF must be consistent with the TAF cloud ceiling, visibility, weather/obstruction to vision, winds, turbulence, and icing phenomena specified in the TAF as defined by the ceiling/visibility category or amendment threshold. CWTs must coordinate differences with the OWS issuing the TAF before application to the MEF unless flight safety or significant mission impact is evident.

7.14.2.1. In cases where the National Weather Service or other indigenous sources provide the TAF for the airfield, the CWT is not required to coordinate differences with the issuing agency. The MEF is produced as a stand-alone product. CWTs should aggressively pursue educating post

or base customers on the difference between the TAF and locally issued MEF. The TAF in this case is only used for flight planning purposes IAW WMO requirements, and the MEF is the official forecast for the post or base.

7.15. Chemical Downwind Messages (CDMs). Upon request from Disaster Preparedness or any other base or post agency, CWTs will provide chemical downwind products using guidelines in **Attachment 3**. Tactical Army CWTs derive the CDM from the IMETS Chemical Downwind Report (CDR) application.

7.16. Flight Information Handbooks (FLIPs). CWTs will provide information to the Airfield Manager or appropriate base/post agency for FLIP entries. Data includes, but is not limited to, operating hours, PMSV frequency, supporting OWS contact information, airfield ceiling and visibility thresholds, and pertinent observing information such as use of automated equipment and limitations hindering unobstructed visibility observations. FLIPs will include a brief description of the Cooperative Weather Watch (CWW) procedures with Air Traffic Control (ATC). CWTs will validate the accuracy of the information each time the FLIP is published and take immediate steps to correct erroneous data.

Chapter 8

SPACE WEATHER

8.1. Space Weather Support Responsibilities. Space weather analysis and forecast products are produced primarily at AFWA and are made available through the normal unclassified and classified weather information dissemination systems. OWSs also post and/or disseminate space weather products that are derived from AFWA products and are particularly relevant to the OWS mission or region of responsibility. In turn, the CWTs primary space weather support role is two-fold: (1) identify those units and operations, within a CWTs purview, that may be affected by space weather and should receive space weather support; and (2) interpret, apply, and tailor (if appropriate) the AFWA and/or OWS products in support of the CWTs customers.

8.1.1. In their first role, the CWT collects space weather product requirements from their supported customers and coordinates with AFWA and the OWS to satisfy those requirements. CWTs need to consider any unit or operation within a CWTs purview as a potential customer of space weather products. CWTs must understand the impacts of space weather on their customers **(Attachment 2)** and will incorporate those impacts into the MEFP. AFWA/DNT maintains on-line training material to assist personnel in understanding the types of military systems that are affected by space weather. The general categories of missions/systems affected by space weather are listed in **Table 8.1.**

8.1.2. In their second role of interpreting, applying, and tailoring existing products for their particular customers, CWTs interpret space weather products and then extract the relevant data and information and apply it for their customers operations. AFWA maintains on-line training material to assist CWT personnel in interpreting and applying space weather products. The different types of space weather products are listed in **Table 8.1.**

8.1.3. CWTs will submit any known space weather impacts to AFWA via the Space Weather Impact Debriefing and Assessment Form located on the Field Support Page on JAAWIN. As well, subject matter experts at AFWA will provide direct assistance with space weather questions and observed impacts to customers via this process.

8.2. Space Weather Products. AFWA prepares many space weather analyses, forecasts, alerts, and warnings (see **Table 8.1.**). The products are built around the 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.

8.2.1. Multiple customers use space products in various ways. For example, some communications products are used to help identify the most effective frequencies for aircraft to communicate through high-frequency (HF) airways stations, while other products are used to identify regions of the world where theater forces may have certain types of satellite communications disrupted because of space weather disturbances. A second example includes GPS navigation products that are used to identify regions of the world where degraded accuracy of single-frequency GPS systems will be abnormally high because of space weather conditions. CWTs must be aware of these space weather products and determine their utility to other customers. Likewise, CWTs may submit requests for new products through the support assistance request process (SAR) to best satisfy their customer requirements.

Table 8.1. 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 effected 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.
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.

Mission Area	AFWA Product	Description
	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.
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 9

CWT READINESS TRAINING

9.1. General. This chapter focuses on the training required to prepare CWT personnel to operate in a deployed environment supporting both Air Force and Army customers. This training builds on the core skills developed at the Initial Skills Course (ISC) and the Operational Weather Squadron (OWS). It provides the foundation to produce weather technicians able to meet the needs of operational customers during contingencies and wartime.

9.1.1. CWTs will develop a dynamic training program following the guidance in this chapter and the overall training requirements in Chapter 10, *Training*, of AFMAN 15-129, *Aerospace Weather Operations - Processes and Procedures;* and Chapter 6, *War, Contingency, Crisis, and Military Operations Other Than War Support*. CWTs will conduct and document training IAW AFI 36-2201, *Developing, Managing, and Conducting Training*, Chapter 13.

9.1.2. CWTs will leverage standardized training developed and/or contracted by the Army, the Air Force, AFWA, combat weather squadrons, OWSs, and indigenous sources to complete duty position qualification and skill level upgrade training. This approach minimizes development effort while ensuring core competencies/tasks can be accomplished.

9.2. Mobility Training (MT). The purpose of MT is to ensure personnel assigned to deployment and AEF positions are fully trained and ready to deploy, fight, and survive (see AFI 10-403, *Deployment Planning*) during wartime. MT prepares personnel to perform their primary functions in a tactical environment. In-garrison operations should resemble tactical operations as much as feasible to prepare personnel for deployments. “The same in peace as in war” should be applied to every facet of operations. MT is not a separate training program, but it is a vital part of a CWT technicians overall training progress and career progression. (See AFMAN 15-129, Chapter 10.)

9.2.1. Initial MT is conducted as part of the Qualification Training (QT) process. Recurring MT will be integrated into Continuation Training (CT).

9.2.1.1. MT will include task certification on all aspects of mobility operations and on the tasked tactical weather equipment. MT will address the climatology, weather regimes, forecast products and techniques, OWS products/services, weapons systems, and Aerospace Expeditionary Force (AEF) support for contingency locations. It will also cover the missions, weapons systems, and weather sensitivities of supported units. CWTs should leverage training conducted by their customer whenever possible. CWTs unable to conduct MT in-house due to lack of equipment or other resources will work with their MAJCOM or higher headquarters to satisfy MT requirements.

9.2.2. CWT leadership will consider the following when developing and conducting MT:

9.2.2.1. Focus MT on personnel assigned to AEF deployment and those tasked to support deliberate plans positionsconsider both skill-level and experience.

9.2.2.2. Conduct MT in conjunction with local base/post exercises whenever possible.

9.2.2.3. Select a location for the training to be conducted that is free from distraction (e.g., classroom or outdoors). Leverage local exercise sites and training offered by customers as much as possible to enhance the reality and understanding of the training.

9.2.2.4. Develop or leverage a lesson or training plan for use in conducting training. Consider exploiting both Air Force and Army units, facilities, and techniques to achieve the best results. The Tactical Air Control Party (TACP) training program (AFI 13-102, *Air Support Operations Center (ASOC) and Tactical Air Control Party (TACP) Training and Evaluation Procedure*s) is an excellent source for Army support CWTs. Army support CWTs with TACPs available should investigate and utilize available training.

9.2.2.5. Supplement MT through a variety of in-house methods (e.g., seminars, slide shows, reading assignments, videos, and exercises).

9.2.2.6. Develop hands-on training and task evaluations to measure proficiency.

9.2.2.6.1. Task evaluations will be conducted for each piece of equipment the unit is tasked to deploy with. Mobility-qualified weather personnel must be able to set up and operate the equipment in accordance with the applicable TOs, operator manuals, or handbooks, and be familiar with operator maintenance procedures.

9.2.2.6.2. Personnel will be proficient on operating and maintaining the tactical version of the

N-TFS, and the IMETS, T-VSAT, and QRCT-III equipment as applicable to their mission and tasking. The AFWA DNT web site contains training materials and references to other sites to assist in SOP construction, training, and troubleshooting.

9.2.2.7. Use task breakouts to describe more complicated tasks in detail and identify what is required to become fully proficient.

9.2.2.8. Establish a training schedule to ensure all personnel meet all training requirements listed in AFI 10-403, *Deployment Planning*, and weather unique requirements.

9.3. Mobility Training Library. Units will develop or have access to a training library (e.g., from the OWS) that includes the reference material used in MT objectives, and focuses on Areas of Interest (AI) and Areas of Operations (AO) deployable weather personnel would most likely support during contingency, AEF, and wartime operations. The MT library will contain publications that are needed, such as Air Force Instructions, Field Instructions, MAJCOM Instructions, Army Field Manuals, General Allowance Source documents, Technical Notes (TNs), Technical Orders (TOs) not located with equipment, FRNs, master lesson plans, forecaster memos, site surveys, and any other material that can be used to conduct MT. CWTs will use training information from the supporting OWS and AFWA/DNT as much as possible to prevent duplication of effort.

9.3.1. A comprehensive list of all officially published weather-related TNs, pamphlets, etc., can be viewed from Air Force Weather Technical Library (AFWTL)/Technical Catalog (TC) 00/001. This publication is inclusive of materials from 1941-2000 and can be ordered on-line from the AFWTL.

9.3.2. If any of the material will be used during deployment, CWTs will maintain two copies so that the training library is complete at all times. A master list of hyperlinks to available materials will meet this intent as long as the list is periodically reviewed for currency. Materials should be on disk, Compact Disk-Read Only Memory (CD-ROM), etc., for easy carrying during deployments whenever possible.

9.3.3. CWT leadership will assign an individual to maintain the library to ensure the most current material is available. This individual will conduct a semi-annual review of the library and update references as needed.

9.3.3.1. Develop an index of publications on hand to ease in the cross-referencing of material. Publications and information maintained by the supporting OWS will be cross-referenced to prevent duplication of effort.

9.4. Aerospace Expeditionary Force (AEF) Training. The AEF Center (AEFC) hosts information designed to ensure everyone deploying as part of an AEF arrive in theater fully prepared. The web site targets individuals preparing to deploy, and includes Training Templates for AFW. Each template provides contact information, duty description, required training, and other tips to make the transition to deployed life successful. **Table 9.1.** lists recommended AEF training for Air Force support. This list may not include all the required training required by local customers.

Table 9.1. Recommended AEF Training.

SUBJECT	AIR FORCE INSTRUCTION	REQUIRED
Law of Armed Conflict	AFI 51-401	Annually
Self-aid and Buddy Care	AFI 36-2238	Every Two Years
Force Protection/Protection from Terrorism	AFI 31-210	Prior to Deployment, Permanent Change of Station (PCS) or Leave Outside CONUS
Explosive Ordnance Recognition	AFI 32-4001	Annually or as Directed by MAJCOM
Counter Intelligence Awareness and Briefing	AFI 71-101	Prior to Deployment, Permanent Change of Station (PCS) or Leave Outside CONUS
Small Arms Training	AFI 31-207, AFI 36-2226	Annually
Nuclear-Biological Chemical Defense Training	AFI 32-4001	Annually or as Directed by MAJCOM
Explosive Ordinance Recognition (EOR)	AFI 32-4001	Annually or as Directed by MAJCOM
Civilian Deployment Training	AFI 36-507	Prior to Deployment
Security Awareness, Training, and Education (SATE)	AFI 33-203	Annually, Prior to PCS

9.5. Army Support Training. For CWTs supporting Army units, **Table 9.2.** lists the suggested schedule of recurring training required of Army personnel. The Headquarters and Headquarters Company (HHC) Commander may suggest other training topics specific to the mission and location.

Table 9.2. Suggested Army Training.

SUBJECT	ARMY REGULATION	SECTION	HHC
Weapons Qualification	350-4	Company	2-3x/year
Physical Fitness (PT)	600-9	Company	PT 3x/wk-Army Physical Fitness Test (APFT) 2x/yr
First Aid	40-3	Company	Integrate with Common Task Training (CTT)
Heat/Cold and Hearing Protection	40-5	Company	Integrate with Safety Classes
Counter-terrorism	190-52	Security	Annually
Check Cashing	CSA dir 210-60	Army Community Services (ACS)	Annually
Nuclear, Biological, and Chemical (NBC) Defense	220-58	Company	Integrate with CTT
Benefits of Honorable Discharge	350-21	Company	Annually with Military Justice and Ethics
Code of Conduct	350-30	Staff Judge Advocate (SJA)	Annually with Geneva Hague
Military Justice	350-212	SJA	Annually with Ethics & Benefits of Honorable Discharge
Geneva Hague	350-216	SJA	Annually with Code of Conduct
Command Info Program	360-81	Company	Bi-annually with Censorship
Censorship	380-200	Company	Bi-annually with Command Information Program
SUBJECT	**ARMY REGULATION**	**SECTION**	**HHC**
SAEDA	381-12	Security	Bi-annually by Security Managers
Army Safety Program	385-10	Safety	Quarterly
Water Safety	385-15	Company	Annually - Recommended before Memorial Day Holiday
Prevention of Motor Vehicle Accidents	385-55	Safety	Annually - Recommended before Thanksgiving Holiday (1st QTR)
Operation Security	530-1	Security	As needed
Electronic Security	530-3	Security	As needed
Equal Opportunity (EO)	600-21	EO	Quarterly
Moral & Ethic Development	600-30	SJA	Annually with Military Justice and Benefits of Discharge
Alcohol & Drug Abuse	600-85	ACS	Annually
Consideration of Others		Company	Quarterly - conducted by each Defense communication System (DCS)/Section (submit lists to EO)

9.5.1. **Table 9.3.** lists the Army Field Manuals (FM) in which CWTs can access for additional training materials. These FMs can be located on the Army Library web site.

Table 9.3. Army Field Manuals.

Air Defense	FM 3-01 series; FM 44 series
Armor	FM 17 series
Army Aviation	FM 1 Series; FM 10-450 series
Artillery	FM 6 series
Combat Service Support	FM 10 series, FM 63 series
Engineer	FM 5 series
Infantry	FM 7, 21, 71, and 90 series
Intelligence	FM 34 series
Medical	FM 4 series, FM 8 series
Military Operations in Urban Terrain (MOUT)	FM 90-10, FM 100 series
Military Police	FM 19 series
Nuclear, Biological, and Chemical (NBC)	FM 3 series
Offensive Weapons	FM 23 series
Operations	FM 100 series
Paradrop	FM 10-500 series
Psychological Operations (PSYOP)	FM 3-05.30, 33-1-1
Signal	FM 11 series, FM 24 series
Training	FM 25 series
Transportation	FM 3-11.34, FM 55 series

9.6. Miscellaneous Training. The Officer-In-Charge (OIC) and Non-Commissioned Officer-In-Charge (NCOIC) are responsible for planning, conducting, and tracking miscellaneous training issues. Examples of this type training include Mission Readiness (Supplemental) Training, 7-level course.

9.6.1. Mission Readiness Training (MRT) is obtained/managed by MAJCOM/DOWs. Requirements for MRT are compiled 1-2 years before the class allocations. OICs/NCOICs must consider personnel turnover when requesting advance quotas. MRT is available for N-TFS, WSR-88D, and Tropical Weather courses. Since course attendance is tied to unit funding, the OIC will ensure the Operations Support Squadron Commander (OSS/CC) or Air Support Operations Squadron Commander (ASOS/CC) is notified of all requests.

9.6.2. MAJCOM/DOWs use a process developed by their personnel office and ensure the supported CWTs understand the selection/notification. The course allocation paperwork will flow through the installation Military Personnel Flight (MPF). The supporting orderly room will be responsible for issuing Temporary Duty (TDY) orders.

9.7. Army IMETS and Collective Training. As the Army continues on the digitization path, an essential element of training involves each operator of an Army Battle Command System (ABCS) workstation, including the IMETS. This includes having a working knowledge of the products and applications avail-

able on web page or client server functions on all the other ABCS workstations in the Tactical Operations Centers (TOC).

9.7.1. Prior to delivery of an IMETS and IMETS Light to a CWT, CWT leadership will contact the AFCWC Current Operations Branch to arrange initial operator training for the unit. Training will include system setup and tear down, operator maintenance, an overview of IMETS TDAs, interoperability with ABCS and AFW systems, and use of IMETS Weather Products.

9.7.1.1. All weather personnel tasked to support IMETS missions will accomplish operator familiarization training. The New Equipment Training Team (NETT) will conduct initial training as IMETS is fielded to each gaining unit. Sustainment training will be conducted as On-the-Job Training (OJT), to include detailed use of the Integrated Weather Effects Decisions Aid (IWEDA) software.

9.7.1.1.1. Mandatory training requirements include participation in NETT training or OJT and review of IMETS Operations Manuals. Recommended qualification training includes participation in IMETS exercise deployments and in-garrison training programs. Courses for IMETS/T-VSAT are conducted by the AFCWC.

9.7.1.2. IMETS operators must be familiar with the Common Tactical Picture (CTP) to obtain situation awareness of the "Order of Battle" for deployed friendly and threat forces. IMETS operators must be able to access digital version of OPORDs and OPLANs and electronically edit weather annexes as needed. Similarly, operators of ABCS workstations such as the Maneuver Control System (MCS) and All Source Analysis System (ASAS) must know how to access weather products from the IMETS web page and utilize IMETS client-server applications like IWEDA and Weather Feature.

9.7.1.3. CWT leadership will ensure weather personnel assigned as IMETS system managers are fully trained in network planning and IMETS operations.

9.7.2. To the maximum extent possible, CWTs must take part in any collective training opportunities offered by the local supported units or ABCS functionaries (e.g., the Central Technical Support Facility, Ft Hood TX). CWTs must be proactive in teaching other ABCS operators how to access and use weather products and services. This means using field training events to conduct face-to-face exchanges with their ABCS counterparts in the TOC as time permits to mutually gain familiarity with each others applications. CWTs are encouraged to conduct periodic in-garrison collective training for weather products for selected customers.

9.8. Rotations to Combat Training Centers (CTC). Army support CWTs will at some point be required to go with their customer to one of the CTCs, and all CWTs should actively lobby to take advantage of this wartime training. There are three main centers: Hohenfels GE, Ft Polk LA, and Ft Irwin CA. This is the best opportunity the CWT has to deploy and train with the customer in a "real" combat environment.

9.8.1. Prior to deployment to CTC, CWTs will:

9.8.1.1. Know the mission and the supported customer. For example, the entire division will likely not deploy. The way a CWT conducts business in-garrison will change when supporting a smaller or different customer. Participate in all ramp-ups before the deployment to fully prepare.

9.8.1.2. Develop a Memorandum of Agreement (MOA) or Letter of Agreement (LOA) with the supported customer that outlines specific duties and expectations. Refer to Appendix C of Joint Pub 3-59, *Joint Doctrine, Tactics, Techniques, and Procedures for Meteorological and Oceanographic Operations,* for LOI contents. Priorities of duties should be developed and agreed upon by the customer. **Table 9.4.** provides an example of duty priorities for deployed CWTs at a CTC.

Table 9.4. Duty Priorities for CTC Deployed CWTs.

Wartime defense of the duty site/location, including NBC defense measures.
Wartime support of the Division and/or Brigade Commander/principle staff elements.
Aircraft/ground emergencies.
Pilot to Metro Service (PMSV) calls from airborne pilots.
Prepare and disseminate Weather Watches/Warnings/Advisories.
Take and record surface weather observations.
Restore primary communications.
Prepare/issue mission execution forecast (MEF) products
Flight weather MEFs.
Other briefings.
NOTE: Based on the judgement of the OIC, NCOIC, or the CWT technician on duty, these priorities may be changed, especially if there is danger to life or property.

9.8.1.3. CWTs will only deploy with OPLAN-tasked equipment and weapons to support the mission. It is critical to train on and test the equipment as if operating in a wartime environment.

9.8.1.4. Inventory all equipment prior to deployment and upon arrival.

9.8.1.5. Prearrange required support with the appropriate OWS prior to deployment.

9.8.1.6. Situational Reports (SITREPs) are mandatory for CWTs to submit. Reference **Chapter 10** for details.

Chapter 10

CWT TACTICAL OPERATIONS

10.1. General. This chapter identifies responsibilities and requirements for CWTs to complete readiness preparation, reporting, and wartime or contingency planning. Weather readiness programs, reporting requirements, and planning guidance developed and documented locally will not violate the intent of this manual. For all actions, COMSEC and OPSEC must be considered/maintained at all times.

10.1.1. *Concept of Operations***.** Tactical, wartime weather operations are based on the Air Force/ Armys global mission, the need for rapid-response combat capabilities, and the highly diversified nature of air combat/ground planning and execution at each level of command. These operations must provide warfighters the weather information necessary to successfully plan and execute missions in support of the theater commander-in-chief's (CINC's) objectives.

10.1.1.1. *Basic Concept.* Wartime weather operations responsibilities will vary based on the supported command level. Specific responsibilities for wartime operations are identified in the appropriate CINC's Operation Plan (OPLAN). Other general responsibilities for wartime-related tasks such as readiness planning, preparation, and reporting are outlined below. Tasking directives, such as OPLANs, Operation Orders (OPORDs), or mission-specific weather operation tasking messages may specify additional, unique concepts and procedures.

10.1.1.2. Deployed weather personnel must be prepared to successfully perform their duties in an austere environment with limited communications and weather data access. Standard tactical weather equipment, means of communications, both secure and non-secure, and proven methodologies will be used.

10.1.1.3. Standardized reporting will be used to assist commanders in assessing unit readiness, shortfalls, and to help incorporate successful tactics and procedures into future operations.

10.1.1.4. Wartime and contingency planning will be performed and coordinated by the appropriate command-level weather units as required.

10.1.1.5. The CINC SMO will provide METOC planning and operational details in concert with the JMO (when designated). This guidance will normally be contained in the METOC Letter of Instruction and be disseminated to all METOC personnel. CWTs will use this information to coordinate support prior to the commencement of operations.

10.2. CWT Responsibilities.

10.2.1. Integrate wartime weather operation methods and procedures into peacetime operations as closely as possible without compromising safety, training effectiveness, or security.

10.2.2. Establish a training program in accordance with **Chapter 9** of this manual, MAJCOM supplements, and local directives.

10.2.3. Submit After Action Reports (AAR) IAW AFI 10-204, *Participation in the Military Exercise Program,* and this manual.

10.2.4. If tasked, submit Status of Resources and Training System (SORTS) reports in accordance with AFI 10-201, *Status of Resources and Training System.* CWT leadership will annually review the weather portion of the War and Mobilization Plan, at a minimum.

10.2.5. Provide trained personnel and equipment to support active and reserve forces as identified in core taskings, OPLANs, OPORDs, or MAJCOM tasking messages.

10.2.6. The senior deploying CWT member will coordinate weather requirements with the operational units they will support.

10.2.7. Prior to deployment, coordinate with supported Air Force or Army component SWO on unique weather operational requirements and personnel, equipment, or operational shortfalls.

10.2.8. Notify parent MAJCOM/DOW through appropriate weather channels when personnel and/or equipment are tasked to deploy in support of contingency operations, higher headquarters directed exercises, and rotational deployments. Include name, rank, Air Force Specialty Code (AFSC), equipment, date departing, destination, and estimated return date (appropriate security procedures apply) in the notification.

10.3. Wartime and Contingency Planning. Wartime and contingency planning should be conducted IAW AFMAN 10-401, *Operation Plan and Concept Plan Development and Implementatio*n. There are different levels of responsibility and taskings in the planning process. Typically, comprehensive planning produces superior deployment and employment actions. At the tactical level, the mission generally requires an ability to accomplish short-notice deployment. Along with the deployment plan of the parent organization, the CWT must have an internal plan to ensure effective and efficient deployment. CWTs should consider:

10.3.1. Identification of customer requirements and the training necessary to meet those requirements.

10.3.2. Knowledge of wartime taskings and duties.

10.3.3. Availability of personnel and selection of the best qualified for deployment. Ensure proper personnel are selected to support Unit Type Code (UTC).

10.3.4. Equipment requirements, operational status, and load plans.

10.3.5. Identification and resolution of shortfalls for both manning and equipment.

10.3.6. Coordinating communications support.

10.4. Personnel Readiness Folders (PRFs). CWTs will establish PRFs IAW AFI 10-403, *Deployment Planning*, for CWT members assigned to an AEF or deployment position if another base/post agency has not established one.

10.5. Table of Organization and Equipment (TOE). Army support CWTs must be familiar with their Modified Table of Organization and Equipment (MTOE). The MTOE is developed from the TOE. TOEs are developed by the Training and Doctrine Command (TRADOC) to provide standard organizational structure. They are designed to support approved Army doctrine. A TOE is not an authorization document for equipment or people, but is the minimum equipment required by the unit to accomplish its mission and as the basis from which to develop MTOEs.

10.5.1. Any unit can request changes to the TOE by submitting a DA Form 2028 through Army channels (parent unit to MACOM; MACOM to HQ TRADOC) to HQ TRADOC.

10.5.2. Equipment supporting the wartime mission must be loaded in the time-phased force and deployment list (TPFDL) to be deployed (AF owned equipment through AF channels and Army owned equipment through Army channels). See your war contingency planners to complete the process.

10.5.3. CWT OICs must also work with the installation Property Book Officer (PBO) and the Army Headquarters and Headquarters Company (HHC) Commander to ensure the CWT is properly issued items on the MTOE.

10.5.4. Command Inventory. Army-aligned CWT OICs/NCOICs become the owners of equipment supplied by both the Air Force and the Army. USAF equipment the CWT is authorized is listed on the Allowance Standard (AS). Army equipment is listed on the MTOE usually hand-receipted from the HHC Commander. Every time the receipt holder changes or the HHC commander changes command, CWTs perform a 100 percent equipment layout. Everything (to include sub-assemblies of big items) will be laid out on a flat surface, and the commander or their representative will account for all assigned equipment. Some items are replaceable without expense to the unit or individual (e.g., grounding rods), but if others are missing, the CWT has to file a report of survey to get replacements.

10.5.4.1. The equipment Technical Order (TO) or Army Field Manual (FM) will list what sub-components make up the item. These are very helpful when accounting for the pieces. TOs must be available for each piece of equipment owned. Additionally, while the equipment is laid out and fully accounted for, take a photograph of the sub-components. The process will be easier in subsequent inventories.

10.5.4.2. **Attachment 5** provides additional details of the inventory process for Army support CWTs.

10.6. Requesting Deployment Communications. Units will coordinate their communication requirements prior to deploying with their supported customers, communications and information providers, and the Senior METOC Officer (SMO) for the deployment area. Communication and information priorities are the responsibility of the OIC/NCOIC. Units should review applicable OPLANs to determine availability of communications assets.

10.6.1. Communication and Information planners need to know the number of weather support personnel, direct customers, weather systems, access to classified and unclassified common user Local Area Networks (LANs) (e.g., NIPRNET/SIPRNET), number of phone circuits, COMSEC, radio frequency, and the need for Internet Protocol (IP) addresses.

10.6.2. Communications and Information, when in the deployed environment, will be coordinated with the A6/J6/G6/S6. Coordination will ensure the best utilization of communication and information services in theater.

10.6.3. CWTs will ensure the CINC SMO, JMO, JMFU, and supporting OWS for the deployed AOR is informed of communication capabilities and/or restrictions.

10.6.4. Air Force Special Operations Command (AFSOC) CWTs have unique deployment scenarios. These CWTs may maintain, deploy with, and use unit-owned communications equipment. OWSs will maintain communications equipment compatible with AFSOC communications equipment to facilitate a push/pull/reach back capability.

10.7. Pre-deployment Considerations. Individuals/units will deploy in accordance with the appropriate contingency/exercise TPFDL.

10.7.1. For deployments planned at wing or Army level, the OIC/NCOIC should identify their requirements using standard weather UTCs for personnel and equipment. If weather personnel and equipment are included in their customers' UTC, then a tasking message identifying AFSC, equipment, and deployment information will be sent through channels to the applicable MAJCOM Battle Staff for validation and flowing of personnel tasking message by MAJCOM/DPs.

10.7.1.1. For CONUS-based CWTs supporting the Army, the SWO must coordinate the tasking message with their J2/G2/S2 through Army component to Joint Forces Command (JFCOM) and the MAJCOM/DOW. CWTs supporting an Air Force deployment are normally covered by the wing.

10.7.2. Deployment Binders. All CWTs with a deployment requirement will establish and maintain deployment binders. Deployment binders aid in a smooth and quick transition to a wartime posture, with all the necessary personnel and equipment information needed to meet mission requirements. **Table 10.1.** is an example of contents included in a generic deployment binder. This example should be tailored to a CWT-specific wartime mission and local requirements.

Table 10.1. Example Deployment Binder.

Sequence of Events Checklist
Personnel Roster
SWO Situation Briefing
Briefing Formats for Customers
Pre-deployment briefings: Mission briefing Security Safety Personal Affairs Finance Emergency data actions Dependent care Convoy procedures
Mobilization/loadout checklists
Equipment inventory
COMSEC

10.7.3. Pre-Deployment Actions/Briefings. The deployment OIC/NCOIC is responsible for ensuring all deploying personnel accomplish all actions. The use of a checklist will ensure a logical, thorough completion of all pre-deployment actions. **Attachment 6** includes an example of a pre-deployment checklist. As well, use the following guidelines as applicable for pre-deployment actions and briefings:

10.7.3.1. Each OIC/NCOIC will keep notes as soon as preparation for the operation begins. Determine how to best support the contingency. Normally, the OIC/NCOIC will report to the com-

mand post/operations center and find out as much initial information as possible concerning the deployment. The OIC/NCOIC fills in as much data (e.g., times and dates) as possible on the checklist. A logbook specifically assigned to the exercise/contingency should be established. As recalled personnel arrive at the CWT they should initial the logbook, enter the time they arrived and review the checklist for times/dates and any information listed concerning the deployment.

10.7.3.2. Identify personnel and equipment for deployment.

10.7.3.3. Document problem areas as they occur, to include local corrective actions taken or initiated. Information can be kept as a word or text file on a computer.

10.7.3.4. Determine the weather support structure to support the exercise/contingency including unit/function (e.g., Joint METOC Officer (JMO), Senior METOC Officer (SMO), MAJCOM/DOW, CINC/SMO, Air Force Forces (AFFOR)/Staff Weather Officer (SWO), Army Forces (ARFOR)/SWO, Corps/SWO, Joint Meteorological Forecast Units (JMFU), etc.)., locations, message address, and phone number.

10.7.3.5. Update weather support requirements and consider a request for centralized weather support IAW AFI 15-118, *Requesting Specialized Weather Support*, or from the supporting OWS.

10.7.3.6. Determine equipment/personnel shortfalls and request assistance from higher headquarters or MAJCOM/DOW if necessary.

10.7.3.7. Determine communications support:

10.7.3.7.1. Identify NIPRNET/SIPRNET requirements prior to deployment.

10.7.3.7.2. Request radio frequencies from frequency control officer.

10.7.3.7.3. Request KQ identifiers and High Frequency Radio Broadcast (HFRB) support from Air Force Weather Agency (AFWA), Current Operations; or MAJCOMs in OCONUS areas. Coordinate use of KQ identifiers with the servicing OWS(s), the CINC SMO, and JMO. This is equally important for exercises as well as contingencies.

10.7.3.8. Coordinate support with the responsible OWS. Also determine what indigenous or other weather services and/or communications are available at the employment site, and if the deployment team will have access (Note: Be aware that allied countries may have different observing rules than U.S. customers. For example, Instrument Flight Rules [IFR] conditions for Spanish airmen may be different than U.S. airmen). If tailored, centralized support is not available, submit a formal request to the supporting OWS or AFWA IAW AFI 15-118 or use web-based support procedures.

10.7.3.9. Time permitting, standardize the Tactical Aneroid Barometers.

10.7.3.10. Conduct a Preparation for Overseas Replacement (POR) with a 100 percent inspection of each individual's PRF.

10.7.3.11. Inspect personal gear for serviceability and/or missing items.

10.7.3.12. Conduct deployment briefings. Brief mission, security, safety, personal affairs, finance, emergency data actions, dependent care, and convoy procedures (Army).

10.7.3.13. Obtain deployment area maps (Army from G2/S2 [1:50,000] and Air Force from Intel)

10.7.3.14. Review country guides, climatology, terrain, geography, culture, and related study material covering the deployment area.

10.7.3.15. Prepare specific climatology/light data for the operational area. Consider terrain information. For example, mountainous areas will impact nighttime illumination for low level flying Army aircraft.

10.7.3.16. If lead unit, create an LOI for the operation. Supporting units should review the LOI prior to the deployment. Refine as time permits.

10.7.3.17. Ensure TDY orders are received and correct.

10.7.3.18. Ensure vehicles are ready for deployment as far in as advance as possible. Even minor problems can “redline” a vehicle and cause it to be unauthorized for deployment.

10.7.3.19. Ensure all equipment being deployed is inventoried, packed, and loaded/palletized to include a SWO/Forecaster Kit Inventory. **Table 10.2.** contains a suggested list of administrative supplies to include in a SWO/Forecaster Kit, but all CWTs should adjust as needed for the mission and the length of the deployment.

Table 10.2. SWO/Forecaster Kit Administrative Supplies (SWO KIT).

Ball point pens	Clear tape, rolls	Duct tape
Felt tip pens, fine point	Tape dispenser	Thumbtacks
Felt tip pens, broad tip	Toilet paper, rolls	Letter envelopes
Water soluble pens	Masking tape	Large envelopes
Alcohol soluble pens	Paper clasps (medium)	Logbook
Lined writing pads	Single edge razor blades	Label sheets
Bond paper, sheets	Batteries	Trash bags
Manila folders	Two and three-hole punch	Pencil sharpener
Acetate	Blank CD-ROMs	2-hole paper fasteners (tops and bases)
Staples, boxes	Computer Disks	2-hole paper fasteners
Staple remover	Clipboards	Scissors
Stapler	12" ruler	Correction fluid
Rubber Bands	Erasers	Paper clips, box

10.7.3.20. Other Deployment Items. CWTs will deploy with the appropriate items (electronic or paper) as listed in **Table 10.3.**, **Table 10.4.**,**Table 10.5.**, and **Table 10.6.**

Table 10.3. Worldwide Deployment Publications.

AFJI 15-157, *Meteorological Support for the US Army*
AFMAN 105-4, *Weather Support for Army Tactical Operations*
AFMAN 15-111, *Surface Weather Observations*
AFI 15-118, *Requesting Specialized Weather Support*
AFMAN 15-124, *Meteorological Codes*
AFMAN 15-129, *Aerospace Weather Operations-Processes and Procedures*
AFI 15-128, *Aerospace Weather Operations - Roles and Responsibilities*
AFMAN 15-135, *Combat Weather Team Operations*
AFWA-TN 98/002, *Meteorological Techniques.*

Table 10.4. Forms.

DD Forms:
173-2, *Joint Message Form*
175-1, *Flight Weather Briefing*
AF Forms:
1297, *Temporary Issue Receipt*
3126-3143, *General Purpose*
3801, *Aneroid Barometer Standardization/Comparison*
3803, *Surface Weather Observations*
3805, *Pilot Report*
3806, *Weather Watch Advisory Log*
3807, *Watch/Warning Notification and Verification*
3811, *Quality Control Register*

Table 10.5. Optional Plotting Charts

SLC-1, North America
SLC-2, Europe
SLC-5, Africa/SW Asia
WPC 2-7-1 (Caribbean)
WPC 2-15-1 (S. America)
WPC 2-15-13 (Africa/SW Asia)
WPC 3-2-1 (Central Europe)
WPC 3-7-1 (Europe)
WPC 5-15-3 (European VA)
WPC 9-16-1 (100 mb SKEW-T)
WPC 9-16a (400 mb SKEW-T)

Table 10.6. Miscellaneous Deployment Items.

Operations Weather Limiters Network (OWL NET) CD-ROM
Deployment area 1:50,000 (FROM G2/S2) maps
World Atlas
FAX schedule (copy)
COMSEC
KQ Identifiers (if applicable)
Magnetic variation charts
Appropriate briefing slides
DoD Flight Information Pamphlets (FLIPs)
Electronic files, charts, forms, forecasting analysis and briefing tools on disks or CD-ROM

10.7.3.21. Verify convoy time or manifest call, and load time.

10.7.3.22. Ensure all meteorological support has been prepared and passed to the supported unit, such as forecasts, climatology, astronomical data, etc.

10.7.3.23. Coordinate with the J1/G1/S1 with names, social security numbers, and security clearances for deploying Army weather support personnel.

10.7.3.24. Coordinate as applicable for: (1) additional personnel if needed, (2) additional weather support or data requirements, (3) reporting requirements, (4) identity of the Weather Support Force commander, and (5) know the contingency frequencies and call signs/KQs.

10.7.3.25. Personnel deploying longer than 30 days must transfer responsibility for hand receipts to someone remaining at home station.

10.7.3.26. Weather personnel in the grades of E-6 and below should hand carry their training records for individual certification at the deployed location.

10.7.3.27. *COMSEC.* The deployment OIC/NCOIC (or deployment director) will detail an individual to retrieve the COMSEC from the custodian's vault. This person must possess local courier orders and be familiar with instructions for handling COMSEC.

10.7.3.28. *Deployment Orders.* All Air Force personnel will deploy with copies of their Contingency, Exercise, or Deployment (CEM) TDY orders IAW AFI 10-215, *Personnel Support for Contingency Operations (PERSCO*). Personnel processing through an Air Force installation will have their orders prepared, verified, and authenticated by the Personnel Readiness function or Deployment Processing Unit (DPU).

10.7.3.28.1. For personnel processing from an Army installation, the official tasking will flow from MAJCOMs to the unit through the host Air Force installation Personnel Readiness function or DPU for all Chairman, Joint Chief of Staff (CJCS) contingencies/exercises and overseas deployments. (Note: for local Army deployments, CWTs will deploy on Army movement orders. Ensure names of CWT members deploying with Army are on the deployment roster.)

10.7.3.28.1.1. Units not conveniently located near their host Air Force installation may have their CEM TDY orders prepared by the Personnel Readiness function/DPM and

faxed to the unit. Units will establish procedures with their host Air Force installation for receiving tasking notification and CEM TDY orders. Local fund cites will be used with the Emergency Special Program (ESP) code for the operation attached. ESP codes are identified in the tasking message to DPU.

10.7.3.28.1.2. Due to the need for rapid deployment of some units with their supported Army unit, CEM TDY orders may be prepared locally using the procedures in AFI 10-215, *Personnel Support for Contingency Operations*, Chapter 4. Copies will be forwarded to host Air Force installation personnel function.

10.7.3.28.1.3. Army prepared individual orders may be used, but must contain information required by AFI 10-215, *Personnel Support For Contingency Operations,* Chapter 4, and a copy of each individual order forwarded to their host AF installation personnel readiness function.

10.7.3.28.1.4. If group orders (containing two or more people) are used, they will contain information listed in AFI 10-215, *Personnel Support For Contingency Operations*, Chapter 4, on each individual. A copy will be forwarded to host Air Force Personnel Readiness function. Individuals will each receive a copy of this CEM TDY order with Social Security numbers suppressed.

10.7.4. *Deployment Notification.* CWTs will notify their MAJCOM/DOW upon receipt of taskings to support an overseas contingency. Units will include name, grade, and Air Force Specialty Code (AFSC) of deploying personnel. Information is required to ensure a balance of experience exists throughout the AOR and for filling positions which require a critical level of experience.

10.7.4.1. CWTs will notify the MAJCOM/DOW when personnel deploy in support of contingency operations. This information is required to update the Unit Line Numbers (ULN) in the CINC's TPFDD with deployment status (i.e., deployed).

10.8. Employment Considerations. There is no hard and fast rule to follow in setting up operations in a deployed environment. Each deployed location will have its own restrictions and guidelines based upon location, operational environment, location commander, and customer requirements. This section briefly identifies items and programs that should be considered prior to every deployment and are recommended for extended deployments. Additional references for weather operations are AFMAN 15-111, AFMAN 15-124, AFMAN 15-129, and AFI 15-128. **Attachment 6** includes an example employment checklist.

10.8.1. *Physical Security/Force Protection*. All personnel will be familiar with the threat and any defensive actions (e.g., perimeter defense) necessary. The OIC/NCOIC of the deployed weather team will ensure all personnel under their supervision are accounted for and provided adequate security and safety.

10.8.2. *Management Practices.* Prior to deploying, unit managers will coordinate with the operational customer they are deploying with to identify weather requirements. If insufficient time is available to accomplish this prior to deployment, it must be done as soon as possible after arrival at the deployment location. These requirements will be "fine-tuned" according to any operational changes once CWTs arrive in their AO. Topics to discuss with the supported customer include air refueling tracks, low-level routes, special weapons requirements, ingress and egress routes, and other mission-specific requirements. Also coordinate customers desired medium and format for receiving weather information (e.g., e-mailed PowerPoint slides, briefed flimsy, faxed 175-1, verbal over radio).

10.8.2.1. *Letter of Instruction/Weather Support Document.* Every person in the CWT should know from the beginning what is expected of them and how to meet their individual mission requirements. One recommended way of informing unit personnel of mission requirements is coordinating a Letter of Instruction (LOI). For extended deployments a Weather Support Document (WSD) may be required. Refer to AFMAN 15-129 on how to develop a WSD.

10.8.3. *Weather Support Evaluation.* Units will develop procedures for tracking weather support effectiveness.

10.8.4. *Observing Practices.* Deployed observing will be completed IAW OPLANs, AFMAN 15-111, *Surface Weather Observations*, and other applicable directives to the fullest extent possible.

10.8.4.1. Observing Standing Operating Procedures (SOPs). Generic observing SOPs should be available for every deployment where observations are required. Written procedures will describe how to take tactical observations, where and how to disseminate them, and how to perform back-up procedures. SOPs will also include TACMET operational procedures to include generator operations, if required. For extended deployments, SOPs will be updated to reflect local requirements.

10.8.5. *Forecasting Practices.* In-garrison weather services and deployed weather services will be the same (as much as possible).

10.8.5.1. Forecasting SOPs. Generic forecasting SOPs should be available for every deployment. Ensure procedures are outlined for accessing OWS weather sources and back-up procedures. SOPs will be updated to reflect local requirements during extended deployed tours.

10.8.6. *Forecast Reference Notebook (FRN).* The FRN is a compilation of all the useful information for forecasting weather at a given location. OWSs maintain the FRNs for CWTs in their AOR, however, it is incumbent upon the CWT to ensure the FRN is current and accurately depicts local forecasting aids and techniques, topography, and customer sensitivities.

10.8.6.1. CWTs will obtain or develop FRNs for operating areas tasked in OPLANs and routinely used by operational customers. The Air Force Weather Technical Library (AFWTL) may have a copy in CD-ROM format of a FRN on file for the site of interest. Call the customer service section to inquire. Additionally, the OWS supporting the AOR may have this information on file or posted on their web site.

10.8.7. *Mission Execution Forecast Process (MEFP).* CWTs will normally deploy with a basic idea of customers supported and will tailor their MEFP to focus on their mission requirements. Weather technicians will be proficient with limited data forecast techniques in case reach-back capabilities cannot be established with the supporting OWS immediately.

10.8.8. *Severe Weather.* OWSs will provide Weather Warnings and Advisories according to deployed customer requirements. CWTs must ensure desired lead-times are coordinated to reflect not only customer needs, but also OWS technical capabilities. Communication and equipment may not be at optimum levels and consideration should be given to weather unit restrictions before promising unrealistic lead-times.

10.9. Redeployment/Post-deployment. Upon notification of redeployment CWTs will:

10.9.1. Inventory all equipment. Determine if equipment is operational and/or if there are missing components.

10.9.2. Ensure equipment is properly packed and stored prior to shipment.

10.9.3. Complete a Report of Survey for missing or damaged equipment.

10.9.4. Ensure the equipment is sent to correct units by verifying the TPFDD with local logistics or MAJCOM/DOW.

10.9.5. Ensure classified material is accounted for, secured, and disposed of properly.

10.9.6. Ensure safety, security, medical, finance, and personnel briefings are conducted.

10.9.7. Complete all After Action Reports.

10.9.8. **Attachment 6** includes examples of re-deployment and post-deployment checklists.

10.10. Reports. Reports provide commanders information necessary to evaluate the readiness of assigned forces. They also provide an excellent opportunity to review performance and crossfeed valuable lessons learned in providing tactical or deployed weather support. After coordinating reports with the supported customer, AFW units will report the following to the Joint METOC Officer (JMO), Senior METOC Officer (SMO), and applicable MAJCOM/DOWs.

10.10.1. *Contingency/Exercise-Generated Reports.* Reports will be submitted for all higher headquarters directed contingencies/exercises as specified by the OPORD, Execution Orders (EXOrd), LOI, tasking message or this manual. Examples and instructions for each report should be included in a Deployed Binder.

10.10.2. *Initial Status Report (ISR),* RCS HAF-XOW(AR)0111. The purpose of the ISR is to help identify deployed unit problems early and begin working possible solutions. Submit an ISR within 24 hours after arrival in the exercise/deployment area to the CINC SMO and AFFOR/ARFOR SWO. The ISR applies to contingencies and/or exercises (OCONUS and CONUS). All reports should be coordinated with the supported customer. Forward the ISR to the senior AF weather officer in the theater (CINC/SMO, AFFOR/SWO, ARFOR/SWO, Corps/SWO, etc.). When communications permit, forward copy to MAJCOM/DOW and HQ USAF/XOW with "Attention Weather." 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.

10.10.2.1. The ISR will briefly state the readiness of the CWT within 24 hours after beginning operations. The ISR will give a brief overview of conditions upon arrival and ability of the CWT to meet customer requirements. The ISR should include, but is not limited to, the following items:

10.10.2.1.1. Personnel. Report number of officers/technicians currently available for duty in the CWT and any expected changes in duty status.

10.10.2.1.2. Equipment. List deployed equipment and operational status.

10.10.2.1.3. Facilities. Briefly describe suitability of facilities.

10.10.2.1.4. Communication. Briefly list available communications to include phone numbers and type.

10.10.2.1.5. Remarks. This section will be used to highlight major successes, problem areas, and comments on equipment, communications, or weather forecast items of special interest to the weather support force.

10.10.3. *SWO Report (SWOREP) or Situation Report (SITREP),* RCS: HAF-XOW(AR)0110. Submit through channels to the CINC/AFFOR/ARFOR as stated in the LOI. See the suggested example in **Table 10.7.** (Note: these reports will be up-channeled to the JMO/SMO as required). 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.

10.10.3.1. *Tactical Meteorology Equipment (TACMET) Reports,* RCS: HAF-XOW(AR)0112. Units deployed for over 60 days will provide a daily SITREP identifying all TACMET and weather support equipment. Units will identify nomenclature, number required, number on hand, and number operational. Forward reports through the SMO in the AO to MAJCOM/DOWs. 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.

Table 10.7. Suggested SWOREP/SITREP Format.

FROM: (Weather Element message address)
TO: (AFFOR)(JFACC)/ARFOR/(each Corp) message address)
/OPER (enter OPER for operations, EXER for exercises)/JOINT GUARD// (Enter operation/exercise name)
/MSGID/GENADMIN//
/SUBJ/SWOREP NR XX// (or SITREP, numbered consecutively)
/REF/A/MSG/DTG//(enter only if required)
/POC/SMITH/1LT/OSW/20OSS/DSN 123-4567// (enter POC information)
/RMKS//(Free formatted, enter info as required. Include only those topics that are applicable or have changed since the last report)
1. PERSONNEL. Report all gains, losses, and changes in duty status. When describing casualties, describe cause and extent of injuries. Note whether replacements are needed and identify surplus personnel.
2. LOGISTICS. Report existing or anticipated equipment and supply problems and actions taken. Advise whether assistance is required.
3. COMMUNICATIONS. Report changes in the quality of communications and how it effects mission capability.
4. WEATHER SUPPORT. Report significant changes from planned or scheduled operations which were due to weather or weather support. Describe the quality and sufficiency of weather support provided and the feedback (positive and negative) from the user. Describe how weather effected decisions. Evaluate Centralized Production Facility (CPF) products received from Theater Weather Center, Joint METOC Forecast Unit (JMFU), AFWA, etc. and recommend improvements and/or changes.
5. REMARKS. As appropriate. Unless otherwise specified, at bases/locations with more than one weather element, the senior weather person will submit a consolidated report. This report is due to the ARFOR/AFFOR/Corps SWO by 1600L each day from all deployed weather elements. The SWOREP/SITREP will be used by the AFFOR/ ARFOR SWO to identify personnel, equipment, and operational shortfalls, make operational decisions, and to request replacements/additional personnel and equipment through the theater AF/Army planning cells. **NOTE:** The AFFOR/ARFOR SWO should spell out the timing and frequency of their reports.
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NOTE: All reports should be coordinated with and through the supported customer. Customer-supplied communication methods will be used to forward these reports.

10.10.4. After Action Report (AAR) Guidelines, RCS: HAF-XOW(AR)0109. The AAR is a tool to identify good as well as bad lessons learned, ideas, products generated, etc. Reports are required whenever MAJCOM units or personnel participate in a Chairman, Joint Chiefs of Staff (CJCS) exer-

cise, other joint exercise, AF-designated exercises, MAJCOM-designated exercises, and real-world operations/contingencies IAW AFI 10-204, Participation in the Military Exercise Program, and appropriate MAJCOM supplements. Submit within 30 days of end of exercise (ENDEX) or operation termination to the CINC SMO and AFFOR/ARFOR SWO with informational copies to the MAJCOM/DOW. This report should include all items submitted through supported customer as Joint Universal Lessons Learned (JULLS). An Initial After Actions Report (IAAR) may be required by the exercise commander prior to ENDEX. 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.

10.10.4.1. Each OIC/NCOIC will keep notes as soon as preparation for the operation begins.

10.10.4.2. Document problem areas as they occur, to include local corrective actionstaken or initiated." Information can be kept as a word or text file on a computer.

10.10.4.3. Focus on items that require higher headquarters action and identify these as action items.

10.10.4.4. Problems that can be solved at the local level should be listed as "lessons learned."

10.10.4.5. Include discussions on communications effectiveness by network, circuit, or system.

10.10.4.6. The report should be written in a timely manner while details and facts are still clear and personnelinvolved are present for consultation.

10.10.5. Readiness Reporting, RCS: HAF-XOW(AR)0113. Unit Type Code (UTC) tasked CWTs will report readiness status in Status of Resources and Training System (SORTS) following the guidelines in AFI 10-201, Status of Resources and Training System, and appropriate MAJCOM and installation supplements. 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.

Chapter 11

CWT COMMUNICATION SYSTEMS AND COMMON OPERATING EQUIPMENT

11.1. General. Weather data may originate from a variety of AFW, DoD, allied, national, indigenous, and commercial sources. These sources use various communication modes to include common user communications, satellite, and high-frequency radio.

11.2. CWT Web Sites. CWTs may maintain a web site for use in disseminating MEFs to local customers and the near-instantaneous relay of weather and climatological data. CWT web sites will meet the following requirements:

11.2.1. Links to non-AFW sites will only be to DoD, colleges or universities, or government agencies (e.g., NWS, FAA). Links to commercial civilian sites (e.g., Weather Underground and the Weather Channel) are not authorized for operational customers.

11.2.2. Web sites will be quality controlled at least quarterly to ensure information is updated and that all links still function. CWTs that use their web site to propagate daily perishable weather data, must ensure the data remains current.

11.3. Common User Communications Networks. The primary source of weather information for CWTs is from the supporting OWS. OWSs provide an array of products to include discussion bulletins, and mesoscale graphics and alphanumeric products. OWSs post these products on Common User Communications Networks, e.g., NIPRNET, SIPRNET, and/or Joint Worldwide Intelligence Communication Systems (JWICS).

11.3.1. Army CWTs and OCONUS Air Force CWTs will coordinate with the supporting OWS when unable to access products on the OWS web site due to low bandwidth or other communication constraints. OWSs will provide the requesting CWT the necessary data and products to support the mission in the most expedient manner possible (e.g., e-mail, FTP, fax)

11.3.2. The following list of AFW and Army systems are designed for integration into a Local Area Network (LAN) and all can host a common user network web site:

11.3.2.1. New Tactical Forecast System (N-TFS)/Advanced Meteorological Information System (AMIS).

11.3.2.2. Integrated Meteorological System (IMETS) and IMETS Light. The IMETS is a mobile, tactical automated weather data receiving, processing and dissemination system designed to provide timely weather and environmental effects forecasts, observations, and decision aid information to Army Battle Command System (ABCS) elements at echelons where AF CWTs provide tactical weather support to the Army.

11.3.3. Quick Reaction Communications Terminal (QRCT III). The QRCT III is a PC-based communications system designed for use in a tactical environment. The QRCT III has the ability to receive AFW High Frequency Radio Broadcast (HFRB) and most worldwide weather marine broadcast stations. It is designed to provide a first-in means of communicating information on the battlefield. QRCT III can supplement more sophisticated communication systems, as well as provide a back-up capability.

11.3.3.1. The primary purpose of the QRCT III is for higher echelons to communicate crucial weather and command and control information to weather elements at lower echelons. It accomplishes this by means of either broadcasting to units, or having two-way communications between units. The system can operate in either the unclassified or classified modes. The lead weather element is responsible for coordinating frequencies, determining broadcast modes, and net protocols, etc. This is usually accomplished through a Signal Operating Instruction.

11.4. Satellite Communications. CWTs routinely use the Very Small Aperture Terminal (VSAT) and the Tactical Very Small Aperture Terminal (T-VSAT). Through VSAT and T-VSAT, AFW provides a wide range of alphanumeric and graphic data, and meteorological model data fields to users via a network of communication satellites. N-TFS and IMETS are two of the primary users of VSAT communications.

11.4.1. VSAT and T-VSAT operate in the receive mode. CWTs will define data requirements on-line using the VSAT/T-VSAT subscription page on JAAWIN. This page lists the subset of products currently on data requirements by any VSAT user. If the required product is listed, simply follow the directions on the subscription page to update data requirements. If the product is not on the listing, refer to the following sources for the product.

11.4.1.1. Graphic Products. For graphic products, refer to the AFW VSAT Graphic Products catalog. The graphic product catalog includes: the Mesoscale Model Version 5 (MM5), Aviation Model (AVN), Medium Range Forecast Model (MRF), Advect Cloud, Formatted Binary Data (FBD), Uniform Gridded Data Field (UGDF), Vector Format, and products available on JAAWIN. The exception is products with interactive capabilities. Product lists can be obtained from AFWA/XOR, and if CWTs wish to add a product to the AFW VSAT product list, contact AFWA/XOR. Users can use the feedback or support assistance request features on JAAWIN for this purpose, or can call DSN [312] 271-1633.

11.4.1.1.1. For emergency requests, contact the AFWA Consolidated Help Desk Team Chief at DSN (312) 271-2586; COMM (402) 294-2586.

11.4.1.2. Alphanumeric Data. For alphanumeric data, any product on the AFWA Master Data Listing (MDL) can be made available via the AFW VSAT system. All N-TFS data requests will be accomplished through the Weather Subscription Service (WSS). AFWA/XORC (Current Requirements) is the AFW focal point for data requirements. AFWA/AWN is the AFW focal point for all N-TFS alphanumeric data requests. Contact AFWA/XORC at DSN (312) 271-1633 or COMM (402) 294-1633 to request data requirement changes to JAAWIN and Secure-JAAWIN (JAAWIN-S).

11.5. High-Frequency (HF) Radio. Some CWTs maintain a limited capability to use HF radio as a first-in and back-up communications mode. Tasked CWT personnel will be knowledgeable of the principles and basic theory of HF communications to include:

11.5.1. High-Frequency (HF) Principles.

11.5.1.1. Signal travel, what affects the signal, and how to make adjustments to improve communications.

11.5.1.2. Concepts such as ionospheric bounce, solar anomalies, ground/sky wave, spectrum/ frequency assignments, and propagation.

11.5.1.3. Adjusting communication setup/system to improve field communications.

11.5.2. The most common type of HFRB system is the Marine Teletype/Facsimile Receiver (e.g., Alden 9315 TRT-R). Marine teletype/facsimile receivers provide units a first-in means of receiving weather information on the battlefield by receiving HFRB and worldwide weather broadcast stations. When more sophisticated communication systems arrive and are operating on the battlefield, marine teletype/facsimile receivers can supplement these systems, as well as provide back-up capability.

11.5.2.1. AFW HF Radio Broadcast Sites**.** AFW uses HFRB to broadcast a mix of alphanumeric and graphic products from three sites to field customers with equipment to receive Worldwide Marine Weather Broadcasts. The CONUS site is located at Elkhorn, NE; the Central/Northern South American site is located at Isabella, Puerto Rico; and the Pacific site is located at Barragada, Guam (see **Table 11.1.**). HFRB is a limited-bandwidth system. By using side bands, HFRB is able to simultaneously broadcast alphanumeric data at a rate of 75 baud and approximately four graphic images per hour. Contact AFWA/XORC for information on or to request permanent or temporary changes to HFRB alphanumeric data requirements or graphic product schedules.

Table 11.1. AFW HFRB Frequencies.

Elkhorn (MHz)	Isabella (MHz)	Guam (MHz)
3.231	3.39 4	4.493
5.096	4.855	6.919
6.904	7.398	7.708
10.567	7.87	13.385
11.12	10.997	14.397
15.681	11.622	17.526
19.325	15.781	29.38
	19.363	

11.5.2.1.1. Indigenous Broadcasts. Many international organizations provide Worldwide Marine Weather Broadcasts. NOAA Publication #202-512-1707, *Worldwide Marine Weather Facsimile Broadcast Schedule* provides a wealth of information to include broadcast sites, transmission frequencies, and product schedules. Contact the AFW Technical Library (AFWTL) for a copy of this publication or download from **http://www.nws.noaa.gov/om/marine/rfax.pdf.**

11.5.3. Contact the AFWA Consolidated Help Desk at DSN (312) 271-2586 or COMM (402) 294-2586 if there are problems with N-TFS or AFWA-controlled VSAT, JAAWIN, JAAWIN-S, JAAWIN (SCI) or HFRB systems. Use the Feedback form posted on the JAAWIN site if the problem or request is not urgent, otherwise contact the AFWA Consolidated Help Desk by telephone.

11.6. Requesting Communications. When requesting communications that require Air Force assets, maintenance, and allied support, a C4 Systems Requirement Document (CSRD) must be submitted to the supporting communications agency for review and determination. Specific guidance on this process is contained in AFI 33-103, *Requirements Development and Processing*. Once the CSRD is received and validated, AFWA will process the request for services (RFS).

11.7. Weather System Support Cadres (WSSCs). WSSCs are teams who deploy to assist theater weather forces with initial weather systems network connection and set-up. Once forces are established, the WSSC will fall back to a centralized location in theater and provide 24-hour help desk functions for weather systems maintenance and systems administration support to any CWT, regardless of owning MAJCOM, deployed in their AOR. WSSC East is located at Robins AFB, WSSC West at Tinker AFB, and the USAFE WSSC located in the USAFE OWS is at Sembach AB, Germany. A WSSC team will also be located at the 20th OWS at Yokota AB, Japan. **Table 11.2.** summarizes which agency a CWT should call for assistance for peacetime, non-deployed support.

Table 11.2. Help Desk Functions by Equipment/System.

AFWA Consolidated Help Desk	WSSC
N-TFS/AMIS	STT
MIST	NAMIS
VSAT/T-VSAT	PASOS
TAWS/NOWS	TACMET
TWR/TMOS	ITWR
SWAFS	

11.8. Observing System 21st Century (OS21). The OS21 is an automated surface observing system (ASOS) that will be used in-garrison and deployed. The fixed OS21 automated sensor system replaces existing fixed meteorological airfield systems and enhances the observational data network. Sensor output signals from automated sensors will be transmitted directly to an OWS and to local operational users through standard forecast/analysis systems.

11.8.1. The deployed OS21 replicates the automated gathering and reporting of the same environmental data parameters provided by the fixed observing system in the deployed environment. It automatically senses, collects, displays, and transmits data to a standard forecast system/weather server (e.g., Forecast System-21st Century [FS21]). The system includes a geo-locating and automated compass orientation capability for platform location information.

11.8.2. OS21/ASOS system sensors will be the principal instrumentation used to collect and provide weather element data for use in official surface weather observations, DD 175-1 flight weather briefings, dissemination (local and longline), and official station records. Certified weather technicians must record complementary weather data sets listed in AFMAN 15-111, Figure 13.1, as required for safety of flight operations. They must also verify and correct ASOS data if necessary.

11.8.3. OS21/ASOS units at outlying fields and remote sites in FAA Class D airspace provide automated basic weather element parameters with no augmentation IAW FAA Order 7400.2. ASOS units at USAF and U.S. Army controlled airfields provide automated basic weather elements with no augmentation when the local ATC tower is closed, thereby designating the airspace as FAA Class D or E.

11.9. Personal Computers (PCs). CWTs should maximize efficiency of PCs to enhance the MEFP. **Table 11.3.** contains a list of PC CD-ROM applications every CWT should have readily available for both

in-garrison and deployed support. All products can be ordered from the AFWTL via Support Assistance Request (SAR).

Table 11.3. Available CD-ROM Applications.

MODCV for Windows
MODCURVES for Windows
Observer Assistant
WXCAT
Nitelite for Windows
Upper Air Climo for Windows
ISMCS
NOWS/TAWS
EO-Climo
Cloud Ceiling Climatology Atlas
Theater Climatic Files (available for likely deployment areas)
TIPs (includes U.S., European, and Pacific regimes)

11.9.1. Electronic Staff Weather Officer (SWO) Kits (ESK). For units with this capability:

11.9.1.1. All deployable personnel will be trained on the use and care of the ESK and have a working knowledge of all software applications.

11.9.1.2. The CWT OIC/NCOIC will determine what software applications will be loaded on the ESK and what software applications each deployable position will be required to operate. Due to constantly changing technology and the need for standardization, MAJCOM/DOWs may designate minimum ESK software requirements.

11.9.1.3. As a minimum, designated individuals must be able to navigate and perform basic operations of the applications and be able to perform mission essential taskings using each application system. Software training requirements will be identified and documented locally.

11.10. Expeditionary Tactical Equipment Fielding. CWTs receive a suite of AFW equipment based on expeditionary needs. This basic suite is sufficient to cover training, exercises and contingencies, and is based upon a category system as listed in the following paragraphs.

11.10.1. *Category I CWTs.* These units consist of Air Force Lead Combat Air Forces (CAF), Mobility Air Forces (MAF), and Air Expeditionary Wings (AEW) and Army EAC/Corps/Divisions. These units can be active or Guard/Reserve. Units that fall into this category require one Manual Observing System (MOS) Kit, one OS-21 Light, one TMQ-53, one T-VSAT, and one DMSP/Geostationary (Small Tactical Terminal [STT]) Satellite reception system. One N-TFS server and one N-TFS client will be provided for every T-VSAT. For AF CAF units one client N-TFS will be provided for every CAF Squadron with more than six aircraft assigned.

11.10.2. *Category II CWTs.* These units consist of non-lead AF CAF and MAF CWTs and Army Aviation Brigades/Separate Brigades/Transportation Groups. Units that fall into this category require one MOS Kit, and one OS-21 Light. One N-TFS server and one N-TFS client will be provided for every

T-VSAT. For AF CAF CWTs, one client N-TFS will be provided for every CAF Squadron with more than 6 aircraft assigned.

11.10.3. *Category III CWTs*. These units consist of non-CAF and non-MAF AF CWTs and non-deployable Army CWTs. Units that fall into this category only require one MOS Kit.

11.10.4. A working knowledge of all assigned equipment is essential for providing customers proper weather support. Units will have applicable Technical Orders (TOs) and/or operator manuals for all assigned equipment with copies available for deployment. Maintain at least 30 days of expendable supplies and establish procedures for resupply. Qualified personnel must be able to set up and operate the equipment in accordance with the applicable TO or operator manual and be familiar with operator maintenance procedures. If required, security procedures for any equipment or associated cryptographic material will be established.

11.11. Form Prescribed. DD Form 175-1, *Flight Weather Briefing*

11.12. Forms Adopted.

11.12.1. DD 173-2, *Joint Message Form.*

11.12.2. AF Form 1297, *Temporary Issue Receipt.*

11.12.3. AF Forms 3126-3143, *General Purpose.*

11.12.4. AF Form 3801, *Aneroid Barometer Standardization/Comparison.*

11.12.5. AF Form 3803, *Surface Weather Observations.*

11.12.6. AF Form 3805, *Pilot Report (PIREP).*

11.12.7. AF Form 3806, *Weather Watch Advisory Log.*

11.12.8. AF Form 3807, *Watch/Warning Notification and Verification.*

11.12.9. AF Form 3811, *Quality Control Register.*

ROBERT H. FOGLESONG, Lt General, USAF
DCS/Air & Space Operations

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFCAT 36-2223, *USAF Formal Schools*

AFDD 1, *Air Force Basic Doctrine*

AFDD 2, *Organization and Employment of Aerospace Power*

AFDD 2-3, *Military Operations Other than War*

AFI 10-201, *Status of Resources and Training Systems*

AFI 10-204, *Participation in the Military Exercise Program*

AFI 11-202, Vol 3, *General Flight Rules*

AFI 10-215, *Personnel Support for Contingency Operations*

AFI 10-229, *Responding to Severe Weather Events*

AFI 10-400, *Aerospace Expeditionary Force Planning*

AFI 10-403, *Deployment Planning*

AFI 10-802, *Military Support to Civil Authorities*

AFI 13-102, *Air Support Operations Center (ASOC) and Tactical Air Control Party (TACP) Training and Evaluation Procedures*

AFI 15-114, *Functional Resource and Weather Technical Performance Evaluation*

AFI 15-118, *Requesting Specialized Weather Support*

AFI 15-128, *Aerospace Weather Operations, Roles and Responsibilities*

AFI 25-201, *Support Agreement Procedures*

AFI 31-207, *Arming and Use of Force by Air Force Personnel*

AFI 31-210, *The Air Force Antiterrorism (AT) Program*

AFI 32-4001, *Disaster Preparedness Planning and Operations*

AFI 33-101, *Communications and Information Management Guidance and Responsibilities*

AFI 33-103, *Requirements Development 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 33-203, *Information Protection Security Awareness, Training, and Education (SATE) Program*

AFI 33-326, *Preparing Official Communications*

AFI 35-101, *Public Affairs Policies and Procedures*

AFI 36-507, *Mobilization of the Civilian Workforce*

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

AFI 36-2266, *The United States Combat Arms Training and Maintenance Program*

AFI 36-2238, *Self-Aid and Buddy Care Training*

AFI 51-401, *Training and Reporting to Ensure Compliance with the Law of Armed Conflict*

AFI 61-204, *Disseminating Scientific and Technical Information*

AFIND 8, *Numerical Index* of *Specialized Education Training Publications*

AFJH 11-203V1, *Weather for Aircrews*

AFJI 15-157, *Weather Support for the U.S. Army*

AFMAN 10-100, *Airmans Manual*

AFMAN 10-206, *Operational Reporting*

AFMAN 15-111, *Surface Weather Observations*

AFMAN 15-124, *Meteorological Codes*

AFMAN 15-129, *Aerospace Weather Operations-Processes and Procedures*

AFMAN 15-162, *Space Weather Observations*

AFMAN 26-2247, *Planning, Conducting, Administering, and Evaluating Training*

AFMAN 36-2234, *Instructional System Development*

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

AFMAN 37-139, *Records Disposition Schedule*

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 Users Guide* (WSR-88D Doppler Radar)

AFTO 31P1-4-108-61, *Operators Manual - PUP Workstation* (WSR-88D Doppler Radar)

AFTO 31P1-4-108-58-1, *Users Guide - Unit Control Position*

AFTO 31P1-4-108-51, *Operators Manual - Unit Control Position WSR-88D Radar*

AFW *Career Field Education and Training Program*

AFWA TN-98/002, *Meteorological Techniques*

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, *Aviation Flight Rules*

Army Regulation 115-10, *Meteorological Support for the US Army*

Army Field Manual 3-6, *Field Behavior of Nuclear Biological Chemical Agents*

Army Field Manual 34-81-1, *Battlefield Weather Effects*

Army FM 34-130, *Initial Preparation of the Battlefield*

Army FM 100-27, *US Army/US Air Force Doctrine for Joint Airborne and Tactical Airlift Operations*

AWS/AFSPC FYI #37, *Space Environmental Impacts on DoD Operations*

AWS FM-300-Series/001, 002, 004, and 005, *Single Station Analysis and Forecasting*

AWS/TN-79/002, *Forecast Reviews and Case Studies*

AWS/TN-87/001, *Whats Hot & Whats Not-Practical Guide to TDA*, Jul 87

AWS/TR-79/006, *Use of the Skew-T, Log P Diagram in Analysis and Forecasting*

AWS-TR-225, *Use of Asynoptic Data in Analysis and Forecasting*

Cloud Types for Observers, Series Title - Met. O. 716

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EOCLIMO (available in various formats from AFWTL)

FAA *Aeronautical Information Manual*

FAA Order 7110.10, *Flight Service*

FAA Order 7340.1, *Contractions Handbook*

FAA Order 7350.6, *Location Identifiers*

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Operator Handbook UCP, *Job Sheets*, 01 Aug 98

OPNAVINST 3710.7R, *NATOPS General Flight and Operating Instructions*

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USAF War and Mobilization Plan, Volume 1, Planning Factors, Annex CC, Weather

Weather Flight Primer, Unpublished, CMSgt Jeff Fries

Weather Service Operations Manual (WSOM) Chapter D-31, *Aviation Terminal Forecasts*

2WW/FM-86-001, *Terminal Forecast Reference Notebook*

2WW/FM-86/003, *Forecast Reviews*

2WW/FM-86/009, *The Local Analysis and Forecast Program* (LAFP)

2WW/FW-91/003, *Tuning Your LAFP* (Local Analysis and Forecast Program)

5WW/FM-81/001, *An Example Local Analysis and Forecast Program* (LAFP)

7WW/FM-78/003, *Back to Basics*

7WW/FM-90/003, *Terminal Forecast Reference Notebook*

Abbreviations and Acronyms

AA—Assembly Area

AAI—Aircraft Accident Investigation

AAR—After Actions Report

ABCS—Army Battle Command System

ACC—Air Combat Command

ACCI—Air Combat Command Instruction

ACCS—Army Command and Control Systems

ACR—Armored Cavalry Regiment

ADC—Assistant Division Commander

ADWS—Automatic Digital Weather Switch

AEF—Aerospace Expeditionary Force

AETC—Air Education and Training Command

AFCAT—Air Force Catalog

AFCCC—Air Force Combat Climatology Center

AFCWC—Air Force Combat Weather Center

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFMIT—Air Force Meteorological Information Terminal

AFOSH—Air Force Occupational Safety and Health

AFPD—Air Force Policy Directive

AFRC—Air Force Reserve Command

AFS—Alternate Forecast Site

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

AFFOR—Air Force Forces

AI—Area of Interest

AIREP—Air Report

AIRMET—Airmans Meteorological Information **(**A NWS In-Flight Weather Advisory)

ALSO—Artillery Limited Surface Observation

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

AOR—Area of Responsibility

AOS—Alternate Observing Site

APOD—Aerial Port of Debarkation

AR—Air Refueling or Army Regulation

ARFOR—Army Forces

ARNG—Army National Guard

ARQ—Automated Response to Query

ARSOF—Army Special Operations Forces

ARTYMET—Artillery Meteorological

ASAC—All-Source Analysis Center

ASAS—All Source Analysis System

ASOG—Air Support Operations Group

ASOS—Air Support Operations Squadron

ASOS—Automated Surface Observation System

AT—Ancillary Training

ATACS—Army Tactical Area Communications System

ATCCS—Army Tactical Command and Control System

ATC—Air Traffic Control

ATF—After the Fact

AV—Assistance Visit

AVN—Aviation Model

AVLB—Armored Vehicle Launch Bridges

AVN—Aviation

AWDS—Automated Weather Distribution System

AWFOS—Alternate CWT Operations Site

AWN—Automated Weather Network

A2C2—Army Airspace Command and Control

BBPCTS—Blocking, Boxing, Packing, Crating and Storage

BCTP—Battle Command Training Program

BDE—Brigade

BDU—Battle Dress Uniform

BFA—Battlefield Functional Area

BIC—Battlefield Induced Contaminant

BML—Base Master Listing

BO—Base Operations

BN—Battalion

BWS—Base Weather Station

BWW—Basic Weather Watch

CAMS—Core Automated Maintenance System

CAB—Combat Aviation Brigade

CARC—Chemical Agent Resistant Coating

CAS—Close Air Support

CAT—Clear Air Turbulence

CB—Chemical or Biological

CBT—Combat

CBT—Computer-Based Training

CCR—Configuration Change Request

CDE—Chemical Defense Equipment

CD-ROM—Compact Disk-Read Only Memory

CE—Civil Engineering

C-E—Communications-Electronics

CEM—Contingency, Exercise, or Deployment

CENTCOM—Central Command

CEOI—Communications-Electronics Operating Instructions

CEWI—Combat Electronic Warfare Intelligence

CFA—Covering Force Area

CFETP—Career Field Education and Training Plan

CFMP—Civilian Furniture Management Office

CFP—Computer Flight Plan

CG—Commanding General

CIF—Central Issue Facility

CINC—Commander in Chief

CJCS—Chairman, Joint Chiefs of Staff

CLS—Contractor Logistic Support for N-TFS Management Plan

CMC—Combined Meteorological Cell

CMD—Command Management Distribution

CMDSA—COMSEC Material Direct Support Activity

CNV—Cryptonet Variable

COA—Course of Action

COB—Co-located Operating Base

COF—Combat Operations Flight

COP—Common Operating Picture (IMETS)

COMET—Cooperative Program for Operational Meteorology, Education, and Training

COMSEC—Communications Security

CONOPS—Concept of Operations

CONUS—Continental United States

CONUSA—Continental United States Army

COSCOM—Corps Support Command

COTS—Commercial Off the Shelve

CP—Command Post

CPX—Command Post Exercise

CS—Combat Support

CSS—Combat Service Support

CSDP—Command Supply Discipline

CSFO—CONUS Severe Forecast Operations

CT—Continuation Training

CTA—Common Table of Allowances

CTP—Common Tactical Picture

CTT—Command or Common Task Training

CTTF—Combined Tanker Task Force

CWT—Combat Weather Team

CWT(A)—Combat Weather Team (Airborne)

CWW—Continuous Weather Watch

C2—Command and Control

C3—Command, Control, and Communication

DA—Department of the Army

DCC—Deployment Control Center

DCS—Defense Communications Systems

DEERS—Defense Enrollment Eligibility Reporting System

DEH—Directorate of Engineering and Housing

DEROS—Date Eligible for Return from Overseas

DET—Detachment

DF—Direction Finding

DG2—Deputy G2

DINS—DoD Internet NOTAM Service

DISCOM—Division Support Command

DISS—Digital Ionospheric Sounding System

DIV—Division

DIVARTY—Division Artillery

DLT—Desired Lead-time

DMAIN—Division Main Cell

DMS—Defense Message System

DMSP—Defense Meteorological Satellite Program

DoC—Department of Commerce

DOCS—Designed Operational Capability Statement

DoD—Department of Defense

DoT—Department of Transportation

DOW—MAJCOM Director of Weather

DP—Director of Personnel

DPU—Deployment Processing Unit

DRU—Direct Reporting Unit

DS—Direct Support

DTG—Date-Time Group

DV/VIP—Distinguished Visitor/Very Important Person

DX—Direct Exchange

DZ—Drop Zone

EAC—Echelon Above Corps

EACIC—Echelons Above Corps Intelligence Center

EEFI—Essential Elements of Friendly Information

EMP—Electromagnetic Pulse

ENDEX—End of Exercise

EO—Electro-Optical

EOC—Emergency Operations Center

EOTDA—Electro-Optical Tactical Decision Aids

EPC—Equipment Performance Check

EPW—Enemy Prisoner of War

ESK—Electronic Staff Weather Officer Kit

ESP—Emergency Special Program

EW—Electronic Warfare

ExorD—Execution Order

FAA—Federal Aviation Administration

FALOP—Forward Area Limited Observation Program

FARP—Forward Area Refueling Point

FAX—Facsimile

FCC—Flight Coordination Center

FCF—Flight Control Facility

FEBA—Forward Edge of Battle Area

FEDLOG—Federal Logistics Data on Compact Disc

FEMA—Federal Emergency Management Agency

FLENUMMETOCCEN—Fleet Numerical Meteorology Oceanography Center, Monterey CA.

FLIP—Flight Information Publication

FLIR—Forward Looking Infrared Radar

FLOT—Forward Line of Own Troops

FM—Field Manual

FO—Forward Observer

FOA—Field Operating Agency

FOB—Forward Operating Base

FOC—Flight Operations Center

FOV—Field of View

FORSCOM—Forces Command

FOUO—For Official Use Only

FRAGO—Fragmentary Order

FRN—Forecast Reference Notebook

FSB—Forward Staging Base

FSCOORD—Fire Support Coordinator

FS-21—Forecast System-21st Century

FSE—Fire Support Element

FSO—Fire Support Officer

FTP—File Transfer Protocol

FU—Forecast Unit

FWA—Forecast Weather Advisory

G2—Assistant Chief of Staff, G2 (Intelligence)

G3—Assistant Chief of Staff, G3 (Operations and Plans)

GEED—Geophysical Environmental Effects Distributor

GMT—Greenwich Mean Time

GS—General Support

HAHO—High-altitude high-opening parachute technique

HALO—High-altitude low-opening parachute technique

HF—High Frequency

HFRB—HF Radio Broadcast

HHC—Headquarters and Headquarters Company

HHT—Headquarters and Headquarters Troop

HQ—Headquarters

HRA—Health Risk Assessment

HR—Hour

HURCONS—Hurricane Conditions

HVT—High-Value Target

IAAR—Initial After Actions Report

IAV—Intermediate Armored Vehicle

IAW—In Accordance With

IBCT—Interim Brigade Combat Team

ICAO—International Civil Aviation Organization

IEW—Intelligence and Electronic Warfare

IFR—Instrument Flight Rules

IM—Information Manager

IMA—Individual Mobilization Augmentee

ImaST—Integrated METEOGRAM and SKEW-T

IMET—Incident Meteorologist (National Weather Service)

IMETS—Integrated Meteorological System

IMS—Ionospheric Measuring Set

INMARSAT—International Maritime Satellite

IPB—Intelligence Preparation of the Battlefield

IR—Infrared

IR—Instrument Route

IRC—Instrument Refresher Course

IRTSS—Infrared Target Scene Simulation Software

ISB—Intermediate Staging Base

ISR—Initial Status Report

IWEDA—Integrated Weather Effects Decision Aid

JA/ATT—Joint Airborne/Air Transportability Training

JAG—Judge Advocate General

JAAWIN—Joint Air Force and Army Weather Information Network

JAAWIN-S—Joint Air Force and Army Weather Information Network Secure

JCDB—Joint Common Database

JCSE—Joint Communications Service Element

JEES—Joint Environmental Exploitation Segment

JMFU—Joint METOC Forecast Unit

JMO—Joint METOC Officer

JMS—Joint METOC Segment

JMOC—Joint Meteorology and Oceanography Center

JMV—Joint METOC Viewer

JTF—Joint Task Force

JOAF—Joint Operation Area Forecast

JTWC—Joint Typhoon Warning Center

JULLS—Joint Universal Lessons Learned System

JWICS—Joint Worldwide Intelligence Communication Systems

LAFP—Local Analysis and Forecast Program

LAN—Local Area Network

LAWC—Local Area Work Chart

LGG—Locally Generated Grids

LIC—Low-Intensity Conflict

LLL—Low Level Light

LLWS—Low Level Wind Shear

LOAC—Law of Armed Conflict

LOC—Lines of Communications

LOI—Letter of Instruction or Local Operating Instruction

LOS—Line of Sight

LP—Lesson Plan

LRF—Laser Range Finder

LRSD—Long Range Surveillance Detachment

LRST—Long Range Surveillance Team

LRSU—Long Range Surveillance Unit

LZ—Landing Zone

MACOM—Major Command (Army)

MAIS—Military Aircrew Information Service

MAJCOM—Major Command (Air Force)

MCS—Maneuver Control System

MDMP—Military Decision Making Process

MEDEVAC—Medical Evacuation Flight

MEF—Mission Execution Forecast

MEFP—Mission Execution Forecast Process

METAR—Aviation Routine Weather Report

METCON—Meteorological Conference or Discussion

METL—Mission Essential Task List

METOC—Meteorological and Oceanographic

METSAT—Meteorological Satellite

METTT—Mission, Enemy, Terrain, Troops, and Time Available

METWATCH—Meteorological Watch

MGRS—Military Grid Reference System

MI—Military Intelligence

MIRF—METSAT Imagery Reference File

MIS—Management Information System

MKT—Mobile Kitchen Tent

MILES—Multiple Integrated Laser Engagement Simulation

MISSIONWATCH—Mission Meteorological Watch

MM5—Mesoscale Model Version 5

MOPP—Mission-Oriented Protection Posture

MOA—Memorandum of Agreement

MOAF—Military Operation Area Forecast

MOS—Manual Observing System

MOS—Military Occupational Specialty

MOOTW—Military Operations Other than War

MOUT—Military Operations in Urban Terrain

MPA—Military Personnel Appropriation

MPH—Miles Per Hour

MRF—Medium Range Forecast Model

M & S—Modeling and Simulation

MSC—Major Subordinate Command

MSCA—Military Support to Civilian Agencies

MSE—Mobile Subscriber Equipment

MSL—Mean Sea Level

MT—Mobility Training

MTL—Master Task List

MTO—Master Training Outline

MTO&E—Modified Table of Organization and Equipment

MTP—Master Training Plan

MTW—Major Theater War

MWA—Military Weather Advisory

MWR—Morale, Welfare, Recreation

NA—Not Applicable

NAF—Numbered Air Force

NAI—Named Areas of Interest

NATO—North Atlantic Treaty Organization

NBC—Nuclear, Biological, Chemical

NCA—National Command Authority

NCO—Non-Commissioned Officer

NCOIC—Noncommissioned Officer in Charge

NETT—New Equipment Training Team

NEXRAD—Next Generation Weather Radar

NGB—National Guard Bureau

NIPRNET—Non-secure Internet Protocol Router Network

NOAA—National Oceanographic and Atmospheric Administration

NOC—Naval Oceanographic Command

NODDS—Navy Oceanographic Data Distribution System

NOE—Nap-of-the-Earth

NORAD—North American Aerospace Defense Command

NOTAM—Notice to Airmen

NOWS—NVG (night vision goggles) Operations Weather Software

NSN—National Stock Number

N-TFS—New Tactical Forecast System

NTC—National Training Center

NVG—Night Vision Goggles

NWP—Numerical Weather Prediction

NWS—National Weather Service

OB—Order of Battle

OBS—Observations/Observer Function

OCIE—Organizational Clothing and Individual Equipment

OCONUS—Outside Continental United States

OIC—Officer in Charge

OJT—On-the-Job Training

OPLAN—Operations Plan

OPSEC—Operations Security

OPORD—Operations Order

OPS II—Operational Weather Squadron Production System Phase II

OPTEMPO—Operating Tempo

OPVER—Operational Verification

OSS—Operations Support Squadron

OTS—On the Spot

OVE—On Vehicle Equipment

OWA—Observed Weather Advisory

OWL NET—Operations Weather Limiters Network

OWS—Operational Weather Squadron

PACAF—Pacific Air Force

PACOM—Pacific Command

PCS—Permanent Change of Station

PC-III—Personnel Concept III

PERSTEMPO—Personnel Tempo

PFPS—Pilot Flight Planning System

PGM—Precision Guided Missile

PGS/S—Product Generation Scheduler/Server

PHS—Personal Health Summary

PI—N-TFS Projection Indicator

PIBAL—Pilot Balloon

PID—Product Identifier

PIREP—Pilot Report

PIR—Priority Intelligence Request

PITS—Personnel, Intelligence, Training and Supply

PMCS—Preventive Maintenance Checks and Services

PMSV—Pilot-to-Metro Service

PN—Part Number

POC—Point of Contact

POL—Petroleum, Oil, and Lubrication

POMCUS—Positions of Material Configured to Unit Sets

POR—Preparation for Overseas Replacement

PRF—Personnel Readiness File

PSYOP—Psychological Operations

PT—Physical Training

PUP—Principal User Processor

PVS-5—Night Vision Goggles

QA—Quality Assurance

QRCT—Quick Reaction Communications Terminal

QT—Qualification Training

QTB—Quarterly Training Briefing

QTP—Qualification Training Package

RAFP—Regional Analysis and Forecast Program

RAM—Reliability, Availability, and Maintenance

RAPCON—Radar Approach Control

RAREP—Radar Report

RASTER SCAN—Picture element (pixel) data

RATT—Radio Teletypewriter

RBS—Regional Broadcast System

RC—Reserve Component

RCS—Report Control Symbol

RCR—Runway Condition Reading

REC—Radio Electronic Combat

RFS—Request for Service

RGMT—Regiment

RH—Relative Humidity

RON—Remain Overnight

RRD—Ranger Reconnaissance Detachment

RSC—Runway Surface Condition

RSTN—Radio Solar Telescope Network

RTD—Modifier for a Routine Delayed weather message

S2—Intelligence Officer (US Army), Battalion Level

S3—Operations and Training Officer (US Army), Battalion Level

SAR—Support Assistance Request

SATCOM—Satellite Communications

SATE—Security Awareness, Training, and Education (SATE) Program

SCI—Sensitive Compartmentalized Information

SEC—Space Environment Center

SECDEF—Secretary of Defense

SEON—Solar Electro-optical Observing Network

SEP—Separate

SERE—Survival, Evasion, Resistance, and Escape

SFG—Special Forces Group

SFIR—Swept Frequency Interferometric Radiometer

SFOB—Special Forces Operations Base

SIGMET—Significant Meteorological Information **(**A NWS In-flight Weather Advisory)

SIGSEC—Signal Security

SINGARS—Single Channel Ground and Airborne Radio System

SIO—Senior Intelligence Officer

SIOP—Single Integrated Operational Plan

SIPRNET—Secure Internet Protocol Router Network

SITREP—Situation Report

SJA—Staff Judge Advocate

SMCT—Soldiers Manual of Common Tasks

SMO—Senior Meteorological and Oceanographic Officer

SOC—Special Operations Command

SOCS—Surface Observation Climatic Summary

SOF—Special Operations Forces

SOF—Supervisor of Flying

SOI—Signal Operating Instructions

SOON—Solar Observing Optical Network

SOP—Standing Operating Procedure

SORTS—Status of Resources and Training System

SOUTHCOM—Southern Command

SPOD—Seaport of Debarkation

STARTEX—Start of Exercise

STT—Small Tactical Terminal

SP—Starting Point

SPECI—Aviation Selected Special Weather Report

SR—Special Reconnaissance

SRS—Solar Radio Spectograph

SSOB—Specialized Support Operations Branch

STC—Standardized Training Checklist

STS—Specialty Training Standard

SWAP—Severe Weather Action Procedures

SWAT—Severe Weather Action Team

SWO—Staff Weather Officer

SWOREP—SWO Report

TAACOM—Theater Area Army Commander

TACAIR—Tactical Air

TACC—Tactical Airlift Control Center

TACCOM—Tactical Weather Communications

TACFIRE—Tactical Fire Direction Computer System

TACMET—Tactical Meteorological Equipment

TAF—Aerodrome Forecast

TAFVER—TAF Verification

TALCE—Tanker Airlift Control Element

TAMMS—The Army Maintenance Management System

TARWI—Target Weather Indicator

TASC—Training and Audiovisual Support Center

TAWS—Target Acquisition Weather Software

TAWDS—Transportable Automated Weather Distribution System

TCOR—Typhoon Condition of Readiness

TCV—Technical Consultation Visit

TDA—Tactical Decision Aid

TDY—Temporary Duty

TFRN—Terminal Forecast Reference Notebook

TFU—Tactical Forecast Unit

TFS—Tactical Forecast System

TN—Technical Note

T.O.—Technical Order

TOC—Tactical Operations Center

TOE—Table of Organizational Equipment

TPFDD—Time-Phased Force Deployment Data

TRADOC—United States Army Training and Doctrine Command

TRANSEC—Transmission Security

TTP—Tactics, Techniques, and Procedures

T-UAV—Tactical Unmanned Aerial Vehicle

TUSA—Third US Army

T-VSAT—Tactical Very Small Aperture Terminal

TWR—Tactical Weather Radar

UAV—Unmanned Aerial Vehicle

UCP—Unit Control Position

UGDF—Uniform Grid Data Field

UGT—Upgrade Training

UIC—Unit Identification Code

URC—Unit Radar Committee

USAICS—United States Army Intelligence Center and School

USARC—United States Army Reserve Command

USAREUR—United States Army Europe

USMTF—US Message Test Format (formerly JINTACCS)

USR—Unsatisfactory Service Report

USSPACECOM—United States Space Command

UTC—Unit Type Code

UTC—Universal Time Coordinate (Zulu)

UTM—Universal Transverse Mercator (GRID)

UW—Unconventional Warfare

VCP—Volume Coverage Pattern

VFR—Visual Flight Rules

VHF—Very High Frequency

VRC—Vehicle Radio Communications

VSAT—Very Small Aperture Terminal

VWP—WSR-88D Velocity Azimuth Display Wind Profile

WA—Weather Advisory

WARNVER—Warning Verification

WBGT—Wet-Bulb-Globe-Temperature

WBT—Web-Based Training

WCM—Warning and Coordination Manager

WETM—Weather Team

WEW—Weather Effects Workstation

WF—Weather Flight

WMO—World Meteorological Organization

WPSB—Weather Product Standardization Board

WS—Weather Squadron

WSD—Weather Support Document

WSF—Weather Support Force

WSI—Weather Support Instruction

WSP—Weather Support Plan

WSR-88D—Next Generation Doppler Radar

WSS—Weather Subscription Service

WSSC—Weather System Support Cadre

WTDA—Weather Tactical Decision Aid

WMO—World Meteorological Organization

WV—Water Vapor

WW—Weather Warning

XOW—Director of Weather (United States Air Force)

Terms

Absolute Humidity—A ratio of the quantity of water vapor present per unit volume of air, usually expressed as grams per cubic meter or grams per cubic foot.

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.

AFWA Product System (AFWA PS)—The computer system and its associated interfaces that provide an automated weather support and communications capability to the AFWA Strategic Center.

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 Operational Weather Squadrons and the Combat Weather Teams worldwide. AFWA provides the centralized repository for global observations and forecasts that are data-based 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.

Airmens Meteorological Information (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.

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.

Atmospheric Pressure—The pressure exerted by the atmosphere as a consequence of gravitational attraction exerted upon the column of air laying directly above any point.

Automated Weather Distribution System—An integrated automated system designed to provide weather and air traffic control products to support the missions of CWTs, OWSs, weather support units, air traffic control agencies, and command posts. AWDS was replaced by the New Tactical Forecast System (N-TFS).

Automated Weather Network (AWN)—A global communications network that collects and distributes alphanumeric environmental/weather data and Notices to Airmen (NOTAMs). The AWN consists of the Automated Digital Weather Switch (ADWS) at Det 7, AFWA, Tinker AFB OK, digital communications processors in Europe and the Pacific, and a variety of dedicated circuits linking other DoD, federal, and foreign meteorological and aviation facilities.

Aviation Routine Weather Report—The WMO code format used to encode weather observations.

Barometric Pressure—The measure of atmospheric pressure by a mercurial or aneroid barometer. Changes in pressure are significant in weather forecasting. The normal pressure at sea level is 29.92 inches of mercury or 1013.3 millibars. Rising pressures usually indicated improving weather conditions. Falling pressures may reflect impending inclement weather. Barometric pressure is used in aircraft altimeter settings to tell pilots how far above ground level the aircraft is. This is critical for landing during obscured conditions and Nap of the Earth (NOE) flying.

Battlefield Environment—A phrase used to describe the combination of weather, terrain, BIC, illumination, and background signatures that occur on a battlefield.

Belt Weather Kit—A small kit with simple equipment, used originally by the US Forest Service, and now employed by S2 personnel at maneuver brigades. The BWK equipment measures temperature, dew point, pressure, and wind speed and direction. It is slow and does not meet the accuracy standards necessary to support the Army's battlefield weapon systems.

Ceiling—The lowest broken or overcast layer of clouds or obscuring phenomena aloft or the vertical visibility into a total obscuration. When 1/2 or more of the sky has cloud cover, a ceiling exists.

Celsius—A temperature scale (formerly called centigrade). The temperature interval between waters ice and steam points is divided into 100 parts (or degrees) with 0 Celsius at the freezing or ice point and 100 at the boiling or steam point. Used commonly worldwide.

Climatology—The historical records of weather conditions measured or observed at a specific location is knows as climatology. Some data go back over 100 but generally a 10- to 25-year history is more common. Climatology is useful in planning operations beyond 5 to 7 days. It usually describes the average (or mean) conditions such as high and low temperatures and extremes.

Cloud Cover—The amount of clouds over, or at, a given location. Cloud conditions are expressed as cloud bases or ceiling, the amount of cover stated in eighths--1/8 to 2/8 is few, 3/8 to 4/8 described as scattered; 5/8 to 7/8, broken; and 8/8, overcast, and cloud tops. Several layers of scattered clouds added together may result in a broken or overcast condition. Low clouds impact many battlefield operations, especially the use of smart weapons.

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.

Communications Front End Processor—The communications switch collocated with HQ AFWA that performs external communications interface functions for AFWA systems.

Density Altitude (DA)—The height above MSL at which the existing density of the atmosphere would be duplicated in the standard atmosphere; atmospheric density expressed as height according to a standard scale. DA is extremely important in flight operations.

Designed Operational Capabilities (DOC) Statement—The document prepared by the parent MAJCOM that outlines each measured units DOC and contains the units identification, mission tasking narrative, mission specifics, and measurable resources.

Desired Lead-time—The amount of advance notice a supported agency desires before the onset of a particular weather phenomenon.

Dew Point—The temperature to which a given weight of air must be cooled at constant pressure and constant water-vapor content in order for saturation to occur. When this temperature is below 0C, (32 F) it is sometimes called the frost point.

Dry-bulb Temperature—The temperature measured by the dry bulb of a psychrometer; ambient air temperature.

Effective Illumination—The level of light available for night operations.

Effective Wind Speed—The combined effect of actual (meteorological) wind and other motion caused by the moving of an object or a person through air. Also caused by moving equipment such as aircraft propellers or rotors.

Eyes Forward—CWT technicians are the eyes forward for the technicians 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.

FALOP—(Forward Area Limited Observing Program)–A program implemented in the 1970's to supplement battlefield observations taken by USAF CWTs. S2 personnel at maneuver brigades and battalions employ FALOP. The Belt Weather Kit is normally used by the S2 to make limited measurements of weather conditions. Additionally, the S2 provides estimates of other weather and environmental conditions he or she observes. The report is encoded and forwarded to the closest CWT.

Federal Logistics Data on Compact Disc (FEDLOG)—FED LOG is a government designated program designed to speed up searches for part numbers, stock numbers, item names and numbers, shipping codes, freight data, classifications, characteristics data, and much more in a format that is easy to use and navigate through for novice to advanced users. The Defense Logistics Information Service (DLIS) manages the FED LOG project for the Defense Logistics Agency (DLA). FED LOG is designated FOR OFFICIAL USE ONLY (FOUO) and is restricted to authorized government users.

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.

General Staff (Army)—Makeup of the Command Staff supporting the commander. This is usually called the G Staff at Division and above and S (subordinate) Staff at echelons below division. Joint staffs may also use these designators.
J1/G1/S1: Personnel
J2/G2/S2: Intelligence
J3/G3/S3: Operations
J4/G4/S4: Logistics
J5/G5/S5: Public Affairs
J6/G6/S6: Communications

Gust—Rapid fluctuations in wind speed with a variation of 10 knots or more between peaks and lulls.

Horizontal Consistency—Weather data provided in one product must be consistent to data provided in another product for the same area and time. For example, MEFs must be consistent with all other products, including current observation, weather warnings and watches, etc. Elements within each MEF 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.

Humidity—A measure of the water vapor content of air.

ICAO Identifier—A specifically authorized 4-letter identifier assigned to a location and documented in ICAO Document 7910.ICAO (used by N-TFS).

Icing—In general, any deposit or coating of ice on an object; a mass or sheet of ice formed on the ground surface during the winter by successive freezing of sheets of water that may seep from the ground, a river, or a spring.

Initialization—The process of comparing numerical prediction model output to the actual state of the atmosphere at the valid time of the model. OWSs perform this function.

Instrument flight rules—(IFR)–An aircraft operational term indicating that the weather conditions have

deteriorated to the point that navigational instruments on board the plane must be used in flying from one place to another.

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.

Intelligence Preparation of the Battlefield (IPB)—IPB is the Armys 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 (sensors spectral response) view of the target area.

Inversion (stable) condition—An increase in air temperature with an increase in height. The condition is called stable because there is usually little vertical movement of air.

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 data base when needed for tactical decisions used in planning.

Lapse (unstable) Condition—A decrease in air temperature with an increase in height. The condition is called unstable because it is accompanied by vertical air movement.

Light and Illumination Data—Battle planning requires accurate timing based on available light. Light tables have been computed for any location that tell sunrise, sunset, moonrise, moonset, and moon phase. Illumination is a measure of sunlight, moonlight, starlight, and air glow. Illumination is a critical factor in the considered of NVG, cloud cover, and terrain masking.

Limited Duty Station—A weather station that provides less than 24-hour a day forecast service.

Local Analysis and Forecast Program—A systematic and consistent approach to weather forecasting. The LAFP identifies techniques and tools used to forecast individual weather elements, describes requirements for locally prepared work charts/composites, and explains refinements to and application of centralized products.

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 greater than 1,080 nautical miles (2,000

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—Systems which vary in size horizontally from 1 to 500 nautical miles (2 to 926 kilometers) and have a duration from tens of minutes to several hours (e.g., low level jets, squall lines, thunderstorms, clear air turbulence, or land-sea breezes).

METWATCH—Monitoring aerospace weather for a route, area, or terminal and advising concerned organizations when phenomena that could effect 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 less than one nautical mile (two kilometers) with a duration from a few seconds to a few minutes (e.g., tornadoes, dust devils, thermals, or turbulence).

Military Aircrew Information Service (MAIS—)A web-based, flight weather and Notice to Airmen (NOTAM) self-briefing service. MAIS provides weather and NOTAM information for mission planning within the Continental United States (CONUS) to Air Force and Army reserve component aircrews only. Future plans include the migration of MAIS to OWS maintained Program Generation Scheduler (PGS/S) web sites.

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 customers 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 which 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 effect operations.

Moderate Weather Impact—A subjective measure of weather conditions impacting a system or operations that require alternative actions to be considered. Moderate impacts limit the effectiveness of the system or operations from 25 to 75 percent.

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 not.

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 the conduct of joint operations that can be used as a basis for development of an Operation Order (OPORD).

Operational Weather Squadron (OWS)—An organization comprised of management, technician, and training personnel responsible for providing regional weather support. Their mission is to produce fine-scale tailored weather forecast products and services to customers within their area of responsibility (AOR).

Operations Weather Limiters Network (OWL NET)—An interactive program CWTs access to research customer weather sensitivities. OWL NET is hosted on each OWS web site as well as the HQs AFWA Field Support Page and at the AFCCC. OWL NET will be available on CD-ROM for easy transport during deployments.

Pilot Report—A report of in-flight weather provided by an aircrew member.

Principal User Processor (PUP)—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.

Quick Reaction Communications Terminal II & III—(QRCT)The QRCT II provides AFW units a first-in, and in many cases sustaining, means of communicating with other weather forces using High Frequency (HF) radio communications in a wartime environment. The QRCT III upgrades the currently fielded QRCT II. QRCT III is designed to maximize the effectiveness of HF, while taking advantage of the Defense Information Service Networks (DISN), when and where available. A similar system, Army Goldwing, is fielded to AFW units providing Army support.

Raster Scan—Picture element (pixel) data. A collection of raster scan data makes up visual imagery products such as satellite pictures, graphics pictures, or facsimile type products.

Refractive Index—A measure of the amount of "refraction," or bending, of an energy wave (visual light, infrared, radio and others) passing from one density to another in a medium such as air or water. The apparent bending of a stick when placed in a pool of water is an example.

Relative Humidity—Ratio, usually expressed as a percentage of air's water vapor content, to its water vapor capacity at a given temperature and pressure.

Regime—A synoptic and/or mesoscale weather pattern that effects a location.

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.

Sea State—Describes wind-generated waves on the surface of the sea.

Service Message—A short, non-meteorological message authorized for transmission on weather circuits used to inform customers of problems or situations effecting the timeliness and availability of products and delays or disruptions to services.

Severe Thunderstorm—A thunderstorm that produces hail greater than or equal to ¾ 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

Slant-range Visibility—The distance a pilot can distinguish objects that are both forward and beneath his aircraft. For example, looking down at an angle as he approaches a target or a runway.

Soil Trafficability—The capacity of a soil to withstand traffic, especially the traffic of military vehicles.

Specific Humidity—The ratio of the mass of water vapor to the total mass of air (including water vapor).

State-of-the-ground—A standardized surface observation that describes the condition of the ground surface. Basically, state-of-the-ground is characterized as dry, moist, wet, frozen, and ice or snow covered.

Senior Meteorological and Oceanographic (METOC) Officer—Officer responsible for assisting the combatant commander and staff in developing and executing operational and oceanographic service concepts in support of a designated joint force.

Staff Weather Officer (SWO)—A weather officer, qualified in forecasting, that usually commands a WETM (Weather Team). The SWO may be a lieutenant or a colonel depending on the Army unit he is attached to. Some SWOs, assigned to Army commands, serve without a WETM. The SWO, a member of the Army commanders special staff, works under the direction of the G2 or S2.

Steering Wind—Winds measured at 50 feet (16 m), although they may extend as high as 2,500 feet. They are used in smoke operations where the moving air is measured far enough above the ground to be free of disturbances caused by local terrain variations. They establish the speed and direction of a smoke cloud. Steering winds also play a role in the direction that weather systems move.

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.

Subscription (Smart Push)—A process to establish automatic and routine distribution of products from a weather production center to a user system. Each user establishes their subscribed product set from the production center product catalog. Products on subscription are automatically pushed from the producing system to the subscriber system without any user action.

Support Assistance Request (SAR)—Used to request specialized weather, space environmental, or climatological support from the Air Force Weather Agency (AFWA), AF Combat Climatology Center (AFCCC), MAJCOMs, or Operational Weather Squadrons (OWS).

Surface Observations—Weather and environmental observations measured or estimated on the land or water surface, and usually reflecting surface conditions. Cloud cover is an exception.

Surface Winds—Wind speed, direction, and gust speeds measured over the land or water. Technically measured at 10 meters above the surface.

Synoptic Scale—Systems which vary in size horizontally from 108 to 1,080 nautical miles (200 to 2,000 kilometers) and have a duration of tens of hours to several days (e.g., migratory high and low pressure systems, frontal systems, or tropical cyclones).

Tactical Weather Radar (TWR)—A mobile weather radar installed at forward bases in which Combat Weather Teams (CWTs) obtain radar products in a deployed environment. A TWR provides a CWT the capability to transmit radar products to their responsible OWS and to share the radar products with other CWTs. For CWTs deployed with Army units, TWR products will be transmitted to the theater injection point for transmission to Integrated Meteorological Systems (IMETS) via Army communications.

Terminal Forecast Reference Notebook—A local publication containing information on forecasting for locations for which the unit has forecast responsibilities.

Terminal Meteorological Watch—The monitoring of aerospace weather at a specific terminal (aerodrome) and informing supported agencies when certain unforecast phenomena could effect operations or pose a hazard to life and property.

Temperature Gradient—The change in temperature per unit of distance between one point and another.

Temperature-humidity Index—An indicator of the effect of temperature and humidity upon individuals. Sometimes called the misery index by television weathercasters. An example is the WBGT (Wet Bulb Globe Temperature) index.

Thermal/IR Crossover—Thermal crossover is said to occur when the temperature of a target is the same temperature as its background. This would cause the target to appear invisible to IR sensors. Depending on cloud ceiling, this usually occurs soon after BMNT and soon after EENT.

Tidal Current—The alternating horizontal movement of water associated with the rise and fall of the tide. In relatively open locations, the direction of tidal currents rotates continuously through 360 degrees diurnally or semi-diurnally. In coastal regions, the nature of tidal currents is determined by local topography as well.

Tide—The periodic rising and falling of the oceans, large lakes, and the atmosphere. It results from the tide-producing forces of the moon and sun acting upon the rotating earth. This disturbance actually propagates as a wave through the atmosphere and through the surface layer of the oceans.

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.

Turbulence—A condition of the atmosphere in which air currents vary greatly over short distances. Turbulence may occur at any altitude, and the intensity may vary rapidly over short distances. See wind shear.

Twilight—The periods of incomplete darkness following sunset (evening twilight) or preceding sunrise (morning twilight). Twilight is designated as civil, nautical, or astronomical, as the center of the sun travels 6, 12, or 18 degrees below the celestial horizon, respectively. In general, civil twilight precedes nautical twilight by 2 hours.

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.

Visual Flight Rules (VFR)—In aviation a set of regulations that must be adhered to when piloting in calm, clear weather where the pilot can move from one point to another using ground features for navigational aids.

Visibility—The greatest distance that prominent objects can be seen and identified by the unaided, normal eye. When NVG or other infrared devices are used to increase visual distance, "seeability" is used instead of visibility.

Weather Advisory—A special notice provided to a supported agency when an established weather condition that could effect its operation is occurring or is expected to occur.

Weather Subscription Service—A web-based subscription service that allows customers to dynamically change their subscriptions to products.

Weather Tactical Decision Aids (WTDA)—These refer to the manual lookup tables and matrices in this manual, or are computer-driven algorithms by which such a product is generated. These tables provide the critical thresholds that effect operations, systems, and personnel adversely. The tables, together with a current forecast, are used to brief the commander and staff.

Weather Warning—A special notice provided to a supported agency when an established weather condition of such intensity as to effect 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.

Wet Bulb Globe Temperature Index—A measure of heat stress potential. It is calculated by using a formula which considers relative humidity, radiant heat, air temperature, and air movement.

Windchill Factors—These factors are revised temperature values based on the effect of wind and temperature combined on exposed skin. This windchill temperature is the effective temperature for troops. The effect of windchill differs individually because of body chemistry, but is an acceptable operating standard.

Winds Aloft—The flow of air, measured in speed and direction above the surface. There is no distinct demarcation between winds aloft and surface winds, although winds above 100 meters are usually referred to as winds aloft.

Wind Shear—The rate of change of wind velocity (speed or direction)with distance. Eddies and gusts form in areas of wind shear, thus producing turbulent flying conditions. Wind shear may occur in either the vertical or horizontal plane.

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

SPACE WEATHER IMPACTS

Table A2.1. High Frequency (HF) Communications Systems.

System Name	Capability	Space Weather Effects	Mitigation Possible
AN/ARC-200/VRC-100 HF Radio	Voice and data, secure and non-secure. Burst Transmission.	Absorption of signal (short wave fade). Distorted Refraction.	Identify when and where poor reception is expected.
AN/GRC-193/ GRC-213 PRC-104 HF radios	Voice and data, 150 km forward of FLOT. Burst transmission.	Signal penetrates ionosphere (signal penetrate straight through).	Specify frequency effected.
AN/TRC-179 Regency Net System Terminal	Voice and data Secure and non-secure Independent operations.	Trap and split the signal (Bending). All above effects are beyond Line of Sight.	Identify optimum angle of incidence for radio transmission.
Integrated Meteorological System (IMETS) Harris HF radios	HF IMETS to IMETS. IMETS to Goldwing HF and AF HF.	No refraction back to earth when signal penetrates through. Receives broadcast weather messages/ charts.	Effects and Mitigation apply to all the systems listed in first column.

Table A2.2. Ultrahigh Frequency (UHF) (225-400 MHz) SATCOM Communications Systems.

System Name	Capability	Space Weather Effects	Mitigation Possible
AN/PSC-5 (spitfire) E-Manpack Terminal	Voice and data.	Intermittent effects from scintillation caused by changing electron density.	Identify time period when lost communications links are expected.
PSC-7 (MST-20) Miniature SAT receiver	Voice and data, interfaces to other UHF systems.	Scintillation (Changing electron density).	Identify locations where communications links will be lost.
PSC-3 Man-portable VSC-7 Vehicle Mounted PSC-10 Manpack for Airborne HST-4 A/C Compact Radio	Voice and data. VSC-7, controls nets of PSC-3s. Burst transmission.	Lower UHF cannot recognize signal. Location dependent; high latitudes have rare scintillation; SA, Africa, SWA, S Far East, night hour interruptions are routine occurrences.	Schedule UHF use when no effects occur. Evaluate limitations before operations start. Use alternate communications for time sensitive operations.
AN/GSC-40 SATCOM Transmitter MSC-64 SATCOM Receiver	Voice and data. Transmit and receive emergency action messages.	Forward units lose C2 links to command elements.	Mitigation capabilities above apply to all UHF systems listed in first column.
AN/TRC-194 MILSTAR Ground Terminal uses UHF for relay but also uses EHF	Voice and data effected but the EHF is not effected by space weather.	UHF relays effects the same as above. All the above effects apply to all systems in first column.	Mitigation capabilities above apply to all the systems listed in first column.

Table A2.3. Superhigh Frequency (SHF) (3-30 GHz) SATCOM Communications Systems.

System Name	Capability	Space Weather Effects	Mitigation Possible
AN/TSC-85B/93B TACSAT Terminal	High Density Comms: Voice, data, and video.	Less significant effects for SHF.	Identify time period of radio wave burst transmission within field of view.
AN/GSC-52, Medium Terminal AN/GSC-49, Jam Resistant Communications Terminal	All data types at high volume.	Signal interference caused by bursts of radio radiation from the sun at the same SHF frequencies.	Identify solar burst as cause rather than jamming by threat forces.
AN/FSC-28/79 Heavy DSCS SATCOM terminal (station) GSC-39 Medium DSCS SATCOM system terminal	All data types at high volume.	Signal interference caused when receiver is pointed toward sun and is in Field of View (FOV).	Identify locations within the FOV, time vulnerable for interference based forecasts and warnings.
SHF Tri-band Advanced Range Extension Terminal	Highly mobile vehicle mounted SATCOM which interfaces with commercial comms of Freq of 4-8 and12-18 GHz	Theater Comms knocked out for short periods (up to 2 hours).	All mitigations above apply to all systems in the first column.
SOF TAC Assured Connectivity Light Weight SAT Terminal 8000	Vehicle mounted, uses DSCS, and interfaces with commercial comms.	Increases near the solar equinox when sun crosses the equator.	
Light Multi-band SAT Terminal	Voice and data effected but the EHF is not effected by space weather.	All SHF effects are less significant but the same as above.	

Table A2.4. Military Intelligence Dissemination Systems.

System Name	Capability	Space Weather Effects	Mitigation Possible
Modernized Imagery Exploitation System (MIES)	Ground based system, receives imagery disseminates through SATCOM broadcast.	Receive and transmit SIGINT and IMINT through UHF SATCOM communications. Space intermittent weather effects on UHF comms apply.	Plan around outage of communication links or plan alternate communication path that is not effected.
Mobil Integrated Tactical Terminal (MITT)	Highly mobile, ground based receiver of multiple sources which integrates, tailors, and disseminates	Space weather impacts by weakening signal and wave shifts.	Same mitigation for all dissemination systems.
Forward Area Support Terminal (FAST)	Extremely mobile, small MITT. Receives SIGINT/IMINT. Tailors and disseminates target information.	Space weather effects on UHF especially in equatorial bands during night hours to interrupt communication links.	Identify time when dissemination will be lost.
AN/TSQ-134(V) Electronic Processing and Dissemination Systems (EPDS)	Advanced ground version to collect, process, correlate, integrate SIGINT and IMINT from NTM to corps.	Intermittent scintillation observed in hi latitudes as arora borealis and in equatorial areas at night.	Same mitigation as above and for all systems.
OE-95/TSQ-134(V) Enhanced Tactical User Terminal (ETUT)	Mobile ground based system that collects from multiple ground and space based sensors, distributes data, and interfaces with EPDS/MIES.	Same as above for all UHF SATCOM.	
AN/TSQ-32/168/178 JSTARS Ground Station Module (GSM)	Mobile, multi-sensor IMINT Tactical Data Center Collects via UHF SATCOM and transmits to other ground stations.	ARL limitation to capability to intercept is primarily in HF.	
Enhanced Tactical Radar Correlator (ETRAC)	Collects and integrates SAR imagery.	Effects capability to collect corroboration information, effects UHF SATCOM effecting broadcast of synthesized picture.	
Commanders Tactical Terminal (CTT)	Fuses data from other sources and interfaces with corps/division warfighter net	Effects capability to collect.	
SOF Intelligence Vehicle (SCAMPI)	Deployable receive/process and dissemination system using HF/UHF/SHF comms.	Effects SOF capability to disseminate Information.	

System Name	Capability	Space Weather Effects	Mitigation Possible
Trojan Spirit	Send/receive Intel data w/SHF for (voice/data/ graphics).	Effects communications in UHF.	
Trojan Lite	Highly mobile, SHF, and commercial.	Same effects as SHF SATCOM comms.	Same as SHF SATCOM comms.
Tactical Information Broadcast Service (TIBS) {classified system} [Technical Exploitation of National Capability Program (TENCAP)]	Collects, correlates Rivet Joint, JSTARS, Airborne Warning and Control, U2, and UAV. SHF and UHF SATCOM effected. Broadcast is classified.	Failure to receive broadcast of tactical SIGINT and IMINT at CDR or Target Planning Group. Distortion and radio wave interference like SATCOMs described in Comms section.	Identify time and location where SATCOM broadcast of Intel information is prevented or delayed. Commander can direct alternate means of passing Intel. Tailor Intel broadcast sequence times to reduce repeated disruptions.
Tactical Reconnaissance Intelligence Exchange System (TENCAP)	Disseminates info collected by U2, Guardrail Common Sensor. Provides classified and Special Compartmentalized Intel.	Same as other TENCAP broadcasts.	
Tactical Related Applications System (TENCAP)	Disseminates electronic Intelligence and related reports.	Same as other TENCAP broadcasts.	
Tactical Data Distribution System/ Tactical Data Information Exchange System-Broadcast (TENCAP)	Collected from multi-source and processed and distributed through a single source. Broadcast is at a classified level.	Same as above.	
AN/MLQ-39 Ground Based Common Sensor (GBCS)	Receive and record HF/ VHF/UHF. Identify location of emitters and perform jamming	Limited intercept of HF/ VHF/UHF.	Mitigation capabilities for HF/VHF/UHF comms apply.

Table A2.5. MI Magnetic Field Collection, Electronic Attack (HF Signal Jamming) Systems.

System Name	Capability	Space Weather Effects	Mitigation Possible
GSQ-187 Improved Remotely Monitored Battlefield System I-REMBASS Magnetic Field Collection System	Unattended, ground based Intel collection system to detect, classify, determine movement and direction, senses seismic-acoustic energy, senses magnetic field changes induced by passing vehicle	Geomagnetic storms superimpose on earth disturbing the vertical and horizontal components of the magnetic field. Radically alters magnetic fields from day to dayTriggers magnetic sensors to give false reading Inability to accurately collect magnetic sensors	Identify periods when magnetic sensors are unreliable. Assist technicians in troubleshooting problems. Advise when REMBASS will appears to be faulty during rapidly changing space weather.
DT-561/GSQ Magnetic Sensor Transducer (Magnetic Field Collection Sys)	Same as I-REMBASS	Same as I-REMBASS	Same as I-REMBASS
AN//TLQ-33, Army HF Electronic Warfare Systems (AHFEWS) {ECM/Electronic Attack System}	Prevent or interrupt threat from using HF signals Searches for HF signal Identifies target by type Executes jamming attack Space weather impacts are on HF jamming only, not other frequencies.	Limits capability to jam using HF skywave transmission because it relies on ionosphere to reflect signal downward toward threat receivers. May fail to jam, or think it is effectively jamming when it cannot jam, and limits areas to be jammed. Deflects the jamming signal into Friendly AO causing radio signal fratricide. Space weather effects are same as on HF comms.	Advise Commander on best time and locations to use electronic attack. Provide estimate to CDR of potential impact on Friendly Forces HF activity. Provide planning to enable use of alternate to HF when fratricide potential is great from friendly jamming of threat HF. Eliminate thinking jamming is successful when space weather may be preventing it.
AN/TLQ-17A (V)4 Sandcrab (ECM/Electronic Attack System)	Ground based intercept and ECM providing electronic attack.	Space weather defines areas where HF system can reach target. Changing ionosphere can shift jamming from intended threat area to friendly AO and jam wrong systems (fratricide).	Same mitigation as above and for all ECM systems.
AN/MLQ-39 Ground Based Common Sensor (GBCS) (ECM/Electronic Attack System)	Ground based intercept and ECM. Jams HF and VHF. Replaces Traffic Jam, Trailblazer, Teammate	Space weather defines areas where HF system can reach target. Changing ionosphere can shift jamming from intended threat area to friendly AO and jam wrong systems (fratricide).	Same mitigation as above and for all ECM systems.

Table A2.6. Navigation Systems.

System Name	Capability	Space Weather Effects	Mitigation Possible
Global Positioning Systems General Description	Special receiver used to navigate. Network of satellites transmit UHF radio signals from multiple satellites. Locks onto 4 GPS satellites at one time.	Accuracy effected as space weather slows down and distorts signal as it traverses the ionosphere. Effects vary with single and dual channel GPS systems. Ionospheric effects depend on frequency: scintillation in UHF in high latitudes and Equatorial areas effect GPS, especially in mountains.	Knowing forecast of GPS wander of 70 ft warns those who use system of increased error to expect in advance. Target planning cells can eliminate GPS guided rounds when wander exceeds allowable tolerances.
Single Channel GPS	Single Channel at 1.6 Ghz. Ground navigation aid.	Total Electron Count (TEC) determines how much wander; with greater TEC, the slower signal goes and exceeds built-in error correction. TEC errors cause up to 70 ft errors for Precise Positioning System (PPS).	Warning of increased solar activity. Helps plan in advance for operations requiring full capability of system specifications. Enables users to know wander jumps around from second to second.
Dual Channel GPS	Double channel at 1.2 Ghz and1.6 Ghz. Ground and aviation navigational aid. Replacing single channel in future.	Same errors in TEC as for single channel but dual channel eliminates much of the problem because it accesses more satellites. Less wander than single channel.	Less wander. Has very limited impact except pinpoint weapon accuracy of precision guided munitions that depend on GPS navigational aids.
AN/PSN-11 Precision Light Weight GPS Receiver (PLGR)/Stand Alone GPS Receiver (SAGR)	Hand-held and mounted single channel GPS. Provides lat/long, altitude/elevations, velocity, time, and direction of movement.	Errors increase in 2 year window at solar maximum period. Operators, now more dependent on GPS, do not expect wander.	Enables planning for backup systems as alternates, or increase timing of operations to help synchronization, and or delay/cancel.
Miniature Airborne GPS Receiver (MAGR)	Aircraft mounted for supplemental aviation navigational aid.	Same as dual channel, but not as a significant effect on aviation.	Enable preflight planning using other navigational aids and recognize in advance potential problems. Eliminates dependence on intermittent capability (if critical).
Army Tactical Missile System (ATACMS) Dual GPS Guidance Weapon.	Weapon is guided to pre-located target coordinates for pinpoint PGM strikes.	Limited wander but may need to consider during solar maximum. May lose pinpoint accuracy and not destroy target.	Added factor to consider before very expensive PGMs are launched, adjust launch time to reduced effects of solar activity, increase probability of first strike kill.

Table A2.7. Military Intelligence Collection Systems - Radio.

System Name	Capability	Space Weather Effects	Mitigation Possible
AN/TSQ-152 Trackwolf AN/TSQ-199 E-Trackwolf	Mobile, ground based HF intercept to collect/process/analyze and identify locations.	Part/full absorption of wave trying to intercept.	Identify time and locations when unable to collect.
AN/TRQ-32A(V) 2 Teammate AN/TSQ-138 Trailblazer	Tactical, ground based Receive and record HF/UHF/VHF ID direction.	HF skywave they are trying to intercept penetrates straight through the ionosphere and the fact that threat is transmitting is unknown.	Identify time periods when the threat cannot use HF/UHF/VHF.
AN/PRD-12 Lightweight, Manportable Radio Direction Finding (RDF) System	Manportable Intercept/Receive Record HF/UHF/VHF.	Trapped within ionosphere. Causes gross changes in locations and frequency: 1) cannot intercept 2) incorrect interpretation, 3) determine incorrect location.	Identify time when threat HF radio may be transmitting but space weather prevents intercept.
AN/ALQ15 Quickfix and Advanced Quickfix	UH-60 Helicopter borne. Intercept electronic attack.	For Quickfix only, space weather may disrupt capability to intercept threat HF electronic attack.	Identify where to position SIGINT collector for optimum intercept.
RC-12 Guardrail	RC-12 Aircraft intercepts HF/VHF/UHF. Identifies direction of intercepted signal.	RC-12 limited in HF intercept, other capabilities are not limited by space weather.	Direct other assets to collect when planned system is limited by space weather activity.
Airborne Reconnaissance Low (ARL)	Modified DHC-7 DeHavilland intercepts HF/VHF/UHF.	ARL limitation to capability to intercept is primarily in HF.	Use knowledge of threat HF vulnerabilities for commanders tactical advantage when included in collection plan, Info Operations.
AN/MLQ-39 Ground Based Common Sensor (GBCS) (Radio only, also see Jamming)	Receive and record HF/VHF/UHF. Identify location of emitters.	Limited intercept of HF/VHF/UHF.	Mitigation capabilities above apply to most of the systems listed in first column.

Attachment 3

CHEMICAL DOWNWIND MESSAGE (CDM) PROCEDURES

A3.1. Chemical Downwind Messages (CDMs). Upon request from Disaster Preparedness or any other airfield agency, CWTs provide chemical downwind products. Tactical Army CWTs derive the CDM from the IMETS Chemical Downwind Report (CDR) application. The CDM is used much like a toxic corridor forecast except that it is a forecast of winds, stability, temperature, humidity, cloud cover, and weather. Additional guidance for preparing CDMs is contained in Army Field Manual (FM) 3-3, *Chemical And Biological Contamination Avoidance*. CWTs can link to this FM from the AFWA Field Support Division (AFWA/XOP) web page.

A3.2. CDM Format. The weather information in the CDM is formatted as in **Table A3.1.** Weather data that is unavailable or for which no code exists is represented by a dash.

A3.2.1. The first part of the CDM consists of the date time group (DTG). The DTG is the time from which the CDM forecast begins (e.g., 310600Z would indicate the beginning of the forecast period). Then, the forecast is broken down into three consecutive two-hour increments, each with its own alphanumeric designator. The increments are:

A3.2.1.1. Line ***Whiskey Mike*** **(WM)** is used for the first two-hours of the forecast (e.g., this would be from 310600Z to 310800Z.

A3.2.1.2. Line ***X-Ray Mike*** **(XM)** for the second two hours of the forecast (e.g., from 310800Z to 311000Z).

A3.2.1.3. Line ***Yankee Mike*** **(YM)** for the final two hours of the forecast (e.g., from 311000Z 311200Z).

A3.2.1.4. A fourth group, **Zulu Mike (ZM)**, may be added for Air Force customers receiving CDM products synchronized with Aerodrome Forecast (TAF) support.

Table A3.1. Chemical Downwind Message Format.

Weather Parameters	Example of Basic Data Format
Surface Downwind Direction (direction towards)	WM**120**010418742
Surface downwind speed in Kilometers in Hours	WM20**010**418742
Air Stability Category	WM20010**4**18742
Average Ambient Temperature	WM120010**18**742
Average Relative Humidity	WM120010418**7**42
Significant Weather Phenomena	WM120010418**4**2
Cloud Cover	WM120010418742

A3.2.2. Surface downwind direction (direction towards). Add 180 degrees to the wind forecast in the TAF since TAF code gives winds in direction "from" which wind is blowing. **Table A3.2.** contains a conversion chart.

Table A3.2. Wind Conversion Chart.

360	010	020	030	040	050	060	070	080	090	100	110	120	130	140	150	160	170	180
180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360

A3.2.3. Surface downwind speed in kilometers per hour (KPH). Convert the wind speed forecast (mean) in knots to kilometers per hour. **Table A3.3.** is a knots to kilometer conversion chart.

Table A3.3. Knots to Kilometer Conversion Chart.

KNOTS	0	1	2	3	4	5	6	7	8	9
	KPH									
0	0	2	4	6	7	9	11	13	15	17
10	19	20	22	24	26	28	30	32	33	35
20	37	39	41	43	45	46	48	50	52	54
30	56	58	59	61	63	65	67	69	70	72
40	74	76	78	80	82	83	85	87	89	91
50	93	95	96	98	100	102	104	106	108	109

A3.2.4. Air Stability Category. **Table A3.4.** contains generic guidelines on stability categories. Figure 1-2 in Army FM 3-6, *Field Behavior of Nuclear Biological Chemical Agents*, provides a detailed decision tree to determine stability.

Table A3.4. Air Stability Categories.

Lapse Rate	Sun Angle	Cloud Cover	Weather/Terrain
1 Very unstable to absolutely unstable	> 46°	CLR - SCT	Dry to slightly moist
2 Unstable to conditionally unstable	40° - 46°	SCT - BKN	Dry to slightly moist
3 - Slightly unstable to conditionally unstable	> 32°	BKN - OVC	Wet, wind > 9 knots
4 - Neutral to conditionally unstable	< 32°	BKN - OVC	Continuous rain, wind > 9 knots
5 - Slightly stable to conditionally stable	< 32°	CLR - SCT	Haze, fog, wet
6 - Stable	< 32°	CLR - SCT	Haze, fog, snow cover
7 - Very stable to stable	< 4°	CLR - SCT	< 1,000 feet in fog; < 6,000 meters in haze/ snow; snow cover or frost

A3.2.5. Average Ambient Temperature. Average Celsius temperature forecast for the period in simple code. To encode, simply enter the Celsius temperature in 2 digits for positive temperatures, add 50 to negative temperatures, for example: 05°C = 05, -03°C = 53.

A3.2.6. Average Relative Humidity. Calculate from temperature/dewpoint forecasts using **Table A3.5.**

Table A3.5. Average Relative Humidity.

Code	0	1	2	3	4	5	6	7	8	9
RH Range	0-9%	10-19%	20-29%	30-39%	40-49%	50-59%	60-69%	70-79%	80-89%	90-100%

A3.2.7. Significant Weather Phenomena. Use the symbol as listed in **Table A3.6.**

Table A3.6. Significant Weather Phenomena Codes.

3 = Blowing snow or sand
4 = Fog, ice fog, or haze (< 4mi)
5 = Drizzle
6 = Rain (moderate or heavy)
7 = Light rain or snow and rain mixed
8 = Showers of rain, snow, hail, or a mixture
9 = Thunderstorms

A3.2.8. Use **Table A3.7.** to determine the code for sky cover.

Table A3.7. Sky Cover Conversion Chart.

0 = sky less than half covered by clouds (CLR-SCT/ 0-4 octants coverage)
1 = sky more than half covered by clouds (BKN/5-7 octants coverage)
2 = sky overcast (OVC/8 octants coverage)

A3.3. Example CDM.

310500Z (Obs Time) 310600Z (Fcst Time)
1 Corps
WM 120010418742 XM 125019416742 YM 130005518642

Attachment 4

MEFP BENCHMARK SOP

(Courtesy of Detachment 2, 7WS)

MISSION EXECUTION FORECAST PROCESS (MEFP): IN-GARRISON

References: AFMAN 15-124, AFI 15-128, AFMAN 15-129, AR 95-1, OH-58D Pilots Desk Reference, and Joint Forces Command (JFCOM) METOC Training Handbook.

Purpose: Provide guidance for all aspects of the Mission Execution Process for garrison support to Hanau Army Airfield (HAAF) aircrews.

1. ***Identify Missions.***

a. Download the initial weekly flight schedule.

b. Check the BWS email box per Daily Duties Checklist (see SOP B-1) for revisions to the flight schedule and download as required.

c. Items to key on include type aircraft, mission type and objective, time frame of flights, destination and routing, and on-board systems to be utilized. The aircraft types we support on a recurring basis are the:

1) OH58 Kiowa Warrior (1-1 CAV) at Budingen, which is a CAT I aircraft. Typically, the OH58 has security and reconnaissance missions during which they must locate targets (people, buildings, vehicles, etc). Mission success is determined by positive identification of targets.

2) UH60 Blackhawk (2-501), a CAT II aircraft. UH60s perform aerial re-supply of cargo and supplies and team insertions. Mission success determined by successful drop or insertion.

3) AH64 Apache (1-501), a CAT II aircraft. AH64s are the shooters. Their objective is to locate and terminate designated targets.

Mission success for these aircraft is dependent upon the intent of the individual mission. The intent may be to destroy targets or it may be to test pilot proficiency. It may be to test system capability or orchestration of complex aerial maneuvers***. Robust SWO and forecaster interaction with aircrews and mission planners as well as each other is critical to the success of the MEFP.***

2. ***Effects of Weather on Aviation and Air Assault Operations***

a. Weather Phenomena and General Impact on Operations.

1) Ceiling--Cloud and Sky Cover. Limits operations requiring aircraft clear of clouds. May preclude landings or increase danger in takeoffs. May preclude CAS missions.

2) Visibility. Affects landing and takeoff capabilities, and reconnaissance and target acquisition. Effects reconnaissance and target acquisition. Low visibility increases flight hazards. Affects E/O target designation and terminally guided munitions.

3) Electrical Storms and Thunder. Hazardous to in-flight operations. Hazardous to refueling operations. Hazardous to rearming operations.

4) Precipitation. Affects visibility and safety of flight. Effects density altitude.

5) Snow Depth. Affects ground handling. Powdery snow may preclude hover operations.

6) Refractive Index. Affects optical, radar, laser, and infrared range-finding techniques.

7) Ice And Thickness. Used in evaluating landing sites.

8) Icing. Affects aerodynamics of aircraft. Any intensity of icing can preclude aviation operations.

9) State-Of-The-Ground. Impacts effectiveness of aerial delivered munitions.

10) Turbulence. Affects reconnaissance and surveillance--shear affects systems performance. May cause aircraft structural damage. May affect aircraft control. Severe turbulence may cancel operations.

11) Wind (Surface). Affects aircraft control near the ground. Affects landing and takeoff, and ground speed for low-level flights.

l2) Blowing Dust and Sand. Effects hydraulic systems and windscreens.

13) Wind (Aloft). Affects navigation, and ground speed at higher flight altitudes.

14) Density Altitude. Affects lift capabilities and reciprocating engine performance. Limits fuel and weapons load.

15) Pressure Altitude. Affects reciprocating engine performance.

16) Pressure Profile. Affects terrain avoidance.

17) Temperature (Surface). High temperatures reduce lift capabilities. Cold temperatures increase maintenance requirements and time to perform. Reduces personnel carried due to weight and bulk of protection gear.

18) Dew point. Affects engine efficiency calculations. Serves as warning of possible fog formation or icing conditions.

19) Illumination. Affects operations using night vision devices.

b. Weather Effects Matrix**.** This list provides general impacts for typical army rotary-wing aviation operations platforms and weapons systems. ***This is not an all-inclusive list. Operational commanders determine critical thresholds.*** The values listed below are examples of critical thresholds, which can significantly reduce the effectiveness of or prevent execution of tactical operations or weapon systems. The following weather impacts are provided in “stoplight” format - ***(Favorable)= minimal operational impact; (Marginal)= moderate operational impact; (Unfavorable)= severe operational impact:***

OPERATIONS	FAVORABLE	MARGINAL	UNFAVORABLE
NBC	WIND<5KTS	WIND5-1OKTS	WIND>1OKTS
CHEMICAL*	WIND TO ENEMY		WIND FM ENEMY
	NO PRECIP	LGT PRECIP	MDT PRECIP
	CLG>5000FT		
	NO LTNG		LTNG<3.1 NM
	HUM>60%	30%<HUM<60%	HUM<30%
*EACH CHEMICAL AGENT HAS ITS OWN SPECIFIC METOC CRITERIA			
NBC SMOKE	WND> 5 KTS	WND 5-18KTS	WND> 18KTS
			TEMP >120F
	LGT PRECIP	MOD PRECIP	HVY PRECIP
	VIS>1000M	400M<VIS<1000M	VIS<400M
			SFC INVERSION
PERSONNEL/LAND	20< TEMP<85F	15F TO 20F	TEMP>95F or <-15
	LGT PRECIP	MOD PRECIP	HVY PRECIP
PERSONNEL/AIRBORNE	CIG >1000FT		
	WNDS < 17KTS	WND 13-17KTS	WND>18KTS
	NO PRECIP	LGT PRECIP	MOD PRECIP
		DENS ALT 4000-6899F	DENS ALT>6900F
FARP	TSTMs > 25NM	TSTMs WITHIN 5-25NM	TSTMs W/I 5 NM
HELO OPS	CIG > 500FT	CIG 300 - 500 FT	CIG <300FT
	VIS> 1600M	VIS 800 - 1600M	VIS <800M
		LGT TURBC/ICING	MDT TURB/ICG
HELLFIRE*	CIG > 2000FT	CIG 800 - 2000FT	CIG <800FT
	VIS > 5000M	VIS 3000 - 500M	VIS < 500M
*LOBL	CIG> 1900FT	CIG 400 - 1900FT	CIG <400FT
	VIS > 7000M	VIS 500 - 700M	VIS <500M
*LOAL	CIG> 1700FT	CIG 800 - 1700FT	CIG <800FT
	VIS > 7000M	VIS 1700 - 7000M	VIS < 1700M
ELECTRO OPTICAL	CLD SCT	CLD BKN-OVC	CLD OVC
	FULL MOON	MOONRISE	NO MOON
	ABS HUM< 14g/m3	ABS HUM 14-18 g/m3	ABS HUM>18g/m3
	TRANSMITTANGE>.4	TRANS .2-.4	TRANS<.2
	ICING		
	TURBULENCE		
NVG-OPS	> 5 MILLILUX	2.5-5 MILLILUX	<2.5 MILLILUX

c. Specific Weather Thresholds/Flight Restrictions.

1) VFR Weather Minimums.

a). Controlled Airspace.

(1) Within tower-controlled airspace, rotary wing aircraft may be flown in United States Army Europe under special visual flight rules (SVFR) when the following minimum weather criteria are met and ATC approval is obtained:

Flight	Ceiling	Visibility
Day	300 feet	800 meters
Night	500 feet	1,600 meters
Night-mountainous	1,000 feet	1,600 meters

NOTE: Higher SVFR minimums apply when published in DOD FLIPs.

(2) Rotary wing ceiling and visibility minimums for flights in uncontrolled airspace are as follows:

Flight	Ceiling	Visibility
Day-general service	500 feet	800 meters
Day-tactical flight	300 feet	800 meters
Night	500 feet	1,600 meters
Night-mountainous	1,000 feet	1,600 meters
Night-unaided HFCA	500 feet	3,000 meters

2) Icing Conditions. Rotary wing aircraft without fully operational blade de-ice kits will not be flown in IMC when ***light icing*** conditions exist or have been forecast unless one of the following criteria can be met:

a) A ceiling of at least 1,000 feet above ground level (AGL) along an entire route is forecast.

b) In and out of cloud conditions at the desired flight level or altitude are forecast.

c) The tops of clouds are forecast to be at or below 8,000 feet mean sea level (MSL).

The OH58 Kiowa Warrior is not equipped with a de-ice kit.

3) Turbulence Conditions.

a) Aircraft will not be intentionally flown into areas of known or forecast extreme turbulence. With some exceptions, aircraft will not be intentionally flown into areas of known severe turbulence.

b) Unit commanders may clear flights to areas of forecasted severe turbulence.

4) Thunderstorms. Aircraft will not be intentionally flown into thunderstorms.

3. ***Obtain Situational Awareness***

a. Access Reference Files.

1) OWS/JAAWIN products constituting the standard data package from which the daily MEF will be derived are:

a) Upper Air Package **https://www.sembach.af.mil/upair/index.htm**

b) Regimes - **https://www.sembach.af.mil/GifImages/regime.xls**

c) FODL 20 ETAX Regional Weather Bulletin for Central Europe - **https://www.sembach.af.mil/gmgo/foxxbull.htm**

d) Hazards PowerPoint - **https://www.sembach.af.mil/GifImages/hazardcolor.ppt**

e) Flight Level Winds Low Level

f) Germany - Forecasts/Observations - https://www.sembach.af.mil

g) Hanau MM5 Meteogram

h) Hanau MRF

i) Hanau MRF Upper Air

j) Solunar data

k) IMaST Products (MM5, Army MM5, Skew-T)

2) Access files via

a) Hanau Weathers Bookmarks page, or

b) Internet Explorer on the forecaster computer.

(1) Click “Favorites/Daily Weather Update”

(2) Click “Tools/Synchronize” and update files by clicking “Synchronize” on the page.

(3) Any files failing to synchronize must be updated manually by clicking the appropriate web address in the “Daily Weather Update” folder.

b. ***First Look at Areas of Interest.***

1) Review ETID and other Germany TAFs and observations for first look and review the OWS product suite.

2) Create interactive MM5/Skew-T forecast products for those locations and areas for which a TAF is not available. If differing weather conditions are expected within an operating area or along a route, run multiple interactive products using latitude /longitude of applicable way-points to define locations.

3) Analyze terrain map for terrain influence on known routes of flight and operating areas. If variable terrain is a factor, run as many multiple interactive forecast products as necessary to build a detailed AO forecast.

c. ***Validate Reference Products.***

1) Look at current run of products in the ***Daily Weather Update*** folder of Internet Explorers ***Favorites*** for an overall perspective of synoptic pattern affecting theater.

2) Ensure logical continuity between regional weather patterns and available forecasts.

3) Call the OWS forecaster for our AO and discuss model initialization, their forecast reasoning and confidence level regarding the local forecast, and areas of interest to ETID flight operations.

d. Complete Mission Route/Terrain Spreadsheet Products

1) Double click ***Mission Routes*** short-cut on the BWS computer desktop (or access file in ***C:Weather Programs/Mission Routes***) to bring up product shell.

2) Select ***Weather Inputs*** tab

3) Enter current and forecast ceilings for each location shaded yellow. Placing the cursor over a ***Location*** cell (column A) will cause a pop-up window to appear. The pop-up comment includes the name of the closest station to that point with an observation as well as possible data sources available from which to derive a ceiling forecast. It also includes the elevation of the designated point. This will aid in adjusting ceiling heights in data sparse areas.

4) Enter data in whole numbers in feet AGL, e.g. Hanau CIG010, enter 1000. If obscured, enter 1 (for 1 foot). If no ceiling, enter 0 (zero). Do not use commas.

5) Once data is entered, all route charts automatically update. (***NOTE:*** Cloud heights on the spreadsheets automatically convert to MSL.)

6) These terrain products indicate the delta between the surface and the clouds based on way-point elevations as well as the ***maximum elevation between two way-points.*** Consequently, when briefing customers, be familiar with the terrain maps and exactly where the problem areas along the routes lie. This product provides:

a) the raw data from which to derive minimum ceilings for mission routes

b) a visual briefing aid for our customers use as well our own.

4. ***Complete daily Mission Execution Planning Forecast (MEFP).***

a. Hanau Takeoff/Landing Weather.

1) Enter forecast ceiling (in hundreds of feet AGL), visibility (meters), winds (magnetic), temperature (degrees Centigrade), maximum Pressure Altitude, and weather in two hour increments valid from 1 hour prior to first take-off of operations window to time of last scheduled landing.

2) Hanau MEF should be consistent with TAF issued by the OWS. Any significant deviations will be coordinated through the OWS forecaster for Hanau AAF. The MEF will not cross standard operational thresholds (i.e. TAF amendment criteria, WW & WA criteria, etc.) without coordinating the change with the OWS, unless critical to flight safety or weather conditions are rapidly changing and prior coordination is not possible.

b. A/O Weather.

1) Enter minimum forecast ceiling (in hundreds of feet AGL), visibility (meters), and significant weather for routes ***to*** applicable training areas (e.g. the HTA, TFA A/B) as well as known routes ***within*** the training areas. Derive forecast ceiling values from the ***Mission Route/Terrain Spreadsheet*** (these values must be converted from MSL to AGL).

2) Enter portion of route or inclusive waypoints impacted by inclement weather

c. Remarks.

1) Enter any advisories or warnings with valid times as applicable

2) Enter number and time and subject of any MEF amendment (e.g., Amd #1/1510Z HTA forecast ceilings)

d. Solunar Data. Enter solar events and illumination data derived by the Target Acquisition Weather Software (TAWS).

5. ***Disseminate MEF.*** The MEF will be disseminated by 5 methods:

a. Post on the weather display board in Airfield Operations Flight Planning

b. Fax to 1-1 CAV Flight Operations at Budingen

c. Post to Det 2 Home Page

d. Fax to crews on request

e. SWO or designee will hand-carry to each battalion Flight Operations Desk

6***. Conduct Mission Watch.*** Monitor mission routes, working areas, and the aerodrome for weather that significantly deviates from the MEF. Focus on mission limiting weather thresholds for specific missions.

7. ***Update MEF.*** Amend MEF and notify customers of weather crossing mission-limiting thresholds. Provide alternative solutions, where possible to facilitate mission success and log mission deviations in remarks section of MEFP form identifying mission(s) effected.

MEF Amendment Criteria.

a. Ceiling and/or visibility is observed or later forecast to increase to or exceed, or decrease to less than any of the following values:

1,000 feet/1 7/8 statute miles (3000 meters)

500 feet/1 statute mile (1600 meters).

300 feet/1/2 statute mile (800 meters).

b. Turbulence. The beginning or ending of turbulence not associated with thunderstorms, from surface to 5,000 feet (MSL) that first meets, exceeds, or decreases below moderate or greater thresholds (for CAT II aircraft) and was not specified in the forecast.

c. Icing.

1). The beginning or ending of any icing not associated with thunderstorms, from surface to 5,000 feet (MSL) not specified in the forecast.

2) A or any change in intensity threshold

3) Non-convective low-level wind shear:

a) Is occurring and is expected to continue, or is expected to begin, but is not specified in the forecast.

b) Is forecast in the TAF, but is not expected to occur during the forecast period.

8. ***Conduct Mission Verification.*** Mission Verification will be accomplished by three means:

a. **PIREPs:** Actively solicit PIREPs from aircrews. Make a conscious effort to aggressively sell the need for PIREPs with each briefing. Stress the benefits not only to us, but also to them.

b. **Aircrew Debriefs:**

1) **Description.** The MEFP contains a very simple debrief section. Was weather briefed “go” or “no-go”? Was the mission “go” or “no-go”? If no-go, was it due to weather? Was the mission changed based on the weather forecast? Was the back-up mission “go” or “no-go”? If no-go, was it due to weather?

2) **Process.** Aircrews are given a MEFP when briefed. Again, assertively solicit debriefing to every crew with every briefing. MEFP debrief drop-boxes are located at unit Flight Operations counters and the Garrison Weather corridor of Bldg. 1310. Crews can also utilize the debrief template of the Hanau Weather Web Page.

Attachment 5

ARMY SUPPLY TERMINOLOGY

(Courtesy of *Armor Magazine, Jul-Aug 2000)*

Tips on Counting Your "Stuff" Before You Sign

Getting off on the right foot for your tour as commander starts with signing for your organizations property. As the commander, you are financially liable for your units property ALL of it. Army Regulation (AR) 735-5, *Policies and Procedures for Property Accountability,* covers your responsibilities, but this information describes, in laymans terms, the types of property, responsibilities of in-coming and outgoing commanders, and tips to help you conduct a successful inventory.

Types of Property Accounts. Normally, you will hold property book accounts with several different offices. The document that you will sign to establish you as the responsible officer for your units property is called a "primary hand receipt." You may be surprised at how many different accounts for which you will sign:

Organizational Property. This is the property with which you are probably most familiar. It consists of all your "go to war" Modified Table of Organization and Equipment (MTO&E) property (MTO&E), and in divisional units, the Division Property Book Office (DPBO) issues it to you.

Installation Property. The Installation Property Book Office (IPBO) normally issues you Table of Distribution and Allowance (TDA) equipment. This equipment is non-deployable and normally consists of items like desks, file cabinets, safes, and other commercial office equipment.

Training Area Support Center (TASC) Property. This is commonly referred to as TASC property and normally consists of items used strictly for training purposes. Most of your business with TASC will be in the form of temporarily borrowing training aids (training films, overhead projectors, televisions, etc.).

Civilian Furniture Management Office (CFMO) Property. This office will issue you all your barracks furniture and linen. It can add up to a substantial amount of property, depending upon the size of your unit. Make sure that the Noncommissioned Officer (NCO) that you put in charge of this is well-versed in proper supply procedures.

Non-Appropriated Fund Property. In United States Army Europe (USAREUR), CFMO issues supplemental items purchased with "non-appropriated" funds from the community account. Normally, these are items to improve morale for soldiers, such as pool tables, weight sets, and microwaves.

Account Requirements Code (ARC). Army property is classified for account-ability purposes as expendable, durable, or non-expendable. The Account Requirements Code (ARC) is a one-position code listed in

the Army Master Data File (AMDF) for every National Stock Number (NSN) to identify the specific classification and the degree of accountability that you must apply. AMDF information is published on Federal Logistics Data on Compact Disc (*FEDLOG)* compact diskettes on a monthly basis by the Defense Logistics Agency. The ARC is the single most important code that you will reference during your inventory. Here is a run-down on the three types of ARC codes:

- ARC "N" Non-expendable item. These are the "major end-items" that you will formally sign for from the different types of property book offices mentioned above. This is the "big stuff" that you absolutely cannot be missing. *Who can order an item with ARC of "N"?* The document register for non-expendable items is maintained by the accountable officers (the PBOs), so the only way you can order one of these items is through them. If you try to order an ARC "N" item with your Unit Level Logistics System Ground (ULLS-G) document register (in your motor pool) or your Unit Level Logistics System S4 (ULLS-S4) document register (in your Supply Room), it will be automatically cancelled. *What if Im short an item with ARC of "N"?* To get your property book officer to remove one of these items from your primary hand receipt, you will need proof of the following: Turn-In (DD Form 1348), Lateral Transfer to Another Unit (DA Form 3161), Report of Survey (DA Form 4697), Cash Collection Voucher (DD Form 362), or Statement of Charges (DD Form 362). In addition, loss of a sensitive item may require you to conduct a 15-6 investigation. A sensitive item is annotated on the AMDF with a Controlled Item Inventory Code (CIIC) of "1-9", "$", "N", "P", "Q", "R" or "Y."

- ARC "D" Durable item. These are items classified as "not consumed during use." Although they do not require property book accountability, they do require hand-receipt control from commanders to the user. Examples of "durable" items include most hand tools, software in excess of $100, and fabricated items similar to durable items (e.g., drip pans for pot-belly stoves). *Who can order an item with ARC of "D"?* Normally your unit supply room will have a durable document register and you will be able to order them yourself. In some units, however, the durable document register is maintained by the battalion S4. If your unit does have a battalion-level durable document register, your local SOP may require you to consolidate your requests and submit them through battalion. If you have the ULLS-S4 system, you should have your own durable document register. *What if Im short an item with ARC of "D"?* As the commander, you are responsible for determining liability for loss of durable items if the loss per total incident is less than $100. If it is greater than $100, you are required by regulation to initiate a Report of Survey (see *AR 735-5*, Para. 14-24).

- ARC "X" Expendable item. Expendable items are classified as repair parts or items that are consumed in use or that are not otherwise classified as durable or non-expendable. Examples include sandpaper, light bulbs, Class IX items, and fixtures. *Who can order an item with ARC of "X"?* It normally depends upon the classification.

Attachment 6

EXAMPLE MOBILITY CHECKLISTS

(Courtesy of AFSOC/DOW)

Table A6.1. Example Pre-deployment Checklist.

1. Determine time and location of briefings. Perform them as required.
2. Contact indigenous weather personnel. Determine what support they can provide, and what support we can provide them. Remember OPSEC.
3. Conduct outdoor site survey. Determine locations for:
a. TACMET.
b. TACCOM.
c. TRT antenna.
d. Lightning Detector antenna.
4. Coordinate with Communication personnel.
a. Explore possibility of 2 phone lines installed.
b. Location of other communications options.
5. Coordinate with CE on power requirements.
6. Set up work area. Determine locations for:
7. Satellite Computer.
8. Computer workstations.
9. Technician work areas.
10. Determine:
a. Where we will sleep?
b. Where we will eat?
c. Is transportation available?
d. Are MWR facilities available?
11. Obtain a phone listing and maps of local area.
12. Identify the chain of command.
13. Determine evacuation site.
14. Perform any other duties as directed by Deployed Commander.
15. Call home station with initial SITREP and phone number. Remember OPSEC.

Table A6.2. Example Employment Checklist.

1. Determine time and location of briefings. Perform them as required.
2. Contact indigenous weather personnel. Determine what support they can provide, and what support we can provide them. Remember OPSEC.
3. Conduct outdoor site survey. Determine locations for:
a. TACMET.
b. TACCOM.
c. TRT antenna.
d. Lightning Detector antenna.
4. Coordinate with Communication personnel.
a. Explore possibility of 2 phone lines installed.
b. Location of other communications options.
5. Coordinate with Civil Engineering for power requirements.
6. Set up work area. Determine locations for:
a. Satellite Computer.
b. Computer Workstations.
c. Technician work areas.
7. Determine:
a. Where we will sleep?
B. Where we will eat?
c. Is transportation available?
d. Are MWR facilities available?
8. Obtain a phone listing and maps of local area.
9. Identify the chain of command.
10. Determine evacuation site.
11. Perform any other duties as directed by Deployed Commander.
12. Call home station with initial SITREP and phone number. Remember OPSEC.

Table A6.3. Example Re-deployment Checklist.

Event Title:	**Deploying Team Members:**
Projected Deployment Dates: _____ to _____	
Administrative Actions	1. Identify personnel for re-deployment. Structure re-deployment to minimize effects on operations. Coordinate with the Mission Commander on final station shut-down. 2. Inform higher echelon and co-located weather units of re-deployment. 3. Cancel SAR. 4. Write Joint Universal Lessons Learned (JULL) as needed. Provide inputs to the Commander as required. 5. Begin After Action Report. 6. Clean the work area of all trash and debris. 7. Use appropriate software to remove all classified information from the laptop. 8. Notify home unit of approximate return time as soon as possible.
Cargo Preparation	1. Inventory all equipment. Cross reference against initial load list. Identify equipment needing repair. 2. Clean all equipment and pack equipment according to load lists. 3. Mark Containers as required (e.g., TCN, Unit, Dimensions). 4. If returning with hazardous cargo, complete DD Form 1387-2. 5. Destroy all non-essential classified material. 6. Protect classified materials at all times. The classified courier will either hand-carry the material or coordinate with the Intelligence flight to use their safe (Recommend using Intel personnel). 7. Palletize/marshal equipment according to Logistics direction.

Table A6.4. Example Post-deployment Checklist.

Event Title:	**Deploying Team Members:**
Projected Deployment Dates: _____ to _____	
After Actions Report	1. Complete the After Actions Report (AAR) according to the TSOPs. 2. First draft goes to the Mobility OIC/NCO to check for sensitive/classified information. 3. The NCOIC must approve the report. 4. The OIC must approve the report and distribute to the appropriate people. 5. SUSPENSE: have first draft completed upon arrival at home station.
Mobility Equipment	1. Return all issued equipment. 2. Ensure possession of hand receipts. 3. SUSPENSE: within 10 days of return to home station.
Tactical Weather Equipment	1. Set up all equipment to operations check; clean and carefully repack. 2. Return equipment to the warehouse and pick up hand receipts from the Mobility OIC/NCO. 3. Replenish any depleted, broken, or missing supplies. 4. Report operational status of all equipment to Mobility OIC/NCO. 5. SUSPENSE: within 10 days of equipments return to home station.
Leave and Compensation Days	1. Compensation days will be awarded at the OICs discretion. 2. Leave upon return must be coordinated with NCOIC prior to deployment. 3. SUSPENSE: time off will be authorized only after completion of this checklist.