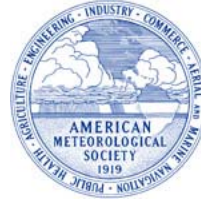


Contacts:

Jim Szatkowski (Kent)
(330) 672-2727
jszatkow@kent.edu



Stephanie Kenitzer, AMS
435-432-2192
kenitzer@dc.ametsoc.org



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Cars May Be Less Dangerous Than Mobile Homes and the Outdoors During Tornadoes, According to Study by Kent State University Researchers

The meteorological and emergency management communities have long recommended that people should get out of mobile homes and cars and seek shelter in a building or in a ditch if a tornado is bearing down on them. New findings from researchers at Kent State University suggests that cars may be a less dangerous option than the outdoors, especially relative to mobile homes.

The issue of remaining outdoors or seeking shelter in a vehicle has come into question in the scientific and emergency management communities in recent years. Study of past tornadoes has shown that people may actually be at more risk outdoors than in a stationary vehicle. In addition, history and statistics have proven that mobile homes are the most dangerous places to be because they are typically not well anchored or constructed.

"So the question is, should people who are in mobile homes or are outside and who do not have access to sturdy shelter, actually go to their vehicles or lie in a ditch during a tornado warning," said Thomas Schmidlin, a researcher at Kent State University. "An automobile is obviously not the best place to be during severe winds and an approaching tornado, and one should always try to avoid that situation. But if your only options are being in a mobile home or taking shelter outdoors, cars are a better alternative. They are more stable in high winds than mobile homes and offer a means to get to sturdy shelter."

Schmidlin, who has been at Kent State for 18 years, is professor and chair of the geography department. He is the lead author of the study appearing in the December issue of the "Bulletin of the American Meteorological Society."

Through wind tunnel tests and field surveys of tornado damage, Schmidlin and his colleagues found that the wind speed range for tipping a car is 115-180 mph at 3 feet (1 meter). This translates to F3 (wind speed of 158 – 206 mph) on the Fujita Scale, where wind speeds are measured at approximately 33 feet height (10 meter).

Manufactured homes are frequently destroyed by tornadoes with winds as low as 110 mph and nearly 45 percent of all deaths caused by tornadoes occur among mobile home residents. The United States typically encounters 700 F0-F2 (wind speed of 40-157 mph) tornadoes annually. Tornadoes with maximum intensity of F3 or greater are relatively rare – only about 7 percent of all tornadoes.

The researchers also found that vehicle safety has improved dramatically in recent years. The percentage of all tornado deaths that occurs in vehicles has fallen from 17 percent in the 1970s to 10 percent in the late 1990s, added Schmidlin.

Currently the National Weather Service and American Red Cross recommend that when a tornado warning is issued, people should get out of automobiles and immediately seek shelter. When no sturdy shelter is available, if caught outside or in a vehicle, people are advised to lie flat in a nearby ditch or depression.

"We don't agree with that guidance," said Thomas Schmidlin. "Our goal is to find the best recommendation and to give guidance that leads individuals to the location of least risk."

Schmidlin and his colleagues suggest the following recommendations for tornado safety and preparedness:

- The safest place is an underground shelter, basement or safe room.
- If that is not available, seek an interior room or hallway in the lowest level of the building.
- Abandon mobile homes immediately and seek shelter in a sturdy building.
- If you are caught outdoors, seek shelter in a basement, shelter or sturdy building. If these are not available, get into a vehicle, buckle your seatbelt, and try to drive at right angles to the storm movement and out of its path. If you encounter strong winds while driving, stop the car off the road, keep your seat belt on, and crouch as low as possible, and cover with a blanket if possible.
- If you are unable to get to building or vehicle, as a last resort, lie in a ditch or depression and cover your head with your hands.

"We believe the recommendations should be revised to encourage those in mobile homes, without nearby sturdy shelter, to use the cars to reach sturdy shelter during a tornado warning if conditions allow," said Schmidlin. "This research shows that mobile home residents face less risk of injury or death from severe winds inside their vehicle than in a mobile home."

The researchers studied 291 vehicles actually struck by a tornado, estimating the wind speeds based on the damage to the house adjacent to the vehicle. They also tested car and minivan models in a Wichita State University wind tunnel with wind speeds up to 160 mph. Additional research on different vehicle models and types is needed, added Schmidlin. The research did not account for complexity of the driver's actions during severe wind situations.

The AMS (<http://www.ametsoc.org/ams>) is the nation's leading professional society for scientists in the atmospheric and related sciences.

Note to Editors and Assignment Desks: PDF or faxed copies of the paper, "Unsafe At Any (Wind) Speed? Testing the Stability of Motor Vehicles in Severe Winds," are available to journalists from **Stephanie Kenitzer**, AMS press office at (425) 432-2192, or kenitzer@dc.ametsoc.org.

You may contact the researchers directly: : **Thomas W. Schmidlin** at tschmidl@kent.edu or (330) 672-3227; co-author **Paul King**, Boyce Thompson Institute, Cornell University, (607) 254-1383 or psk3@cornell.edu