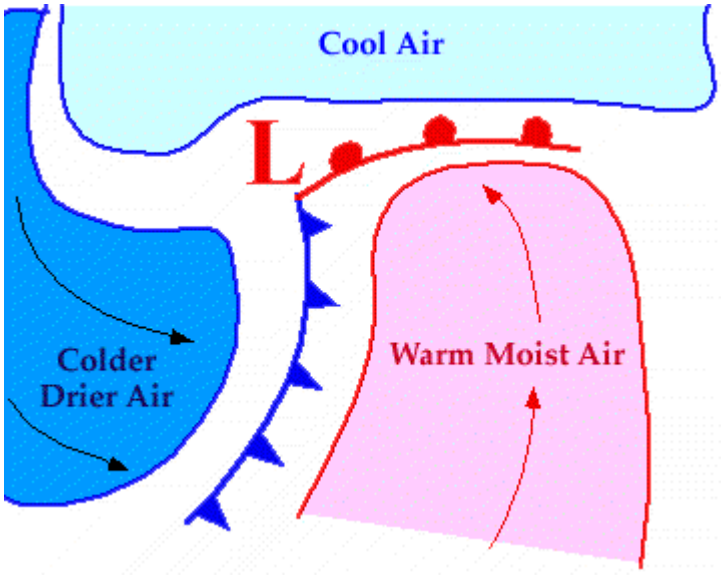
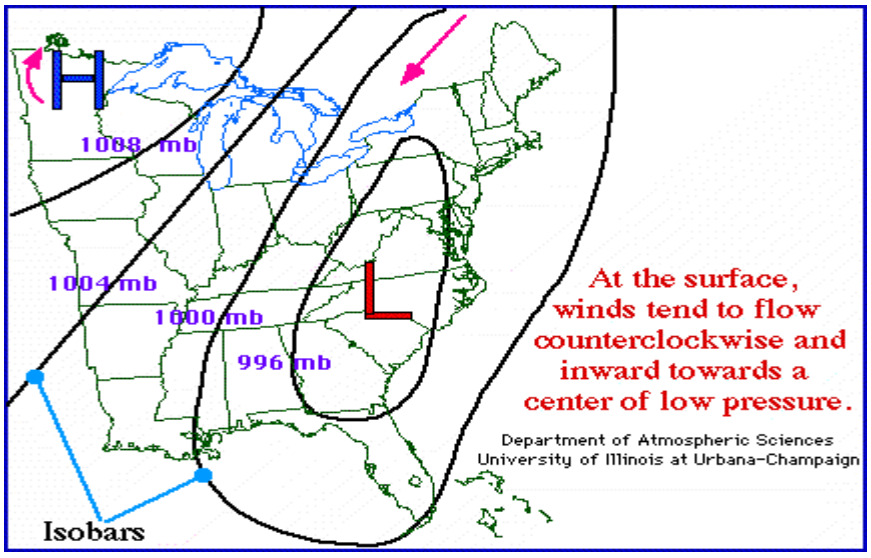
CIVIL AIR PATROL – ARUNDEL COMPOSITE SQUADRON

July 2004	SAFETY	TORNADOES

Approximately 800-1,200 tornadoes occur in the U.S. each year, luckily most of them in uninhabited areas. The tornadoes that strike the United States are due to storms created by dry and cool polar air from Canada, which meets warm and moist air from the Gulf of Mexico. A large portion of the tornadoes in the U.S. strike an area known as "Tornado Alley", which stretches from northwest Texas, across Oklahoma and Kansas.

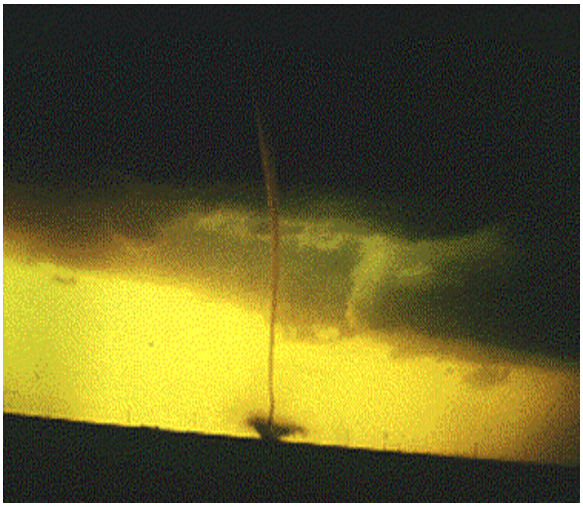


Tornadoes start as cyclones. A developing cyclone is typically accompanied by a warm front pushing northward and a cold front pulling southward, marking the leading edges of air masses being wrapped around a center of low pressure, or the center of the cyclone. Winds flow around this low pressure areas counter-clockwise in the Northern Hemisphere, and clockwise in the Southern Hemisphere.



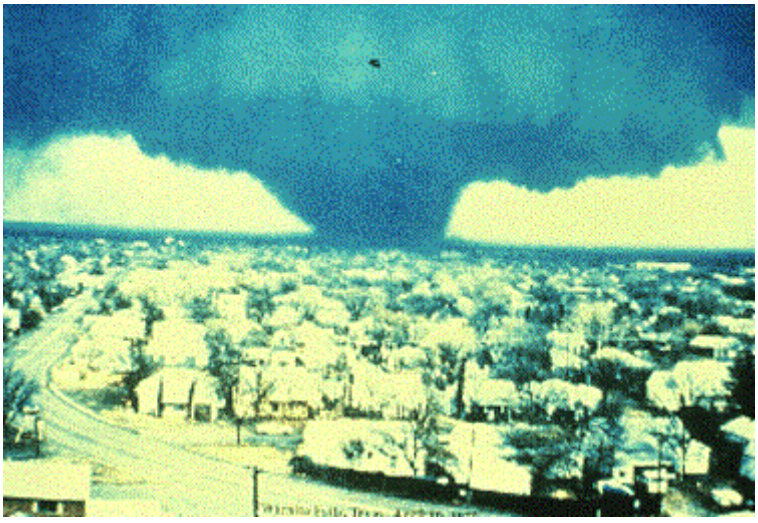
Rising air in the vicinity of a low pressure center favors the development of clouds and precipitation, which is why cloudy weather and likely precipitation are commonly associated with an area of low pressure.

A tornado is defined as a violently rotating column of air in contact with the ground, and pendent from a cumulonimbus cloud. They are categorized as "weak", "strong", and "violent".



Weak Tornado

Strong Tornado

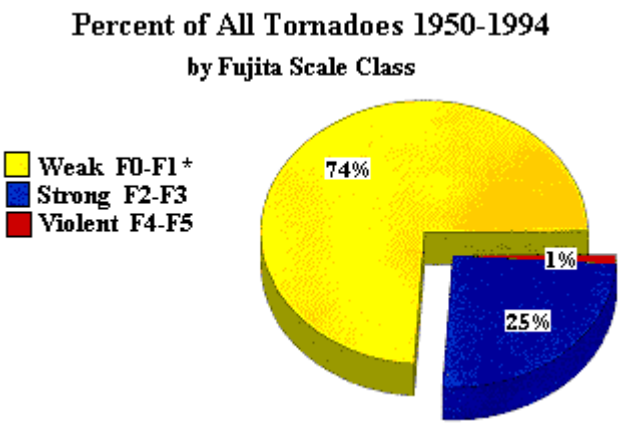


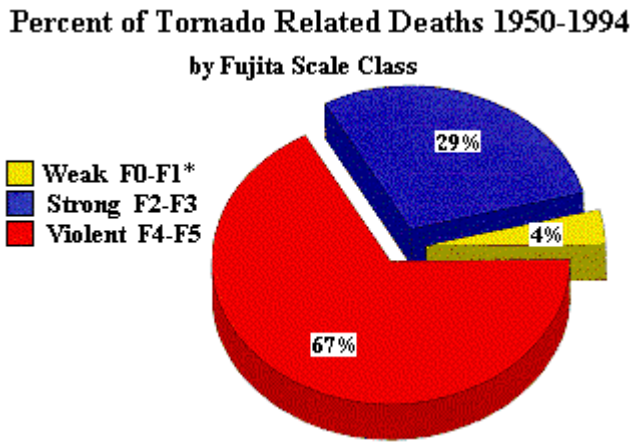
Violent Tornado

Weak tornadoes often have a thin, rope-like appearance. About 70%-75% of the tornadoes are weak, with rotating wind speeds at typically less than 110 MPH. The typical strong tornado often has

what is popularly considered a more "classic" funnel-shaped cloud associated with the whirling updraft. Rotating wind speeds vary from 110 to 200 MPH. About 25%-30% of the tornadoes are strong. An important safety consideration is that weak and strong tornadoes by definition do not level well-built homes. Therefore, a secure home will offer shelter from almost 100% of all direct tornado strikes.

Only violent tornadoes are capable of leveling a well-anchored, solidly constructed home. Fortunately, less than 2% of all tornadoes reach the 200+ MPH violent category. Furthermore, most violent tornadoes only produce home-leveling damage within a very small portion of their overall damage swath. The huge circular wall cloud above the tornado (picture on previous page) is probably close in size and location to the parent rotating updraft (mesocyclone), which has spawned the violent tornado.





In 1971, the Fujita Scale (also known as the Fujita-Pearson Scale) was adopted as the official classification system for tornado damage. This scale was developed by Dr. Fujita (University of Chicago) along with Allen Pearson (Director of National Severe Storm Forecast Center). It is a subjective scale for tornado classification, and an experienced surveyor is needed for damage assessment. The scale ranges from F0 to F6, but typically a tornado is only classified to F5 because F6 winds are very unlikely to occur. In the U.S., the National Weather Service (NWS) issues tornado watches and warnings, and sets the official rating of a tornado.

The Fujita Scale

F-Scale Number	Intensity Phrase	Wind Speed	Type of Damage Done
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well constructed houses; trains overturned; most trees in fores uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-inforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies

SOME TORNADO MYTHS

1. **Highway overpasses are a safe place to shelter if you are on the road when you see a tornado coming – False! The truth is that any time you deliberately put yourself above ground level during a tornado, you are putting yourself in harm's way. Flying debris can be very deadly!**
2. **Opening windows to equalize air pressure will save a roof, or even a home, from destruction by a tornado – The idea that moving one thin pane of glass is going to protect a roof or house from one of the most violent natural forces on the planet has a certain absurdity about it. If a tornado comes, forget about the windows and get into the basement or other shelter as fast as possible.**
3. **Tornado never strikes big cities – Did you already forget about the tornado that passed through Miami, Florida last spring? St. Louis, Missouri, for example, has been hit by tornadoes 22 times in the past 40 years.**
4. **Some towns are "protected" – Some of these myths about protection go back to the Native American culture. The idea that one's town is "protected", however, is a combination of wishful thinking, short memory, the rarity of tornadoes, and a distorted sense of "here" and "there". Emporia, Kansas, for instance, had sat "protected" between the Cottonwood and Neosho Rivers,**

in native Osage territory, for over a century. Emporia was free of damaging tornadoes until June 8, 1974, when a tornado killed 6 people and destroyed $20 million worth of property on the northwest side of town.

5. **The southwest corner of a basement is the safest location during passage of a tornado – This myth dates back to 1887 to a book published on tornadoes by John Park Finley. The southwest corner typically faces the oncoming tornado. This myth was proven to be wrong in 1966 by Professor Eagleman (University of Kansas). He did surveys of tornadoes, such as the Topeka tornado on June 8, 1966, and found that the south side and southwest corners (i.e. area facing the oncoming tornado) were the least safe.**

SAFETY in TORNADOES

One of the most important things you can do to prevent being injured in a tornado is to be ALERT to the onset of severe weather. Stay aware, and you will stay alive! If strange clouds start moving into your area and the weather begins to look stormy, turn to a local radio or TV station and get the weather forecast.

Tornado watch – this means that tornado is possible

Tornado warning – this means that a tornado has actually been spotted, or is strongly indicated on radar, and it is time to go to a safe shelter immediately

These are some of the things that people describe when they tell about a tornado experience:

a) **A sickly greenish or greenish black color to the sky**

b) **If there is a watch or warning posted, then the fall of hail should be considered as a real danger sign**

c) **A strange quiet that occurs within or shortly after the thunderstorm**

d) **Clouds moving by very fast, especially in a rotating pattern, or converging toward one area in the sky**

e) **A sound a little like a waterfall or rushing air at first, but turning into a roar as it comes closer**

f) **An obvious "funnel-shaped" cloud that is rotating**

Homes or Other Small Buildings:

a) **Go to basement, but stay away from west and south walls. Hide under a heavy work table or under the stairs. Use blankets, quilts, etc. to protect you against flying debris**

b) **If you have no basement, then go to an interior room on the 1st floor, such as a closet or bathroom. The bathtub and commode are anchored directly into the ground, and sometimes these are the only things left in place after a tornado. Get into the bathtub, and cover yourself with a couch cushion or blankets.**

Schools:

a) **Leave auditoriums, gyms, and other free-span rooms. Go to interior rooms and halls on the lowest floor.**

b) **Stay away from glass on both windows and doors**

c) **Crouch down and make yourself as small a "target" as possible**

d) **If you have something to cover your head, do so, otherwise, use your hands**

Outdoors or in a Car:

a) **Try to get home immediately if you can**

b) **Lie flat in a ditch or low–lying area. If in a ditch, watch out for the possibility of flash-flooding!**

c) **If you are in a car and see a tornado forming or approaching, leave the car immediately. Many people have been killed in cars while they were trying to outrun the tornado. Leave your car, find a low-lying area on the ground, and lay down flat on the ground.**

d) **Do not go to underpasses. Debris flying under the underpass could be very deadly. Head for a ditch instead.**

High-Rise Buildings:

a) **Go to interior rooms and halls**

b) **Central stairwells are also good, but elevators are not. If the building loses power, you may be stuck in the elevator for a long time.**

c) **Stay away from glass walls and windows, no matter how small.**

Mobile Homes:

Most tornado deaths occur in cars and mobile homes. If you live in a mobile home park, find out if they have shelter or a steel reinforced concrete laundry room. If they do not, then you need to find another substantial structure that you can reach very quickly. Get out from your mobile home!

Shopping Centers, Hospitals, and Factories:

a) **Go to interior rooms and halls on the lowest floor.**

b) **Stay away from areas with wide-span roofs, such as auditoriums, theaters, and warehouses.**

c) **Crouch down and cover your head**

d) **A corner of the room is typically safer than the middle of the wall.**

e) **A bathroom, closet, office, or maintenance room with short walls would be the safest area, especially if it was on the north or east side of the building.**

GET MORE INFORMATION

References:

1. http://ww2010.atmos.uiuc.edu/
2. http://www.fema.gov/hazards/
3. http://www.redcross.org/
4. http://geography.about.com/
5. http://www.tornadoproject.com/