

Incident: Tornado Plainfield/Crest Hill, IL

Date of Incident: Aug. 28, 1990 **Date Final Report Issued:** May 1991

Incident Cost: \$ 160 million **Fatalities:** 29

Maximum Intensity: F5

Executive Summary

On the afternoon of August 28, 1990, an intense F5 tornado struck Kendall and Will Counties in northeastern Illinois. The storm produced severe property damage, while causing 29 deaths and more than 300 personal injuries. Damage in these two counties exceeded \$160 million, with the tornado's impact being most destructive and deadly from Plainfield to Crest Hill. The severe thunderstorm that produced the tornado also produced large hail and damaging winds along a nearly continuous path from west of Rockford, Illinois, to central Indiana. The storm produced severe weather in Illinois for more than 4 hours, making it not only unusually intense but very long-lived.

Although the large-scale meteorological environment did not appear supportive of supercell storms and possible tornadoes because of unfavorable wind shear in low levels, it was characterized by extremely large convective instability. However, the storm, as viewed by conventional weather radar, displayed distinct supercell characteristics throughout much of its life and produced at least five smaller tornadoes prior to the final, and most intense, one which struck Kendall and Will Counties. One or two of these occurred early in the storm event and produced confirmed damage near Rockford. A post-event, aerial survey indicates four small tornadoes occurred in rapid sequence immediately prior to the major tornado.

The weather event which occurred in northeastern Illinois on the afternoon of August 28 was unusually intense and climatologically very rare, resulting in an extreme service challenge to staffs of the National Weather Service offices at Rockford and Chicago. Between them, these two offices had severe thunderstorm warning responsibility for all of the Illinois counties struck by the storm.

Services

The National Severe Storms Forecast Center, located in Kansas City, Missouri, has responsibility for providing outlooks and watches for possible severe thunderstorms and tornadoes across the entire country. The morning outlooks concerning the potential for severe thunderstorms were very accurate. The center issued a severe thunderstorm watch just prior to the onset of the event that included all of northern Illinois. This watch remained in effect at the time of the Plainfield/Crest Hill tornado. Although the severe thunderstorm moving across northeastern Illinois displayed supercell characteristics, staff at the center chose not to reissue this watch to include the threat of tornadoes. The reason was that the storm was isolated, and the tornado threat was being well-covered by local warnings issued at Rockford. Early in the event, the Weather

Service Office at Rockford responded quickly and provided warnings for the second reported tornado and other severe weather associated with the thunderstorm. The Rockford office communicated with staff at the Weather Service Meteorological Observatory in Marseilles, Illinois, the site of the relevant network weather radar, to determine the storm's intensity and probable track. The office in Rockford received several very timely reports of a funnel cloud, a tornado touchdown, and other associated severe weather from the Illinois State Police, which helped them confirm the serious nature of the storm's threat.

As the storm moved into the warning area of the Weather Service Forecast Office at Chicago, the severe weather services provided were not as timely or accurate as they might have been. The first two severe thunderstorm warnings issued at Chicago were for locations that remained to the north and east of the actual path of the severe weather. The large hail, damaging winds, and tornadoes in southwestern Kane, northeastern Kendall, and western Will Counties occurred, essentially, without warnings of any type in effect. The last several minutes of the major tornado were covered by a severe thunderstorm warning that included western Will County.

During the time that the supercell storm was moving through Kane, Kendall, and Will Counties, neither the staff at Marseilles nor Chicago recognized severe thunderstorm signatures or indicators of the storm's tornadic potential exhibited by its radar echo. Few reports of severe weather, none of funnel clouds or tornadoes, were received at the Chicago office, contributing to slow recognition of the continuing serious threat this storm posed. The lack of spotter reports and limited flow of information in northeastern Illinois prior to and during the severe thunderstorm event, coupled with the failure of radar operators and forecasters to recognize the severe nature of the long-lived supercell thunderstorm, indicates that training and preparedness activities and severe weather program oversight had not been implemented effectively at Chicago during recent years.

The Disaster Survey Team feels strongly that careful consideration of the reasons why, for this particular tornado occurrence, warnings were not as timely or effective as they might have been, can lead to long-term improvements in the warning and forecast system. The team has developed an extensive series of "Findings" and "Recommendations" as part of its report of the Natural Disaster Survey. These are presented on the following pages. The body of this document provides detailed and sometimes technical information supporting the team's findings and recommendations.

Recommendations

1. The NSSFC should make a concerted effort to alert WSFOs if SELS (Severe Local Storms unit) forecasters feel that a localized tornadic threat has developed within a severe thunderstorm watch. In situations like this, unusually close coordination is needed to ensure that all affected offices are aware of the threat and how it will be dealt with (i.e., via a new tornado watch or through local warning actions).

2. During severe weather situations, the WSFO Chicago lead forecaster/severe weather focal point should interact aggressively with affiliated WSOs, its CWSU, and other nearby NWS offices to monitor the current status and anticipated actions regarding severe storms and related products.
3. The WSFO Chicago should update its AFOS Alarm and Alert program to include all WSO statements and warnings from Illinois as well as from NWS offices in adjoining states.
4. The NWS, at all levels, should work closely with FAA officials to develop procedures that will ensure rapid, two-way communication of significant severe weather information between the two agencies.
5. Elevated scanning strategies should be used routinely when intense storms are located near the radar. Occasional operation of the radar in short-range mode can provide high-resolution detail and help both the operator and WSFO Chicago forecasters identify storm signatures. Although these procedures may cause some interruptions for external users, the NWS responsibility to use the radar for warnings and protecting life and property should take precedence.
6. Management of the WSFO Chicago should work closely with its WSMO at Marseilles to ensure that all radar operators are well trained and drilled in severe thunderstorm detection procedures and cognizant of severe storm structures and signatures. The same applies for all WSFO Chicago forecasters. This training would help ensure more effective use of the remote radar's capabilities and provide a common base for improved communication among the radar operators and forecasters.
7. Formal coordination guidelines should be established between the WSFO and WSMO. The WSFO should encourage effective communication and interaction by instituting frequent familiarization and exchange visits among the respective staffs.
8. During the warm season, WSFOs potentially affected by severe thunderstorms should issue a morning State Severe Storm Outlook, characterizing the likelihood for severe weather over their area of responsibility using the NSSFC Convective Outlook (AC) products as guidance. State Severe Storm Outlooks should not be considered optional for "moderate" and "high risk" situations.
9. Management at WSFO Chicago should establish and enforce clear lines of authority and responsibility to be followed during severe weather operations. These guidelines should cover specifically situations in which senior station managers may be present in the forecast operations area.
10. In addition to the radar surveillance training recommended earlier, WSFO Chicago should conduct annual severe weather forecasting and warning

workshops with attendees, including NWS employees from all WSOs, the WSMO, and the CWSU. The WSFO should attempt to draw upon local, regional, and national meteorological communities as workshop resources. Emphasis should be given to keeping all staff current in advances in severe storm forecasting procedures, e.g., use of AFOS Data Analysis Program (ADAP) products, hodograph and sounding analysis, etc.

11. Management at both WSFO Chicago and Central Region should conduct readiness reviews to ensure that national, regional, and local severe storm plans and procedures are well understood by staff and are implemented routinely.
12. The Chicago WSFO should conduct monthly and spot drills to sensitize the staff, local officials, and emergency response managers to proper severe weather watch and warning procedures and responses.
13. The radar monitors used at WSMO Marseilles and WSFO Chicago should be maintained so that displays are as accurate as is possible. At WSFO Chicago, both the RADID display and an accurate PPI monitor should be situated to allow easy viewing by the forecaster working at the WSFO severe weather desk.
14. The WSFO Chicago needs to invest considerable effort to establish better organized, well trained, and broadly distributed severe storm spotter groups throughout their entire warning responsibility area. As part of this effort, severe weather desk spotter resource guides need to be updated.
15. The Chicago WSFO has such a large user population within its warning area and such diverse responsibilities that a dedicated WPM position is needed.
16. The NWS should continue to encourage support of improved and coordinated severe weather preparedness procedures at all levels—state, county, and municipal. Staff from WSFO Chicago should visit local emergency response officials, especially officials having county-wide responsibilities, in each of their warning counties every year, preferably near the start of the severe weather season, to review past and planned interactions and severe weather operations.
17. Storm spotter training should be provided to these officials so that they are aware of the damage potential of straight-line winds and downbursts.
18. The importance of conveying the past severe weather history of storms to downstream emergency managers should be emphasized in WSFO Chicago severe weather drills.
19. The Chicago WSFO should routinely review and coordinate with appropriate State Police Districts procedures for using the LEADS, the Illinois State Police Emergency Radio Network System (ISPERNS), and the National Warning System (NAWAS) to distribute severe weather information. The office should

also work with local officials to encourage use of NWR during threatening weather situations. The importance of two-way communication between the NWS and state, county, and local organizations and officials should be strongly established.

20. Management at WSFO Chicago should consider conducting an annual workshop or seminar for the media to increase severe weather awareness and prepare for the storm season. Visits to some stations may be appropriate.
21. Because of the extreme importance of highly detailed documentation of severe weather occurrences to support the operational implementation of the new WSR-88D radars, the DST feels that NOAA should develop a capability for executing very rapid response storm damage surveys during the 1990s.