

# ARES Storm Spotter Education 2019

## Presentation Outline

Our thanks to the Allen County Office of Homeland Security for its support in making this auditorium available, Josette Jordan, Event Manager, Allen County Public Library, for her assistance and the Northern Indiana National Weather Service office (IWX) for providing content for many of tonight's presentations.

## Not a Ham? Consider Becoming One!

- Ham radio SKYWARN nets are great for situational awareness.
- Hams can still communicate after disasters disrupt cell service.
- Many resources can help you prepare for the written licensing exam.
- Radios have become very affordable.
- In addition to storm spotting, you can use ham radio for other communications.
- Visit [www.arrl.org](http://www.arrl.org) for licensing info.

## Role & Importance of Storm Spotters

Jim Moehring, State Leader, Amateur Radio Emergency Service

### The SKYWARN® Program

- Volunteer program created in 1970s by National Weather Service
- ~400,000 trained severe weather spotters
- Help keep communities safe by providing timely and accurate severe weather reports to National Weather Service
- Nation's first line of defense against severe weather
- Open to anyone with an interest in public service

### National Weather Service

- 122 weather forecast offices nationwide
- Northern Indiana office (IWX) has staff of 23:
  - 13 Forecasters
  - 3 Administrative Meteorologists
  - 4 Electronic/Information Techs.
  - 1 Observation Program Leader
  - 1 Hydrologist
  - 1 Administrative Assistant
- The NWS Northern Indiana office (IWX), located in North Webster, IN covers:
  - 37 Counties
  - Northern Indiana
  - Northwestern Ohio
  - Southern Lower Michigan

## Accurate Spotter Reports Important

- Verify what NWS sees on radar
- Add credibility to NWS warnings

## Improved public response to warnings

- Public is more likely to take action when NWS warning includes spotter reports.

## Radar Limitations

- Radar can't see below a thunderstorm (where tornadoes form)
- Beam gets farther above ground as it gets further from radar antenna
- Radar beam is higher than 2,500 feet above ground over most of Allen County
- Beam also broadens with distance, making small-scale features – like hook echoes – harder to see
- Radar data can be insufficient to detect distant rotation

## Spotter Reports help Agencies & Media

- Provide a consistent message
- Convey urgency and impact
- Encourage public action
- Minimize loss and facilitate recovery

## Storm Spotter Safety

Charles Ward, Veteran Storm Spotter & ARES member

### Safety Starts at Home

To ensure full attention to your safety, make sure your family is prepared first, so you can concentrate on your safety and the safety of others around you.

### Priority One: Your Personal Safety

Common sense. Everyone knows it, but as a spotter, you really need to follow it.

Personal safety should be the primary objective of all spotters!

Never put your safety before any attempt to catch that perfect shot!

### Obey All Laws

Shouldn't have to say this, but always obey all laws and direction from local officials

This includes speed limits and other traffic control devices for those mobile spotters

### Your Safety is in the Cards!

Adhere to the concept of ACES

- Awareness
- Communication
- Escape Route
- Safety Zone

## ACES - Awareness

- Stay aware of rapidly changing weather conditions
- Storms can and do change direction and intensity with little to no warning. You do not want to be caught unaware!
- Consider mobile radar apps

## ACES - Communication

- Always keep others aware of where you are and what your intentions are!
- Keep multiple methods of communication available (ham radio, Zello, Spotter Network location beacon) to keep you and others safe.
- GRLevel 3 or other radar apps will show your and other spotters' locations

## ACES – Escape Routes

- Always have at least one way to a safe location.
- Home spotters, a quick and easy route to your safe area.
- Mobile spotters, try to spot from locations with at least two ways to leave the area, like an intersection.

## ACES – Safe Zones

- Home spotters: Your shelter place such as an interior room with no windows, a bathroom, or basement area.
- Mobile spotters, it can be as simple as knowing which direction to drive in, or knowing how to shelter in place if needed!

## Spotter Safety – More Suggestions

- Keep a buffer zone between you and the storm to allow for changes in direction.
- Travel in pairs, so driver can concentrate on driving.
- Always know where you are in relation to the storm.
- Storms in our area predominantly move west to east. Stay south of the line of direction.
- Never drive through the core of the storm.

## The Warning Process

Jay Farlow, Ass't Emergency Coordinator — SKYWARN, Allen Co. ARES

### Official Warnings Start with NWS

- All official storm warnings originate with National Weather Service
- Warnings based on:
  - Radar data
  - Atmospheric conditions
  - Spotter reports

### Storm-Based Warnings (Polygons)

- Began in October, 2007
- Based on forecast storm track, not county lines
- Issued as polygon (often trapezoidal)

## Warning Dissemination

- NWS warnings automatically trigger:
  - NOAA Weather Radio
  - Wireless Emergency Alerts
  - Emergency Alert System (formerly EBS)
  - Certain smartphone apps
- Warnings also relayed by:
  - Broadcasters
  - Text message services (for subscribers)
  - “Reverse 911”
  - Outdoor warning sirens

## Warning Dissemination: Bottom Line

- Only NWS warning issuance assures multilateral public alerts.
- Spotters must therefore get their reports to NWS promptly, even if they also contact others

## Role of Allen County Office of Homeland Security

Bernie Beier, Director, Allen Co. Office of Homeland Security

## Leadership for a Safe & Secure Indiana

- Secure Our Homeland
  - A Shared Responsibility
- Local, State & Federal Structures
  - Federalism
  - Creates Opportunities & Challenges
- Working Together
  - Districts
  - Capabilities-based

## Incident Command & Management

- For types of incidents
  - Complex
  - Complicated
  - Chaotic
  - Simple

## Multi-Discipline

- One Team – One Fight
  - Common goals
- Jurisdiction Focus
  - Shared motivation
  - Shared values
- Seamless
  - Integrated Management

## Managing the Consequences of Severe Weather

- Emergency Managers
  - Mitigate
  - Prepare for
  - Respond to
  - Recover from
- We are consumers of WX info
  - Situational Awareness
  - Indicators & Warning
  - Anticipate EM/CM requirements
- EMs are NOT forecasters
- EMs are NOT a primary source of weather information
- Local media should be the primary source of WX information to our local public.

## Role of 911/Dispatch

John Chavez, Deputy Director, Consolidated Communications Partnership

### Overview of 911 Center

- 81 employees
- 206,541 911 calls 2018
- 16,297 Outbound, 71 Inbound Text to 911 calls in 2018

### Emergency Warning System (EWS)

- When the NWS puts Allen County under a severe thunderstorm warning, high wind warning, or flood warning the 911 dispatch center will transmit that information as a general broadcast to all emergency services on their main dispatch channels and will ask for spotter reports.
- Activation of the Emergency Warning Siren System is a decision made by a representative if HLS or one of the 3 following events.
  - 1 NWS activates the weather alert radio
  - 2 First Responders or Trained Spotters call into Dispatch
  - 3 INLETS Tornado Warning Message

### The CALM after the storm

- Does the 911 center see a reduction in calls after the storm has passed?
- 911 does not stop for us.
- The CCP still handles unrelated calls in the County on top of the post storm damage calls.
- Off duty Dispatchers are paged in for overtime if needed to help handle calls.

## Thunderstorm Basics

Caleb Saylor, Fox 55 Meteorologist

### Ingredients for Thunderstorms

- Moisture
- Instability

- Instability refers to the type of air in the atmosphere
- Lift (Trigger)
- Wind shear
  - Wind Shear only needed for *severe* storms

### Life Cycle of a Thunderstorm

- Developing Cumulus Stage
- Mature Cumulus Stage
- Dissipating Stage
- Above process normally takes about 30 minutes

### Developing Cumulus Stage

- Updraft forms
- Little to no rain reaching the ground
- No severe weather
- Lasts about 10 minutes

### Mature Cumulus Stage

- Updraft strengthens
- Rainfall reaches the ground
- Downdraft hits ground causing gust front
- Lasts 10-20 mins

### Dissipating Stage

- Downdraft cuts off the updraft
- Threats:
  - Minor wind
  - Heavy rain
  - Lightning
- Other storms may develop along gust front

### Role of Wind Shear

- Separated updraft/downdraft
- Rotating updraft

## Thunderstorm Types

ABC21 Meteorologist Caleb Chevalier

### Single Cell Thunderstorms

AKA: Pulse Storm, Garden Variety

- Mature stage lasts 20 mins
- One updraft
- Generally expect:
  - Small hail

- Gusty winds
- Heavy rain

### Multicell Convection

- Overall severe threat level: Low to moderate
- Flash flooding due to slow movement
- Downbursts, straight-line winds, small- to medium-sized hail, lightning

### Multicell Squall Line

- Overall severe threat level: Moderate to high
- Damaging winds
- Medium-large hail
- Lightning
- Isolated tornadoes possible along the leading edge
- Tornadoes weak, short lived

### Extreme Case: Derechos

- Overall severe threat level: High

### Supercell Convection

- Overall severe threat level: High
- Responsible for most significant U.S. tornadoes & hail larger than golf balls

## Thunderstorm Hazards

Jon Wilson, Fort Wayne's NBC Weekend Meteorologist

- Thunderstorm Hazards
- Straight-Line Winds
- Hail
- Flash Flooding
- Lightning
- Tornadoes

### Straight-Line Winds

- Thunderstorm outflow that blows in one direction
- Damage more widespread than tornadoes, but usually less extreme
- Exception: Derecho winds can be stronger than 100 mph
  - June 29, 2012 derecho
  - ~600 miles in 10 hours
  - Gusts 80-100 mph
  - More than 1,000 reports of winds >65 knots (75 mph)

### Hail

- Stronger updraft = larger hail
- Colder, drier air aloft = larger hail

- Largest hail seen with supercell thunderstorms
- Hail usually falls in a small area, but has big impacts.

### Flash Flooding

- Caused by localized heavy rain from thunderstorms (3-5" in < 3 hours)
- Typically a greater problem in urban areas
- Impacts include washed out bridges, forced evacuations, structural damage

### Lightning

- Caused by ice particles colliding in clouds
- Not part of severe thunderstorm criteria
- When thunder roars, go indoors!

### Tornadoes

- Violently rotating column of air in contact with the ground
- >1,000/year in U.S.
- Ave. 9/year in IWX coverage area

#### The EF Scale: Tornado Intensity

- EF0 – EF-
  - 65-110 mph
  - Short-lived, track <3 miles
  - Develop quickly, occasionally without warning
- EF2 – EF3
  - 111-165 mph
  - 10- to 15-mile track
  - Better detection
- EF4 – EF5
  - 166 – 200+ mph
  - 20- to 50-mile track, can last up to an hour
  - Develop from supercells

### Cloud Identification

Nicholas Ferreri, WANE 15 Chief Meteorologist

#### Scary but Harmless or True Threat?

- Tornadoes vs. funnel clouds
- Shelf clouds & roll clouds
- Wall clouds
- SCUD lookalikes
- Context
- Rotation?
- Touching ground?
- Debris visible?



- Sloping toward or away from rain?

### Shelf and Roll Clouds

- Horizontal, shelf-like cloud
- Leading edge of thunderstorm
- Signals approach of:
  - Gusty winds
  - Possible hail
  - Heavy rain
- Strong updraft just in front of downdraft creates rotor effect
- Usually seen from east of squall line, looking back to west
- Typically found on north side of supercells
- Always slopes *toward* rain
- Associated with rain-cooled downdraft

### Identifying Shelf Clouds

- NWS does not need to know about shelf clouds ...
- ... but knowing how to ID them is important ...
- ... and they make cool photos (take a “shelfie”!)
- Can have rotation, but it will be about a *horizontal* axis
- Anything that rotates about a horizontal axis is *not a tornado!*
- Spotter’s perspective makes a difference to how a shelf cloud looks
- If a shelf cloud become detached from its parent cloud, it’s called a roll cloud
- Obstacles, like buildings, can create optical illusions

### Wall Cloud Formation

- ROTATING lowering from thunderstorm updraft base.
- Indicates strong updraft
- Often precedes funnel cloud or tornado
- Updraft ingests rain-cooled air from downdraft, causing it to climb as it moves away from downdraft
- Always slopes *away* from rain

### Wall Cloud vs. Shelf Cloud

- Report rotating wall clouds – they have tornado potential
- Don’t report shelf clouds – they have mostly straight-line wind threats
- Not sure? Take a photo or video and send it to NWS
  - IWX monitors Facebook ([www.facebook.com/NWSNorthernIndiana/](http://www.facebook.com/NWSNorthernIndiana/)) and Twitter (@NWSIWX)

### Tornadoes and Funnel Clouds

- Both are violently rotating columns of air
- Both rotate about a *vertical* axis (unlike roll clouds)
  - Spinning like a top = funnel cloud or tornado
  - Rolling like a rolling pin = shelf or roll cloud

- “If it doesn’t spin, don’t call it in!”
- Tornado: In contact with the ground
  - Tornado cloud might not be visible until it picks up enough dirt & other debris (air is transparent)
  - Look for flying debris or circulation at the surface
- Funnel Cloud: *Not* in contact with the ground
- Rapidly rotating tornado and funnel clouds typically have *smooth* edges, because they’re spinning so fast.

## SCUD

- *Ragged*, scary-looking but *harmless* clouds
- No rotation
- Can move up & down, look turbulent

## Radar Application

ABC21 Meteorologist Caleb Chevalier

- When evaluating storm-relative velocity, consider radar location to discern rotation from convergence
- When evaluating correlation coefficient data, debris signature must overlap velocity signature to indicate tornado debris

## What to Report and How

Jay Farlow, Ass’t Emergency Coordinator —SKYWARN, Allen Co. ARES

### What to (and not to) Report

- Report these to NWS
  - Tornado
  - Funnel cloud
  - Rotating wall cloud
  - Wind or lightning damage
  - Measured gusts  $\geq$  50 mph
  - Flooding
  - Hail of any size
- Don’t report these to NWS
  - SCUD
  - Lightning
  - Estimated wind speeds (report instead what you see the wind *do*)
  - Radar data

### Information to Include

- **Time** of observation
  - Clock time, not “just now” or “two minutes ago.”
- **Event** observed

- E.g. hail, tornado, damage, etc.
- **Location** of phenomena
  - Specific as possible
  - Address
  - Distance & direction from major intersection or town center
- Use the mnemonic, “**TEL** the NWS” to remember **T**ime, **E**vent **L**ocation

#### Hail: TEL NWS

- Time
  - When it started
  - When it stopped, or that it’s still falling
- Event
  - Size in inches or coin size
  - Use largest stone seen
- Location
  - Specific as possible

#### Wind Damage: TEL NWS

- Time
  - When damage occurred, or unknown
- Event
  - What is damaged & how
  - Width of branches, trees
  - Wind speed, if measured
- Location
  - Specific as possible

#### Tornado, Funnel or Wall Cloud: TEL NWS

- Time
  - When it started
  - When it ended, or still occurring
- Event
  - Rotating wall cloud, funnel cloud or tornado (debris visible)
  - Rotation about vertical axis
  - Debris or damage observed
- Location of phenomena
  - Specific as possible

#### Flooding: TEL NWS

- Time
  - Time observed
- Event
  - Water depth (e.g. how for up a road sign, etc.)
  - Washout
  - Road closure

- Location
  - Specific as possible
- Safety Tip: Don't enter flood water to measure its depth (or for any other reason)

### Lightning Damage: TEL NWS

- Time
  - When damage occurred
- Time unknown
- Event
  - Damage to trees or structures
  - Injuries or fatalities due to lightning
- Location
- Specific as possible

### Report During Warnings

- NWS still needs spotter reports, even after it issues a warning.
- Report anything from the previous slides, even if a warning already exists.

### How to Report

- Ham radio: 146.88 MHz (146.76 backup)
- Telephone NWS office
- SpotterNetwork.org
- Twitter: @NWSIWX
- Web form: [inws.ncep.noaa.gov/report/](https://inws.ncep.noaa.gov/report/)
- Zello: "IWX SKYWARN" channel (experimental)
- Facebook: /NWSNorthernIndiana (Not for life-threatening reports like tornadoes)
- Email: [w-iwx.webmaster@noaa.gov](mailto:w-iwx.webmaster@noaa.gov) (Not for life-threatening reports like tornadoes)

### How to Report: Ham Radio

- WX9T: "Whiskey x-ray nine tango, wall cloud."
- NCS: "Nine tango, go ahead."
- WX9T: "At 4:11 p.m., (time) tornado with debris, (event) approximately one mile northwest of the intersection of U.S. 30 and the Allen/Whitley County line (location). WX9T (legal ID)."
- NCS: "Roger, nine tango, relaying to NWS. W9NCS, net control."

### How to Report: Zello

- Spotter: "This is trained spotter John Doe with a wall cloud."
- NWS: "Go ahead, John."
- Spotter: "At 4:26 p.m. (time) a rotating wall cloud formed (event) about 1 mile northwest of Jefferson Pointe shopping center in southwest Fort Wayne (location). I can still see it now."
- NWS: "Got it, John, thank you."

### How to Report: Telephone

- NWS: "National Weather Service."

- Spotter: “This is trained spotter Jane Doe. At 3:13 p.m. (time) I saw a funnel cloud form (event) about 2 miles northwest of Leo in Allen County (location). I can still see it now.”
- NWS: “Got it, thank you.”

#### How to Report: Spotter Network

- If using a smartphone app that sends your location to the network, web form knows your location
- Move map marker as necessary to indicate where the feature is, if different than spotter location
- Report automatically goes to NWS when web form is submitted.

#### How to Report: Twitter

- Time, event, location
- Include @NWSIWX
- Optionally include #INwx
- If possible, include photo