Multi Vortex Tornadoes



- Many tornadoes contain smaller, rapidly spinning whirls known as *subvortices*, or *suction vortices*; but they are not always as clearly visible.
- Suction vortices can add over 100 mph to the ground-relative wind in a tornado circulation. As a result, they are responsible for most (if not all) cases where narrow arcs of extreme destruction lie right next to weak damage within tornado paths.
- Subvortices usually occur in groups of 2 to 5 at once and usually last less than a minute each.

Satellite Tornadoes:

1999 Roger Edwards

- A satellite tornado develops independently from the primary tornado -- not inside it as does a suction vortex.
- The tornadoes remain <u>separate and distinct</u> as the satellite tornado orbits its much larger companion within the same mesocyclone.
 - Their cause is unknown; but they seem to form most often in the vicinity of exceptionally large and intense tornadoes.

Circulations formed <u>without</u> a rotating updraft

LANDSPOUT

- A weak tornado with a narrow, rope-like condensation funnel that forms when the thunderstorm cloud is still growing the spinning motion originates near the ground.
- <u>**Technically considered tornadoes</u>** since they are defined by an intensely rotating column of air in contact with both the surface and a cumuliform cloud.</u>
- Form when pre-existing horizontal circulations (boundaries) are stretched and tilted upward by a developing thunderstorm updraft.
- Landspouts are usually stationary as they form in a weakly sheared environment.
- Damage from these types of tornadoes tends to be EF2 or less.
- Formed in environments where there is strong instability.
- Since these type of tornadoes have their origin near the ground, they are very difficult to detect by radar.







Circulations formed <u>without</u> a rotating updraft

GUSTNADO

- A short-lived, ground-based, shallow, vortex that develops on a gust front (thunderstorm's outflow leading edge of storm) associated with either thunderstorms or showers.
- They have no association with an updraft or cloud rotation and are not connected to a cloud base. *Hence, they are NOT considered tornadoes.*
- They may only extend a couple hundred feet above the ground (can be up to a mile or so) with no visible connection to the cloud above.
- They may be accompanied by rain, but usually are wispy, or only visible as a debris cloud or dust whirl at or near the ground.
- Wind speeds can reach 60 to 80 mph, resulting in significant damage, similar to that of a F0 or F1 tornado.
- Often form with squall lines or bow echoes.
- Almost always non-detectable on radar.

Gustnadoes are small and usually weak whirlwinds which form as an "eddy" in thunderstorm outflows. They do not connect with any cloud-base rotation and are not considered tornadoes.

Gustnadoes are classified as thunderstorm wind events.



Gustnadoes

Example of a Gustnado





Majority of information presented is from an essay by Dr. Chuck Doswell

Safety...Safety...Safety!

Ask of several ber we would rather <u>NOT</u> receive a report Versive a report Evaluate every situation for potential safety concerns

S.E.T. Effect and it's implications...

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seen before

SIMM

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Copyright Ryan McGinnis

Number 1 Threat: Driving on the highways!

Spotters are prone to:

- Drive with less than 100% attention
- Drive above the speed limit
- Drive down rain/hail covered roads
- Make sudden stops and starts without warning
- Drive in adverse conditions, such as low visibilities from intense downpours, wet pavement and strong gusty winds.

Avoid going out alone

 Having two persons in the vehicle, enables one person to do nothing but drive, and the other person able to navigate and analyze the storms.

WATCH FOR STANDING WATER ON ROADWAYS

Hydroplaning is a serious threat.
During a storm, water will likely collect along the tire paths.
If you are hearing water splashing under your car, then you are on the verge of hydroplaning, if you are not doing so already.
Use your headlights when it's raining
Avoid speeding

Never drive onto flooded roadways!



Parking

- NEVER stop in the middle of the road or highway.
- When pulling off on the side of the road make sure you are fully off the right-ofway.
- Make sure that where you are parking is legal
- When opening your vehicle door, make sure you are off the road enough so that you can open your door safely.
- Inspect the shoulder you are about to park on to make sure it is in good condition. (i.e. muddy, deep ditch, etc)
- Remember that parking on the interstates is for emergencies only.
- Use your parking lights.





Be extra cautious at night

Night spotting requires extreme vigilance, awareness of winds and storm behavior, and experience to avoid downbursts, hail shafts, and tornadic circulations.

Be extra cautious at night

Obviously, it is more dangerous to deal with something you cannot clearly see. Storms at night present special problems for spotters and you should be extremely cautious when observing storms after dark.

Spotter Vehicle

- Make sure the car is reliable (i.e. tires filled with air including spare, good wiper blades).
- Prepare for small emergencies (i.e. have a tire jack, road flares, jumper cables, motor oil, etc).
- Clean windshield and apply RAINEX.
- Make sure all lights work.
- Filled gas tank fill often as there may not be a gas station for many miles.

Keep Your Engine Running and car doors open



http://1.bp.blogspot.com/_RdqUlvhN4jo/Swk8AXEU1dI/AAAAAAAAAAQxQ/1YyFca3cnwA/s1600/chasers.jp