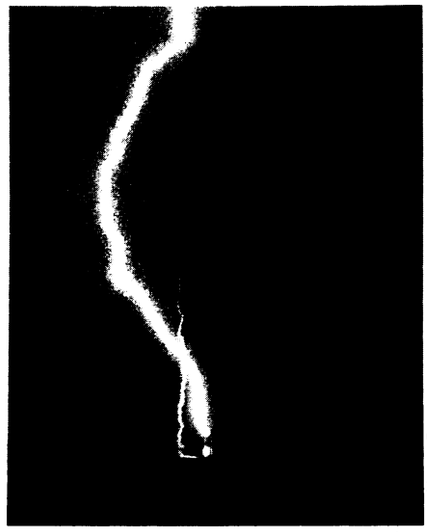
Helping pilots fly the stormy skies

When the U.S. House of Representatives Committee on Science and Technology recently summoned a panel of experts to a hearing on aviation safety, the testimonies and discussion focused, predictably, on weather. Legislators also issued recommendations calling for stronger regulatory standards for aircraft deicing procedures, seat strength and floor connections, and research into voice and flight data recorders and runway friction devices. But all the recommendations return to a theme brought home to air travelers too often in recent months: the risks that weather poses to planes.

Despite advances in aircraft and control technology, weather is a critical factor in about 40 percent of fatal general aviation accidents and more than 50 percent of air carrier accidents, according to Jim Burnett, chairman of the National Transportation Safety Board. These percentages have remained fairly constant through the years, he said. Three crashes this year — the Air Florida B-737 crash into the Potomac River in Washington, D.C. January 13 following deicing problems, the skidding of a World Airways Boeing 727 off the runway and into Boston Harbor January 23, and the Pan American Boeing 727 crash into a residential area near New Orleans just after takeoff July 9 — all are attributable to prevailing weather.

It's a two-pronged problem, with each aspect reliant on the other for resolution. On one hand, pilots need immediate information about weather conditions such as thunderstorms and rapidly changing wind conditions. However, collection and transmittal of such information requires sophisticated technologies and procedures still in development phases.

Participants in the hearing repeatedly invoked results of current research into the incidence and detection of microbursts — highly localized downdrafts and rapid horizontal spreading of wind at the surface. Such a windshear, a probable cause of the New Orleans crash that killed 154 people, is expected to occur over several hours and on a scale of miles during summer in association with major thunderstorms. But the present project, called JAWS (for Joint Airport Weather Studies), at the National Science Foundation's National Center for Atmospheric Research in Boulder, Colo., showed that microbursts occur in seemingly innocuous clouds and on a small scale, less than a mile in diameter. They may last as little as five minutes. In a three-month pilot project ended August 15, a network of three Doppler radars in the Denver area detected about 50 microbursts, reports James Wilson of NCAR's Atmospheric Technology Division. He is principal investigator on the JAWS project along with John McCarthy, of NCAR, and Theodore Fujita of the University of Chicago, who first suggested that microbursts occur.



New Mexico Tech Photo

Thunderstorms can breed microbursts that endanger planes on takeoff and landing.

Microbursts are particularly dangerous as planes approach or take off from runways because the sudden shift in wind direction as the downdraft spreads can cause loss of lift on the wing. McCarthy, himself a pilot, says that when this happens "an aircraft doesn't have enough acceleration to keep climbing. In fact, it may lose enough lift that it begins a descent it can't recover from, and may even stall." The problem is more severe for large jets, especially on approach, he says, because if a large plane flying at reduced power for landing suddenly needs a lot more power, it takes about six seconds to get it, whereas a small piston plane can achieve full power in about half a second. It takes about 10 seconds, he says, to fly through a microburst.

The JAWS program is testing several systems, including ground-based pressure sensors that could correlate changes in pressure with wind change, and Doppler radar, which is promising in its ability to detect microbursts and windshear. Wilson expects the JAWS results to lead to recommendations for a Doppler radar network based at major airports across the country. The findings will be integrated into considerations of the NEXRAD, or next generation radar system, being planned by the National Weather Service, the Federal Aviation Administration, and the Air Forces Air Weather Service. NEXRAD will use a system of Doppler radar to replace the present, obsolete radar systems purchased in the late 1950s.

The question of where to place the costly radar network is still being debated. Dopplers require large antennas that could be unwelcome obstructions in airport vicinities. However, because microbursts are highly localized, it may not be desirable to have the Dopplers at any great distance from airports.

Researchers are trying to determine how to display and communicate weather data in a way useful to pilots in flight, and what combination of ground-based measurements, radar and satellite information best offers pilots the information needed to make a decision rapidly. —*C. Simon*

Crowding fails to faze chimps

Mammals exposed to crowded conditions often respond with increased aggression toward their companions. Laboratory studies have shown this phenomenon to be true not just for rats and other rodents, but also for primates like monkeys, macaques and baboons. Anecdotal data from the field suggested that the same relationship would hold true for chimpanzees as well.

But Kees Nieuwenhuijsen and Frans B. M. de Waal, of the State University of Utrecht in Arnhem, the Netherlands, report in the 1982 *Zoo Biology* (Vol. 1, No. 1) that although they found a "slight increase" in the number of aggressive interactions among chimps subjected to crowding, the amount of aggression was far lower than what has been observed in other mammals. The researchers made their observations of a colony of about 20 chimpanzees at the Arnhem Zoo over three winters and two summers. In winter, the animals are moved to an indoor hall that is only 5.4 percent the size of their outdoor enclosure.

While Nieuwenhuijsen and de Waal found no significant increase in aggression from summer to winter, they did notice an increase in some other activities, namely "submissive greeting" (a vocal exchange that recognizes dominance of one individual over the other) and grooming. They suggest that these behaviors may diffuse, or regulate, aggression in chimpanzees. And, because chimps are man's closest living relatives, they suggest that "it might well be that the effects of crowding on man will be less severe than on other species."

Robert Sommer, a psychology professor with the University of California at Davis who also has studied crowding, agrees that chimpanzees could exhibit less aggression in response to crowding than other mammals, but he questions the researchers' interpretation that the other behaviors were regulating aggression. These behaviors "aren't substitutes for aggression but are just other ways of expressing tension," he says. He is also concerned that all variables were not controlled and that seasonal changes — such as temperature, lighting and proximity to visitors — could also influence chimp behavior. —*L. Tangley*

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