

METEOROLOGY

Tornado Season Here

"Twisters" are most numerous in the spring and early summer. Squall lines, along which tornadoes are found, will be tracked by new devices this year for first time.

By ANN EWING

► THE "SEASON" for destructive tornadoes, nature's most violent storms, is at hand. Weather Bureau records show that 68% of all "twisters" in the United States occur between March and June.

Tornadoes can start whirling any month at any hour of the day or night east of the Rocky Mountains, but they are most frequent in May and June in the late afternoon. They have, however, been reported in every state.

Usually the "twister" is seen as a funnel-shaped cloud, swinging down toward the earth from the base of a dark thundercloud. It spins rapidly, and wherever the whirling funnel touches ground, destruction follows. Houses are leveled or blown apart by its tremendous force.

Close by, a tornado has a very distinctive sound "like the roar of a swarm of jet planes overhead," Dr. Morris Tepper, chief of the Weather Bureau's severe local storms research unit, told SCIENCE SERVICE.

The width of the storm's destructive path is usually only a few hundred yards, and its length is only about ten miles. During the half hour or so of its existence, a tornado swirls forward at 20 to 30 miles an hour. The winds that whip around its low pressure center have been estimated as up to 500 miles an hour.

Although every state has had at least one tornado in the last 50 years, the storms are most frequent in the midwest plains states—northern Texas, Oklahoma, Kansas, Nebraska and Iowa.

Definite conditions are required to spawn a "twister." That is the reason certain regions are hit more often than others.

Hot and Cold Air

At the surface, abnormally warm, humid and oppressive weather prevails, with winds usually from a southern direction. Above this damp, hot air, at 8,000 to 10,000 feet, is a cooler air current, generally moving from west to east.

Both near the surface and aloft, tornado development is accompanied by narrow belts of swift air, meteorologists believe.

These conditions provide the necessary unstable atmosphere for the violent storm. Another factor is required, however. This is the long line of thunderstorms in which the spinning funnel is usually embedded. Stretching for 100 miles or so, and moving from west to east, this line is called a squall line. It is characterized by severe thunder,



FUNNEL OF DESTRUCTION — Swooping down on a town, a tornado can leave total destruction in its wake. "Twisters," such as the one shown here, are the most violent of all nature's storms.

strong wind squalls and heavy rains, as well as considerable lightning.

This squall line is also known as a pressure jump line, since a sudden rise in barometric pressure always accompanies it. This is the "trigger" for tornado birth. Before meteorologists are able to tell when and where tornadoes will strike, they will have to be able to predict the development and movement of these pressure jump lines, Dr. Tepper believes.

"We suspect," he said, "that these lines are atmospheric gravity waves that form and move according to the same rules that govern the formation and movement of ocean waves."

To learn how to use these lines in a tornado warning system, the Weather Bureau plans to set up in late spring, probably somewhere in northern Texas, a special research network of ten instruments, known as variographs, to signal barometric pressure changes.

When pressure changes meet certain specifications set up in the instrument, a bell will ring or light flash automatically, alert-

ing the observer, a civic-minded citizen who will notify the nearest Weather Bureau of the passage of a pressure jump.

These extra observations are necessary since the pressure jump lines are about 100 miles long, which is just a little more than the distance between Weather Bureau stations. To identify and track the lines accurately requires observations spaced no more than 20 to 25 miles apart.

"The Weather Bureau believes that if advance knowledge of the existence and direction of movement of a pressure jump line were available," Dr. Tepper said, "communities in its path could be warned of the time to expect trouble."

This would further reduce the danger zone included in tornado advisories. An area about half the size of a state is usually alerted now.

Pinpointing tornado occurrence and movements, Dr. Tepper said, will not be solved until future studies have also revealed where and why tornadoes break out on the pressure jump line itself.

Warning Systems

For the present, the best warning system consists of community networks, now numbering several hundred, that work like this:

Observers, mostly on the outskirts of a town or city, are alerted to the danger of "twisters" whenever an area tornado forecast has been issued by the Weather Bureau. They usually man stations on hilltops or high buildings, particularly to the south and west of the city. When a tornado is spotted, the observer notifies a control point.

Urgent community-wide warnings are then issued.

The low death rate, especially among school children, at San Angelo, Texas, when it was struck by a tornado on May 11, 1953, is credited to an alert received in time for students to reach inside hallways.

Squall lines can be identified and tracked by radar. Under a new plan, soon to go into operation, several communities in Texas and Louisiana have raised the funds required — about \$10,000 — to modify Weather Bureau radar sets for this special use. The Texas A & M Research Foundation modifies the sets.

Whenever an echo that looks suspicious is spotted by radar, a state police car operating in that area will be dispatched immediately by radio to investigate, as now planned. If the storm is a tornado, communities lying in its path will be warned.

About ten radar sets have been installed so far, and another five are expected to go into operation this spring.

Lightning discharges, known as "sferics," a contraction of the word atmospheric, also give a clue to tornado occurrence. Working on the theory that "twisters" occur with exceptionally severe lightning, several

scientists, particularly Dr. H. L. Jones of Oklahoma A. & M., are studying the possibility of identifying and tracking tornadoes by these electrical discharges.

Their equipment tells them the direction from which strong lightning strokes are coming. By using three or more stations, it may be possible to pinpoint the storm's location. Three sferics stations in Texas and Louisiana will be operated by the Weather Bureau this spring, and the U. S. Air Force will have a similar network in Oklahoma.

When whole-state or half-state tornado warning advisories are issued by the Weather Bureau, no particular action is called for, except an extra close following of radio reports and an occasional glance at clouds to the west and south if the sky becomes threatening.

When a person actually sees a tornado approaching, however, swift action is called

for.

The safest place to be during a "twister" is in a cave, storm cellar or other underground excavation that has an air outlet. If time does not permit this, lie flat in the nearest depression such as a ditch or ravine in the open country. Always try to move at right angles to the tornado's path.

In a city, seek inside shelter, preferably along the inside walls on the lower floors of a steel-reinforced building. It is wise to stay away from windows.

At home in a frame house, the southwest corner of the lowest floor, the basement if possible, offers the most safety.

People living in brick or stone houses should find other shelter, such as a storm cellar or the southwest corner of a frame house.

If time permits, turn off the gas and electricity.

Science News Letter, March 12, 1955

MEDICINE

"Jet" Shot In Arm

► THE MILITARY has even gone automatic on its "shots" in the arm. Pistol-shaped jets for injecting typhoid and other vaccines have been developed at the Army Medical Service Graduate School, Washington, D. C.

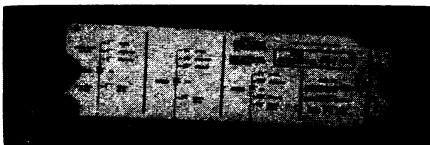
The new device has been tried on military inductees at an Army reception center with good results, Dr. Joel Warren of Walter Reed Army Medical Center, Washington, and Frank A. Zihler, Arthur W. Kish and Louis A. Zihler of Cleveland, report to the *Journal of the American Medical Association* (Feb. 19).

The new jets are called automatic jet injection syringes. They are designed for speedy vaccination of large numbers of persons. In the most recent study 1,685 persons were vaccinated daily in groups of 117 to 252. Those trained to use the new automatic jet syringes were able easily to keep pace with highly trained corpsmen using preloaded hypodermic needles and syringes.

While not entirely painless, inductees said the jet injection did not hurt as much as a needle injection given at the same time in the other arm.

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The device is run by a motor-driven hydraulic pump. The injector unit is built like an automatic pistol with two triggers. The lower trigger reloads and cocks the piston, and the upper trigger "fires."

The present design is not considered a final one ready for commercial production. The units now available are the property of the armed services and are for use solely for research and development.

Science News Letter, March 12, 1955

MEDICINE

Disease Virus Raised In Embryonic Fishes

► A NEW way of propagating disease-causing viruses has been discovered through use of the embryos of an aquarium fish that bears its young alive.

Following success in culturing through eight generations of the eastern equine encephalomyelitis or EEE virus, it is now hoped that viviparous fishes will be used in the study of the puzzling animal virus causing foot and mouth disease or aftosa.

Reported to the New York Academy of Sciences by Dr. Murray Sanders and Manuel G. Soret of the University of Miami, South Miami, Fla., the living embryos are removed by Cesarean operation upon the common mosquito-eating fish, *Gambusia*. The virus grows in the embryo fish as they are reared in simple tissue culture fluid.

The American Museum of Natural History's Lerner Marine Laboratory at Bimini, in the Bahamas, where the fish are found, was the scene of the development that may now be used for the successful propagation of other human viruses.

Science News Letter, March 12, 1955

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