ARE DOWNBURSTS JU

"You may as well try and catch the wind"
Donovan P. Leitch

BY SUSAN WEST

In 1976, after studying aircraft crashes at three different airports, University of Chicago meteorologist T. Theodore Fujita decided they were caused by fleeting, previously undetected and unreported downward-accelerating air cells. He dubbed the phenomenon "downburst" and defined it as "a strong downdraft inducing an outward burst of damaging winds on or near the ground." Fujita said downbursts often accompany tornadoes and may be responsible for tornadoes' erratic behavior (SN: 6/10/78, p. 374). But, he said, they are unpredictable. They might occur with thunderstorms or alone, with "weak-looking convection systems" or as part of gusting straight-line winds. They may last only three minutes or as long as 15 minutes, and can carry rain and winds up to 112 miles per hour. He claimed to be able to see their characteristic signature in aerial photographs of damage often attributed to tornadoes. Downbursts squash houses and vegetation flat or spread them in a single direction, he said; the egg-beater action of a tornado scatters debris far and wide.

By 1978, Fujita had sufficiently impressed enough people with his theory that the National Science Foundation, the National Aeronautics and Space Administration and the National Oceanic and Atmospheric Administration provided funds, personnel and assistance for a two-year downburst watch using three Doppler radars, 27 automatic weather stations and aircraft and satellite observations.

Now into the second year of the project, Fujita thinks he's caught a few downbursts red-handed; other meteorologists think not. The controversy seems to center on whether or not Fujita has actually tagged onto a distinct meteorological happening or if he is just upgrading some old ones. For instance, Ron Alberty of NOAA's Severe Storms Laboratory in Norman, Okla., told SCIENCE NEWS that there is a strong possibility that the outflow of air, or gust front, that often occurs at the leading edge of a thunderstorm due to the accumulation of rain-cooled air could "do considerable damage," but probably not on the scale attributed to downbursts.

Or, as Allen Pearson of the National Severe Storms Forecast Center in Kansas City, Mo., proposes, strong horizontal winds — as opposed to the vertical downrush followed by horizontal spreading Fujita suggests — could cause downburst-like damage. "We have thousands of reports of wind damage not connected to tornadoes," he says. "But they could be caused by straight line winds above, ahead or at the base of clouds."

Some meteorologists maintain that many so-called downbursts are actually downdrafts — common sinkings of air within a cloud that do not reach the ground. But Fujita maintains that it's a question of intensity and dimensions. He says downbursts not only originate higher in clouds than do downdrafts (13 kilometers as opposed to 6 or 7 km for downdrafts), but they come very near or ac-

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tually reach the ground. In addition, downdrafts have a horizontal wind speed near the ground of less than 40 miles per hour; the majority of downbursts have ground speeds of 40 to 72 mph and about a third of them reach 112 mph. And they are much more deadly than downdrafts. Though downdrafts might rock the boat a little, downbursts — by virtue (or vice) of their near-ground proximity and force — can literally knock a landing or climbing plane out of the sky. It is because of this destructive potential that Fujita is trying to establish the downburst as a distinct event and to develop a detection and prediction system. And he doesn't seem to lack for believers. Says George P. Cressman, former director of the National Weather Service, "I think he's on to something rather interesting. I'm inclined to accept it." Even his skeptics aren't too adamant: "I think he's bringing something to the fore," says Pearson.

In the meantime, seeing is believing. Fujita and professional meteorologist Mike Smith of Wichita, Kan., believe they have a series of photographs showing the birth of a downburst. Whatever name and origin that future research decides for it, the above photos, taken by Smith on July 1, 1978, near the Kansas Turnpike just east of Wichita, capture an unusual meteorological moment.

In Smith's words, the first picture (left to right) "shows a rainshaft falling from a thunderstorm. It caught my eye because it seemed to be 'rushing' out of the storm. [Second picture] The rain was coming out of the storm like a wall of water. You could actually see the rain falling out of the cloud and thicken in appearance. Since the temperature at Wichita's Mid Continent Airport was 102[°F], it occurred to me that this was probably a downburst in the making. [Third picture] The left edge of the rainshaft near the surface is spreading out into a pseudo cold front structure as the denser cold air clings to the ground. Another interesting feature is the abrupt edge of the rain shaft at cloud base. [Fourth picture] The rain continues to spread rapidly near the ground [Fujita estimates 400 to 500 feet above the ground] and the curling motion becomes even more apparent. [Fifth picture] The curl has now made a complete circle and the forward motion slows a little. [Sixth picture] The curl is definitely becoming disorganized, but seems to be caught in the thunderstorm's inflow and is drawn upward. [Seventh picture] The downburst is dissipating and the remains of the curl are being drawn up into the thunderstorm. [Eighth picture] [This picture is of] the damage that occurred in a mobile home park in east Wichita from a downburst the evening of July 6, 1978. In surveying the damage path, there was no evidence of a tornado — our radar never indicated a tornado — and the Doppler radar from the National Severe Storms Lab did not indicate rotation with that particular storm. Yet several people reported seeing a tornado. My explanation is that the downburst might have looked like one in photos 2 and 3. To the untrained eye, that could look like a wide tornado. I think that since no one has really known what a downburst looked like there has been no way to separate these reports from reports of actual tornadoes." □