AccuWeather Enterprise Solutions White Paper

Extraordinary Tornadoes and Preparedness Best Practices

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One of the goals of AccuWeather Enterprise Solutions is to keep our clients and friends apprised of the latest developments in weather science, meteorological technology, and business best practices. A lot has changed since our last white paper in 2011, thus the need for an update.

I’m going to begin with the changes in weather science because that is the foundation on which both our services and best business practices rest.

/ Progress in Weather Science

Weather science is moving forward rapidly. There are three major developments that affect our clientele:

1. **Dual Polarization** is being retrofitted to the existing NWS radars plus several new types of radar (such as the CASA network being installed in Dallas-Ft. Worth) have it. Without going into the details, dual polarization allows us to much more effectively differentiate between large hail and heavy rain. For example, the radar image below left from eastern Kansas shows an area of high reflectivity in the conventional radar data (the type you would see on television). Unfortunately, we don’t know for sure whether the conventional radar indicates very heavy rain or large hail.

With dual polarization, we are sure – the radar indicates large hail, and we are able to warn accordingly.
But that is not all dual polarization does. Because the earth curves out from under the relatively straight radar beam, we don’t know whether a tornadic rotation is all the way to the ground unless the storm is very near the radar.

When a tornado is on the ground, it lofts debris into the air, as shown in this example to the right, from Hattiesburg, Mississippi, in February, 2013.

To dual polarization radar, the lofted debris appears completely different from precipitation. The deep blue color just northwest of the center of Hattiesburg, indicates lofted debris.

In urban areas or during the day with clearly visible tornadoes this usually isn’t an issue. Spotters can let us know whether the tornado is on the ground. But, if the tornado is rain-wrapped, in rural areas, or at night, the certainty as to whether the tornado is on the ground means better warning decisions.
Terminal Doppler Weather Radar (TDWR) has been around a while but the high-resolution data available at one-minute intervals is new to private sector meteorology. The wind sensing capability of TDWR is four times greater than other Doppler weather radars. That additional resolution helps us warn more accurately of tornadoes, downbursts, and other small wind storms.

In addition to better wind data, Terminal Doppler Weather Radars provide superior all-around data in a number of major cities including New York, Philadelphia, Charlotte, Orlando, West Palm Beach, Salt Lake City, and many others.

Mesoscale Modeling is a term coined by the legendary Dr. Ted Fujita (for whom the Fujita Scale is named). Mesoscale means “fine grained” – weather features as small as 2.5 miles. Mesoscale models are already providing us with superior forecasting data for ice storms, blizzards, and thunderstorms.

AccuWeather Enterprise Solutions uses these scientific breakthroughs and combines them with our storm warning technology, our third-generation SmartWarn® System, which is the envy of meteorology. What does this mean to you?

- The highest level of accuracy
- Timeliness that meets the agreed-upon goals
- Minimal false alarms

April 14, 2012, because the tornado is so close to the TDWR (deep purple circle at upper right), it could actually measure its swirling winds. The lighter purple oval shows the circulation around the tornado (known visually as a “wall cloud”).

The yellow arrow points to the (black pixel) calm center of the tornado. The darker blue area to the right of the arrow tip is winds of 150 mph. The small green area surrounded by red above the arrow’s tip is winds of 100 mph. This data assisted AccuWeather Enterprise Solutions in providing superior tornado warning accuracy that evening when compared with other sources.

Eight hours in advance, 70 to 75 mph are forecast for Washington, D.C. On schedule, the great derecho of June 29, 2012, swept across the city causing power interruptions for up to a week.
We consult with scores of medium and large businesses from New York to San Diego and we learn a lot from listening to our clients. The suggestions below came from those consultations as well new meteorological and social science research into storm preparation and response.

As a result of both Hurricane Sandy and the multi-state derecho (a storm that produced destructive winds from west of Chicago to Washington, D.C. then east into the Atlantic) of June 29, 2012, both electrical and telephone service were lost over large geographic areas for extended periods of time. Fortunately, there is a solution to insure your company maintains communications when cell and landline telephone service are lost in your area: a satellite phone.

The cost of satellite phones has come down dramatically the last five years to where a number of models are well below $1,000. Monthly fees have come down as well: you can maintain a number with both voice and text capability for less than $50 per month. This seems a reasonable investment to maintain communications after violent weather, a major geologic disaster, or manmade event occurs.

Tornado drills in the central U.S. are at least as important as fire drills because the statistical odds of experiencing a tornado are actually higher. To simulate the actual conditions, turn off your lights during a drill as power may be lost in advance of the tornado if the “real thing” occurs. If there are any procedures (other than sheltering) that must occur when a tornado approaches (such as shifting responsibility to a different office) it is encouraged that those be practiced during the drill. The more realistic, the better.

What can go wrong during a tornado warning?
The question has been researched (Weather and Forecasting, October, 2010, p. 1412-1429):

- Person responsible for initiating warning response was off-site
- NOAA weather radio batteries were dead
- False reports of a tornado where none actually existed
- Conflicting information as to whether a tornado warning was still in effect
- “Built-in” delay due to secondary relay of warning information before action can be taken (i.e., warning received in one department, second department responsible for ordering action)
- Communicating an “all-clear” was impossible (due to lack of power and/or communications)

I would add one more: Decision paralysis caused by too many sources of information.

It seems logical to gather as many opinions as possible. The problem with this approach is that it requires someone to make a final decision from a myriad of sources (Doppler radar display, sirens, weather radio television, commercial radio, etc.) and that person likely lacks meteorological expertise. Or, as I call it, someone has to “play meteorologist” while the tornado or other storm is approaching.

While the “gather as much information approach” seems logical, academic research shows it is ineffective.

Dr. Catherine Smith of East Carolina University, in her study of school districts of North and South Carolina, learned that the school districts that used one or two sources of information made much better decisions as to whether to call off school for a winter storm than those that used six or more sources.

Social science also tells us that action will not be taken on receipt of a National Weather Service tornado warning until the warning is “confirmed” (c.f., Communication of Emergency Public Warnings, Mileti and Sorensen, FEMA, 1990). This includes a process of determining the warning’s relevance to the location in question, the level of threat posed, et cetera. This process can be fraught with uncertainty and inevitably delays action being taken.

What is the solution?

It is natural and profitable for companies to focus on their core mission. Rather than worrying about the state of the battery charge in a NOAA weather radio, it is far more effective to outsource storm monitoring and warnings to specialists and work with those specialists to effectively integrate those warnings into your existing business processes.
/ Advantages of AccuWeather Enterprise Solutions’ SkyGuard® Service

Site-specificity.
No more trying to figure out where the tornado is, which way it is moving, and whether it will affect your location. You receive a warning from AccuWeather only if your location is going to be affected by the storm.

Advance preparation time.
Your enterprise gets the time it needs to shelter people and protect assets.

Clarity of communications.
Whether it is a railroad’s operating rules, industry standards or other communication requirements, our messaging fits seamlessly into your mode of operation. No more trying to translate wide-area “one size fits all” governmental warnings.

No unnecessary false alarms.
Expensive false alarms, that call the credibility of your organization’s warning system into question, are minimized with SkyGuard.

Warnings created by true specialists.
AccuWeather’s certified storm warning meteorologists typically have eight times the amount of experience handling tornadoes as local meteorologists (both government and media). That level of expertise, combined with our unique technology, leads to the highest quality warnings the state-of-the-science will allow.

Communication with our meteorologists.
Day or night, any day of the year, you may speak to the meteorologist who is monitoring your location and who issues the warnings for your location. Expert advice is a phone call away.

SkyGuard takes all of the guesswork out of protecting your assets and your people when dangerous weather presents itself. SkyGuard warnings are received only when your specific location is threatened and action is prescribed.

/ How Good is SkyGuard?
A thirty-two month study of America’s automobile industry documents the amazing value of SkyGuard. An unplanned shutdown is extremely expensive (i.e., half-painted cars ruined, stamping equipment must be cleaned, robotic computers reset, etc.).

<table>
<thead>
<tr>
<th>Auto Manufacturer</th>
<th>NWS Tornado Warnings</th>
<th>SkyGuard Tornado Warnings</th>
<th>Hrs. of Production Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>203</td>
<td>25</td>
<td>131</td>
</tr>
<tr>
<td>Company B</td>
<td>54</td>
<td>14</td>
<td>31</td>
</tr>
<tr>
<td>Company C</td>
<td>133</td>
<td>14</td>
<td>93</td>
</tr>
</tbody>
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This represents a cumulative saving of $15 million dollars via the elimination of lost production time to the U.S. auto industry during the period of study.
Similar results were achieved with a world-leading heavy equipment manufacturer with locations throughout the United States, Canada, and Mexico:

<table>
<thead>
<tr>
<th>Heavy Equipment Manufacturer</th>
<th>NWS Tornado Warnings</th>
<th>SkyGuard Tornado Warnings</th>
<th>Hrs. of Production Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>735</td>
<td>47</td>
<td>955</td>
</tr>
</tbody>
</table>

This represents a saving of more than $20 million via the elimination of lost production.

But it isn’t just about the bottom-line, it is about the safety of your most important asset, your people.

This same manufacturer took a direct hit from a tornado on February 5, 2008. Because their business continuity department had set up a SkyGuard warning system, they received twenty-two minutes of advance warning allowing them to move 88 people into shelter where they stayed as the plant collapsed around them (along with multi-ton air conditioning equipment on the roof). Other than minor cuts, which occurred while exiting the shelter through the demolished plant, everyone was safe.

The company had rudimentary production back up just 13 days later!

This happy outcome would never have occurred using the local government warnings. The first tornado warning for the plant’s location was issued four minutes after the tornado struck.

Regardless of your industry, your weather and storm information should be clear and actionable so as to protect your people, property and profits.

For more than a half-century, AccuWeather has provided award-winning services to business, industry, and government. Call us today. After all, the next storm may already be on the way.

Mike Smith is a board-certified consulting meteorologist and a Fellow of the American Meteorological Society. He is founder of WeatherData, Inc. which became part of AccuWeather in 2006 and where he now serves as Senior Vice President and Chief Innovation Executive of AccuWeather Enterprise Solutions. Mike is the author of two books, When the Sirens Were Silent and Warnings: The True Story of How Science Tamed the Weather. Mike is a frequent speaker and author on both popular and technical weather-related topics. He has appeared on The Discovery Channel, The History Channel, Fox News, and all of the major networks.
Call 814.235.8600 or email us at sales@accuweather.com to learn more about AccuWeather Enterprise Solutions.