



Owning the Weather: Weather Support to Force XXI

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We must own the environment and the night, operating unrestricted in adverse weather conditions.

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The history and lessons of weather and war are enduring. Historically, weather has decisively impacted battlefield success, and warfighters prepared to exploit the effects of weather and terrain will benefit in any battle. In the timeless words of Sun Tzu from *The Art Of War* written over 2000 years ago: "Know the enemy, know yourself; your victory will never be endangered. Know the ground, know the weather; your victory will then be total." Instead of reacting to the weather with a cope-and-avoid mentality, Force XXI warriors will anticipate and exploit it.

Owning the Weather

"Owning the Weather" is about understanding, anticipating, and exploiting the impacts of weather on both friendly and threat capabilities to gain a warfighting edge over enemy forces. Owning the Weather (OTW) will soon provide Force XXI an effective "all-weather" mission capability by giving the warfighter the information he needs to fight and operate smart weapons and munitions in all weather conditions. It will enable commanders and soldiers to fully exploit tactics that maximize the weather-related advantages our forces have over the threat.

OTW is the use of advance knowledge of battlefield environmental conditions and their effects on friendly and threat soldiers, systems, operations and tactics in order to gain a decisive advantage over opponents. It involves exploiting and improving the weather-derived technological advantages of our battlefield operating systems (BOS) over hostile systems, making adverse weather a force multiplier. OTW enables the commander to anticipate the impending impacts of weather on friendly and threat capabilities for exploiting windows of advantage created by weather conditions.

The OTW operational strategy for battlefield weather exploitation involves a three-step process. First, a variety of battlefield sensing systems must observe and collect in real time the actual meteorological conditions for the area of operations, including critical, data-denied target areas. Then, this information must be processed, analyzed, and disseminated rapidly to the user. The input of the observational data into models is essential for forecasting atmospheric conditions and their effects. The final step concerns the combat application of the observations, forecasts and effects, and their transformation into usable battlefield weather- visualization products. These include weather

analysis displays for the intelligence preparation of the battlefield (IPB) and automated weather-effects decision aids.

Weather Capabilities

Weather conditions must be observed before they can be forecast and ultimately converted into weather intelligence. No single sensing system can supply all the diverse observations required. Therefore, a variety of complementary space-based, airborne, and ground-based sensing systems will provide observations at the required accuracies, resolutions, and coverages. The data collected from every available source is validated and combined with appropriate models to build a complete, detailed, and accurate horizontal and vertical picture of the atmosphere and weather over the full extent of the battlefield. Future sensing capabilities (2005 through 2010) to support Force XXI will include meteorological satellites, meteorological sensors on unmanned aerial vehicles, and dropsondes, automatic meteorological surface sensors, and tactical atmospheric profilers.

The Integrated Meteorological System (IMETS) serves as the integration (fusion) point for the weather data from a variety of sources:

- National Polar-Orbiting Operational Environmental Satellite System (NPOESS) and the U.S. and foreign Geostationary Operational Environmental Satellite (GOES) transmit real-time space observations.
- Automatic Meteorological Sensor Systems (AMSSs) placed at key locations will transmit real-time surface weather and ground-state data over area communications.
- The Field Artillery's Target Area Meteorological Sensors System (TAMSS) atmospheric profiler and Computer Assisted Artillery Meteorology (CAAM) model will broadcast upper-air weather profiles via Mobile Subscriber Equipment (MSE).
- UAV target area weather observations will reach the IMETS in near-real time through the UAV ground control station.
- In addition to the Army Battle Command System (ABCS) tactical communications architecture for IMETS data collection, the Low Earth Orbiting Satellites (LEOSATs) will soon transmit sensed weather data to the IMETS.

It is an automated, tactical, mobile, weather-data system designed to provide decision-aid information and timely weather- and environmental-effects forecasts to appropriate command elements. For lower echelons without direct weather support (for example, brigade and below), software on command and control systems will allow them to request weather information from a division IMETS and produce weather effects decision aids, using weather data passed through the ABCS. IMETS capabilities will include

- Satellite, tactical radio and Mobile Subscriber Equipment communications.
- A battlescale forecast model for our high-resolution weather prediction (local).
- Automated decision aids for weather effects.
- Weather-forecasting decision aids.

OTW will provide a digitized, real-time, dynamic shared picture of the battlespace weather, and its effects for IPB, to support mission planning and rehearsal, situational awareness, synchronized battle management, and advanced decision and execution support. The IMETS will collect data from various sources and disseminate timely battlescale weather information to multiple command elements via the ABCS. Tactical Decision Aids (TDAs) and displays resident on computers of the BOSs will use this information to provide warfighters with real-time and predicted environmental effects on operations. Additionally, at the individual soldier level, the local weather data will be employed in soldier-support weather effects TDAs, such as the environmental medicine TDAs which provide information on cold and heat strain. Capabilities will include user-tailored weather support TDAs, critical-value databases containing weather sensitivities of friendly and threat

systems, and automated comparison and assessment of weather effects on both friendly and threat capabilities.

Commanders and their planners must consider weather effects in all phases of operations, so that the best course of action (COA) can be chosen for each mission. Weather support TDAs allow commanders to manipulate and present real-time and predicted weather information, showing its effects on terrain and combat systems. They also allow planners to wargame COAs in anticipation of changes in the weather. The Integrated Weather Effects Decision Aid (IWEDA) is a sophisticated expert system that provides these capabilities. It automatically identifies unfavorable, marginal, and favorable weather-effects information based on operating limitations of friendly and threat weapon systems. IWEDA is tailorable to specific tactical operations and missions, providing color-coded time-dependent assessments of weather effects on missions and equipment performance.

The commander and planners require weather information before deployment, enroute, and in the area of operations to support force projection operations. A small, lightweight, first-in weather operations system, along with split-based capabilities, will provide the ability to move quickly with the early-entry forces. (See the sidebar.) Commanders and their staffs will be able to "pull" in weather intelligence tactically tailored in the required format when needed (including while on the move). The Air Force Global Weather Central, through the Tactical Forecast System and in conjunction with the Deployable Intelligence Support Element (DISE), will provide support to split-based operations. With the IMETS, the first-in weather capability will provide units a Manportable Weather Support System (MWSS) capability, able to truly support the level and urgency of any contingency.

Military Intelligence Applications

Weather is one of the essential elements of combat intelligence. The interaction of weather, terrain, and the enemy forms the basis for the IPB process. The commander's primary tool for presenting and analyzing the effects of weather and terrain is IPB. In the context of IPB, weather intelligence is the process of converting weather observations and forecasts into weather-effects information portraying the impacts of weather on both our operations, troops, and equipment and that of the enemy. In the IPB process, weather analysis includes

- Comparing observed and forecast conditions against critical weather-effects threshold values and identifying limitations on operations.
- Evaluating the effects of precipitation on mobility and countermobility, on trafficability, and on deep-attack weapons and operations.
- Comparing friendly and threat capabilities in varied adverse weather conditions.

OTW automated IPB weather analysis products will provide the commander and his staff with the capacity to immediately assess how current and future weather conditions affect enemy activities and events, and both the friendly and threat force's ability to fight. This automated capability will enable the revision of IPB products such as the situation template in near real-time using the most current information available. All of this will enhance our ability to see the battlefield in four-dimensional time and space, and will enhance the commander's skill in determining the enemy's expected COA as well as his own.

Some critical capabilities for Intelligence XXI that OTW will provide include

- Reliable target-area weather data for precision-strike targeting accuracy and battle damage assessment.
- All-source fusion of environmental information for modeling current and future weather effects on terrain and combat operations.
- Reliable communications for weather-intelligence dissemination.
- A scalable, dynamic view of battlespace weather simulation and visualization of battlefield weather effects for real-time and predicted shared situational awareness.
- Mobility comparable that of the supported force and an ability to maintain the operational tempo through enhanced knowledge and

understanding of weather effects.

Conclusion

OTW is a vision for Force XXI battlefield weather operations. It leverages the power of weather information and technology to enhance deployment and sustainment, and to increase lethality, survivability, and the tempo of operations in war and other military operations. OTW is critical to seeing and out-thinking the enemy, gaining information dominance and winning the information war, and to controlling the environment (to permit continuous around-the-clock operations). It is essential for dominating maneuver forces and knowing target-area meteorological conditions needed to execute precision strikes. Force XXI commanders must have the ability to see the depth of a dirty battlefield, cutting through both bad weather and the fog of war with unprecedented detail, certainty, and in near-real time.

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