

## Canton Area Radio Emergency Services

### Storm Spotting Primer

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Canton Area Radio Emergency Services (CARES) is a 501c3 organization in Van Zandt County whose purpose is to serve the citizens of the county and surrounding area through emergency radio communications. There are several components involved in emergency communications, one of which is storm spotting and communication of information seen. This document is to serve as a starting point for members of CARES to effectively communicate storm information.

### **RACES & ARES**

Two national organizations oversee and set standards for emergency communications via radio. RACES stands for Radio Amateur Civil Emergency Service and was developed by FEMA and the FCC to establish standards and protocols for emergency communications. RACES works in conjunction with FEMA and local governments to set up communication protocols in a local area in the event of an emergency. This applies to weather and other civil emergencies. RACES has a standard bureaucracy as part of its protocols. Education for RACES certification/participation is available on the FEMA website. Van Zandt County does not currently have a formal RACES entity and CARES does not have enough participation to warrant setting up a local RACES group.

ARES, Amateur Radio Emergency Services, is the other entity involved in emergency radio communication. It was developed by ARRL, Amateur Radio Relay League, and consists of licensed ham radio operators who are registered with ARES and volunteer to participate in ARES events and communication. Van Zandt County and CARES has an area ARES coordinator, and the group is active in ARES and works with the County's emergency coordinator. Unlike RACES, ARES is only ham radio operators and not GMRS licensed operators currently.

### **Skywarn**

Skywarn is a program developed by the National Weather Service, NWS, to train individuals in how to safely observe weather, how to report observations and what information the NWS wants to be made aware of. Van Zandt County, and the counties immediately north and south of us, are underserved by the radar installations in Ft Worth and Shreveport. Because these counties are equidistant from both radar installations there is a zone where the NWS has poor information and reliability in the radar information in these areas. This makes effective communication of weather events in these counties to the NWS and citizens imperative.

Skywarn has two certification levels. Basic Skywarn teaches how to recognize different cloud formations and types, what to look for and report in the event of a tornado and how to report that

information. It also teaches basics of hail, wind speeds and flooding that the NWS needs to be made aware of. Classes are put on by NWS meteorologists both in person and remotely and upcoming presentations can be found on the

Advanced Skywarn training has very recently been modified. It advances the information in the basic class and now adds information on interpretation of basic radar information. These classes are not offered as frequently as the basic class and the NWS needs to be consulted for times and locations.

### **Weather Nets**

A weather net is a group of trained storm spotters communicating via radio, ham and/or GMRS, with the NWS. Typically, a net is held on a designated repeater frequency, or in an optimal case a group of linked repeaters, that cover an area. The net is run by one individual, called net control, who is responsible for maintaining order during the net and communicating with the NWS. The storm spotters ask for recognition by net control when they have something worthy of reporting to the NWS or other storm spotters. Net control can communicate information to the NWS via NWSChat, text messaging or in some cases directly via an Allstar link. Net control is also responsible for communicating information to the storm spotters that they need to know, such as special warnings by NWS or information gleaned from other Storm Spotters that impact other Storm Spotters.

### **Storm Spotter Tools**

Several phone/tablet/computer apps are available that can assist a Storm Spotter. Several Radar apps are available both for Android and Apple products. A favorite of CARES members is Radar Scope. This is a powerful app that works on both phones and tablets. Numerous others are available, and you should find one you think works best. While these apps are helpful in the field, they should never replace personal observation of the sky nor interfere with driving and personal safety.

GRlevel 3 is a computer program that uses complex radar interpretation software and can provide powerful and accurate information to Storm Spotters. It is available on Windows computers for a fee that is about \$80 dollars for a lifetime subscription. It utilizes live Nexrad radar. While it is not NWS grade data it is comparable to many TV station's radar imaging. GRlevel 3 is not practical for Storm Spotters in the field as it requires a strong internet connection and requires significant interactions with the computer operator. It is a powerful tool for the net control operator as it provides local radar information that can help in communicating with field Storm Spotters and NWS.

NWSChat is a means of communicating with the NWS and other Storm Spotters or TV stations that may provide information to net control. This is a means by which net control can communicate with the NWS and means of getting information in advance of storms moving into the area.

## **Radios**

Two types of radio frequencies are available to storm spotters, and both should be utilized at some point during a weather net. Ham radio is the most common form of radio communication for weather and other natural disaster nets. Most repeaters that are available utilize ham radio frequencies, typically the 2M and 70 Cm bands. A newer form of radio communication utilizes the 16 GMRS (General Mobile Radio Service) frequencies. A complete discussion of GMRS radios can be found on the CARES website or the GMRS USA website. It is becoming increasingly utilized for several reasons and is now being recognized by traditional radio groups. It is against FCC regulations for ham radios and GMRS radios to use the same frequency and communicate with each other, however there are no rules that prevent net control operators or storm spotters from passing information on both GMRS and ham radio during a weather net. This provides the information to the most citizens who need that information for their safety.

## **Go Bag**

A go bag or go kit is simply a container with the supplies needed to storm spot safely for an extended period of time. Contents of a go bag is very individualized and examples of go bag contents can be found on our website, ARRL website and others. Typically, it contains a change of clothes and shoes, medications, snacks, radios, and extra batteries for radios. More experienced storm spotters often have go bags that fill two bags.

## **Storm Spotting Safety**

The first 10 rules of storm spotting are to never storm spot alone. Spotters simply can not drive, watch the sky and report in findings at the same time. A two-person team is required with one person assigned to driving and the other to watching the sky and communicating with net control. Not all storm spotters are mobile and very useful information can be obtained while stationary especially if you can not find a team member.

It is important for storm spotters to have a high quality detailed local map and to know the roads, their potential problem areas, the terrain and specially to keep in mind the most efficient and safe exit from any area that you are spotting. It is very important to know where “dead zones” are in your area so you can effectively communicate with net control. Be sure to keep in mind map directions and location for useful communication with net control.

While its important to communicate information and changes in weather to net control, it is more important to keep in mind how the weather and changes can affect the storm spotter themselves. Don't get so caught up in the weather you forget to get out of its way. Personal safety is paramount.

Most serious storms involve rain and typically lots of it. Be aware of the water levels in your area and keep in mind the possibility of flash flooding. Its very important to know your area in

advance of storm spotting so you know the locations that are likely to flood easily. Stay out of water that is fast moving, rising or one you can't see the road underneath it.

Hail is also a common feature of storms and can be both damaging to property and vehicles but can cause serious harm to individuals. In hail stay in your vehicle and seek cover if it is safely possible. Reporting hail size is very important in storm spotting and a guide for size comparison will be found in a separate document on the CARES website.

If you can hear thunder, then you are at risk for a lightening strike. Stay in your vehicle and seek cover. Be careful when using your radio with lightening nearby.

While driving, use extra caution. Do not speed and in rain and wind slow down. Do not slam on your brakes on wet roads and avoid hydroplaning while driving. Watch for flying debris or downed power lines. Immediately leave the area if debris is in the air or there are downed power lines. Keep your vehicle running and be sure you start storm spotting with a full tank of gas.

Remember, you can not outrun a storm!! If the storm is coming to you and your partner, move in a different perpendicular direction. Always storm spot in pairs and keep your safety at the top of the list of things to do.

## **What to Report**

The Beginner Skywarn class goes into great detail about what the NWS wants reported. Briefly, NWS wants to know the following:

1. Flash Flooding
2. Wind greater than 50 mph
3. Hail  $\frac{3}{4}$  of an inch or greater or very heavy hail rates
4. Rain greater than 1" per hour
5. Power flashes that are not lightening
6. Tornadoes on the ground, debris clouds or rapid cloud rotation or funnels not on the ground

That is the information that needs to be reported to net control for communication to the NWS. Information that affects individual safety is also important to pass to net control. This includes but is not limited to road blockage or damage, significant building damage especially where life is at risk, injuries, downed power lines etc. While this information is not passed to the NWS it can be passed over the repeaters for public safety and where warranted passed on to local authorities for action.

## CARES Storm Spotting Cheatsheet

7/23

### Elevated Reporting Criteria

Net Control Stations will call for elevated reporting criteria for significant reports such as a rotating lowering, rotating funnels, flashes of light at aground level not associated with lightning, tornados or other immediate threats to life or property.

When Elevated Reporting Criteria is in effect, stations with Minimum or Modified Reporting Criteria should hold their reports.

### Reporting Criteria of Precedence

#### 1. Tornado

- a. Defined as visible debris cloud or surface damage occurring
- b. What is your USNG and/or major thoroughfare intersection?
- c. Direction and distance from you to tornado?
- d. Direction and rate of travel of tornado?

#### 2. Funnel Cloud

- a. Defined- rotating funnel not apparently in contact with the ground.
- b. Is funnel visible halfway to the ground?
- c. Is there a visible clear slot?
- d. Give your USNG and/or major thoroughfare intersection?
- e. Direction, and distances from you to funnel?
- f. Direction and rate of travel of funnel?

#### 3. Wall Cloud

- a. Defined as a sustained, rotating lowering
- b. is surface damage occurring?
- c. Where is the updraft located on the wall cloud?
- d. Is there a visible clear slot?
- e. What is your USNG and/or major thoroughfare intersection?
- f. Direction and distance from you to wall cloud?

g. Direction and rate of travel of wall cloud?

#### **4. Flashes of light at ground level, not associated with lightning strike**

- a. Are there multiple flashes or a continuous line of flashes?
- b. What is your USNG and/or major thoroughfare intersection?
- c. Direction and distance from you to flashes?

Net Control Stations will call for modified reporting criteria at the request of a served agency such as the National Weather Service. Modified Reporting Criteria may be, but not limited to, events such as wind or flooding-reports with more specificity than implied in Minimum Reporting Criteria. When Modified Reporting Criteria is in effect, stations with Minimum Reporting Criteria may continue to submit reports.

Note: Do not attempt to estimate rainfall from a moving vehicle. Rain beating on the windshield can be misleading.

#### **Estimating Wind Speeds**

##### **Miles per Hour Observation**

- 25 to 31 Large branches move; Whistling in high wires
- 32 to 38 Whole trees in motion
- 39 to 46 Twigs break off trees; impedes progress while walking.
- 47 to 54 Slight structural damage
- C 55 to 63 Trees uprooted: Considerable structural damage (seldom seen -inland)
- 64 to 75 Widespread damage (rarely experienced)

#### **Estimating Hail Sizes**

##### **Report Corresponding Object Size**

Pea-1/4"--mothball 1/2"—Penny-3/4"—Quarter-1"—Ping Pong Ball-1.5"--Golf Ball-1.75"—  
Chicken Egg-2"—Tennis Ball-2.5"—Softball-4"

#### **USNG**

- A County Map
- Major Highway Map

#### **Communicate**

- Speak clearly and with moderate speed
- Use plain English, no codes ,
- Repeat critical items for confirmation}
- Use phonetics
- The initial call to NQSK

Station identification on long exchanges

### **RADAR for the Skywarn spotter**

Radar can be a valuable tool for the Skywarn spotter, but when used incorrectly it can be detrimental. Spotters should use radar data for positioning themselves while remaining clear of danger such as the core area of a storm.

There are seven weather surveillance radar systems utilized by the National Weather Service Fort Worth Weather Forecast Office. The Fort Worth radar, a WSR-88D Doppler radar, is located at Spinks Airport in southern Tarrant County.

Other WSR-88D radars are in Granger, TX at Dyess AFB near Abilene, Frederick, OK, and Shreveport, LA.

In addition to these five network radar sites, the NWS has access to terminal Doppler radars at Dallas Love Field and DFW international Airport. Finally, several broadcast television stations have individual radars which can be accessed via the web.

Before, during, and even after an event periodically check your radar feed to maintain awareness of storms in the area. While using this data for situational awareness be especially cautious of some of the limitations of the radar and its beam.

The WSR-88D focuses on a one-degree beam width that spreads out with distance. The beam is approximately one mile wide at seventy-five miles from the radar site. Therefore, the radar is unable to effectively sample storms further away from the site. If a storm is too close to the site, it will not be sampled well in the upper levels, which may give the appearance of the storm weakening. in both cases.

The Skywarn spotter is the missing piece that can put eyes on the storm and effectively observe what is occurring at ground

Radar is a tool. The trained Skywarn spotter is a craftsman. Both have limitations. The radar is limited technically while the primary limitation on the spotter is safety. Use radar when appropriate. but focus your eyes and training on the storm.

### **Tornado Safety Tips**

If a Warning is issued or if threatening weather approaches: in a home or building, move to a pre-designated shelter, such as a basement.

if an underground shelter is not available, move to an interior room or hallway on the lowest floor and get under a sturdy piece of furniture.

**Stay away from windows.**

### **Get out of automobiles.**

Do not try to outrun a tornado in your car; instead, leave it immediately. Do not use bridges or overpasses for shelter from tornadoes.

Mobile homes, even if tied down, offer little protection from tornadoes, and should be abandoned.

Occasionally, tornadoes develop so rapidly that advance warning is not possible. Remain alert for signs of an approaching tornado.

Flying debris from tornadoes causes most deaths and injuries.

### **Flash Flood Safety»**

When a flash flood Warning is issued for your area, or the moment you realize that a flash flood is imminent, act quickly to save yourself.

**You may have only seconds!**

### **Get out of area subject to flooding.**

These include dips, low spots, canyons, washes, etc. Avoid already flooded and high-velocity flow areas and do not attempt to cross flowing streams. If driving, be aware that the road bed may not be intact under flood water. Turn around and go another way. NEVER drive through flooded roadways! If the vehicle stalls, leave it immediately and seek higher ground if you can safely.

Rapidly rising water may engulf the vehicle and its occupants and sweep them away.

### **Severe Thunderstorm and Lightning Safety**

Severe thunderstorms are dangerous environments:

If you can hear thunder, you are close enough to the storm to be struck by lightning. Go to a safe shelter immediately!

Move to a sturdy building and stay away from windows.

Do not take shelter in small sheds, under isolated trees, or in convertible automobiles. If a sturdy shelter is not available, get inside a hard-top automobile and keep the windows up. Beware, though, since vehicles offer poor protection from downburst winds and only fair protection from hail.

Get out of boats and away from water.

Unplug appliances that are not necessary for obtaining weather information. Avoid using the telephone or any electrical appliances. Use landline phones ONLY in an emergency. If caught



outdoors and no 'shelter is nearby: Find a low spot away from trees, fences, and poles. Make sure the place you pick is not subject to flooding. If you are in the woods, take shelter under the shorter trees. If you feel your skin tingle, or your hair stands on end squat low to the ground on the balls of your feet.

## Spotter Glossary

**Anvil** — The flat, spreading top of a cumulonimbus cloud. Often shaped like an anvil.

**Beaver('s) Tail** - An inflow band with a relatively broad, flat appearance suggestive of a beaver's tail. It is attached to a supercell's updraft and is oriented roughly east to west.

**BLMRS** -- The BLMRS card is RACES' equivalent to the NIMS Resource Status Card. It is used at staging to record incoming communicator contact information, resource capability, and to log assignment activity. The card provides the staging manager a tool to manage available and assigned resources, their status and location. See page 40.

**Clear Slot** — A local region of clearing skies or reduced cloud cover indicating an intrusion of drier air. Often seen on the west or southwest side of a wall cloud, believed to be a visual indication of a rear flank downdraft.

**Cumuliform** — Have the appearance of a cumulus cloud, a solid and lumpy or cauliflower-like in appearance. Cumuliform towers are often associated with strong updrafts.

**Downburst** — A strong downdraft resulting in an outward burst of damaging winds on or near the ground. Sometimes referred to as "straight-line winds." Downbursts can produce damage similar to a strong tornado.

**Downdraft** — A small-scale column of air that rapidly sinks toward the ground. Usually accompanied by precipitation as in a shower or thunderstorm.

**Elevated Reporting Criteria** — Net Control Stations will call for elevated reporting criteria for significant reports such as rotating lowerings, rotating funnels, flashes of light at ground level not associated with lightning, tornados or other immediate threats to life or property. When Elevated Reporting Criteria is in effect on a Skywarn Net, stations with only Minimum or Modified Reporting Criteria should hold their reports.

**Flanking Line** — A line of cumulus or towering cumulus clouds connected to and extending outward from the most active part of a supercell. Normally extends to the southwest of the main storm tower.

**Flash Flooding** -- A rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within six hours of the causative event (e.g., intense rainfall, dam failure, ice jam). However, the actual time threshold may vary in different parts of the country. Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters.

**Funnel Cloud** — A condensation funnel extending from the base of a towering cumulus or cumulonimbus. It is associated with a rotating column of air that is not in contact with the ground.

**Glaciated** — Having the appearance of a cirrus cloud. Thin in fibrous in appearance. Glaciated clouds are associated with the tops of thunderstorms, especially those with weaker updrafts.

**Gust Front** - The leading edge of gusty surface winds from thunderstorm downdrafts. It is sometimes associated with a shelf or roll cloud.

**High Precipitation (HP) Supercell** — A supercell with a large amount of visible precipitation encircling the mesocyclone. HP supercells can be difficult to observe visually, as the precipitation often obscures the updraft related cloud features.

**Inflow Bands** — Bands of low clouds, arranged parallel to the low-level winds and moving into or toward a thunderstorm. They may indicate the strength of the inflow of moist air into the storm, and hence, its potential severity.

**Landspout** — A tornado that does not arise from the organized storm-scale rotation and therefore is not associated with a wall cloud or a mesocyclone.

**Low Precipitation (LP) Supercell** — A supercell with little visible precipitation falling from it. LP supercells often have flared-out updraft towers with striations. Thus they are easy to recognize visually. However, they can be difficult to detect on radar.

**Mammatus Clouds** — Rounded, smooth, sack-like protrusions hanging from the underside of a thunderstorm anvil. Mammatus clouds often accompany severe thunderstorms but do not produce severe weather.

**Mesocyclone** — A storm-scale region of rotation, typically around two to six miles in diameter and often found in the right rear flank of a supercell, or on the front flank of an HP storm.

**Minimum Reporting Criteria** - The standard criteria required for reporting weather events on a Dallas Area FACBS Skywarn Net. Defined as being equal to or greater than any of the following Flash flooding, wind greater than fifty miles per hour (50 MPH), or hail one inch (1”) or larger. Events that do not meet these Minimum Reporting Criteria should not be reported on a Skywarn Net. Net Control Stations may institute Modified or Elevated Reporting Criteria at the request of served agencies or to control or further limit Net traffic.

**Modified Reporting Criteria** — Net Control Stations will call for modified reporting criteria at the request of a served agency such as the National Weather Service. Modified Reporting Criteria may be, but not limited to, events such as wind or flooding reports with more specificity than implied in Minimum Reporting Criteria. When Modified Reporting Criteria is in effect on a Skywarn Net, stations with Minimum Reporting Criteria may continue to submit their reports.

**Multiple-vortex Tornado** — A tornado in which two or more condensation funnels or debris clouds are present, often rotating about a common center or each other.

**Overshooting Top** — A dome-like protrusion above a thunderstorm anvil, representing a very strong updraft and hence a higher potential for severe weather with that storm.

**Power Flash** - A blue-green flash caused by the arcing of electric power lines. They are often a visual indication of damaging winds.

**Rain Foot** — A horizontal building near the surface in a precipitation shaft, forming a foot- shaped prominence. A rain foot is a visual indication of a wet microburst.

**Rain-free Base** — A dark, horizontal cloud base with no visible precipitation beneath it. The rain-free base typically marks the location of the thunderstorm updraft.

**Rear Flank Downdraft** — A region of sinking dry air on the back side of and wrapping around a mesocyclone. The RFD is often visible as a clear slot wrapping around the wall cloud.

**Roll Cloud** — A low, horizontal tube-shaped cloud associated with a thunderstorm gust front.

**Scud** — Small, ragged, low cloud fragments that are unattached to a larger cloud base and often seen with and behind thunderstorm gust fronts. Scud clouds generally are associated with cool, moist air, such as thunderstorm outflow.

**Severe Thunderstorm** - A thunderstorm which produces tornadoes, hail 0.75 inches or more in diameter, or winds of 50 knots (58 MPH) or more. Structural wind damage may imply the occurrence of a severe thunderstorm.

**Shelf Cloud** — A low, horizontal wedge-shaped arcus cloud, associated with a thunderstorm gust front. The shelf cloud is attached to the base of the parent cloud above it.

**Squall Line** — A solid, or nearly solid line or band of active thunderstorms.

**Striations** — Groves or channels in cloud formations, arranged parallel to the flow of air and therefore depicting the aiiJow relative to the parent cloud. Striations often reveal the presence of rotation, as in the barber pole or “corkscrew” effect often observed with a rotating updraft.

**Supercell** — A thunderstorm with a persistent rotating updraft. Supercells are rare but responsible for a remarkably high percentage of severe weather events: especially tornadoes, extremely large hail, and damaging straight-line winds.

**Tail Cloud** — A horizontal, tail-shaped cloud (not a funnel cloud) at low levels extending from the precipitation region of a supercell toward the wall cloud.

**Tornado** — A violently rotating column of air in contact with the ground and extending from the base of a thunderstorm.

**Tower Cumulus** — A large cumulus cloud with great vertical development, usually with a cumuliform or cauliflower-like appearance, but lacking the characteristic anvil of a cumulonimbus.

**Updraft** — A small-scale column of rising air.

**Virga** — Precipitation which falls from a cloud base but evaporates before reaching the ground. Virga often has a streaky or stringy appearance as it hangs down from the cloud base.

**Wall Cloud** — A rotating, localized, persistent, often abrupt lowering from a rain-free base. Wall clouds can range from a fraction of a mile in diameter, up to nearly five miles in diameter and are normally found on the south or southwest side of the thunderstorm.