Capricious cyclones and downbursts

In 1975, an airplane crashed in the Caribbean. The accident was attributed to pilot error. But a University of Chicago meteorologist, researching the crash, came up with a different answer. It was caused, according to Theodore Fujita, by a phenomenon he called a downburst: a sudden, uncharted, 50-to-60-mile-per-hour downward air current.

Just coining the term, which has been officially adopted by the National Weather Service, was not enough. Fujita decided if his discovery had such destructive potential, he'd better find out more about it.

He found that downbursts are, at best, unpredictable. They are several miles wide, may occur at any time, in any weather conditions (though more often in June and July when it's hotter), usually last about 15 minutes and can move 20 to 60 miles per hour horizontally. They can occur alone or with tornadoes, hurricanes and thunderstorms.

How to get a hold on such a willful beast? Fujita and his colleagues chose tornadoes as logical handles because downbursts occur with about half of all tornadoes and tornadoes can be detected easily.

Now the researchers have found that downbursts give tornadoes their capricious behavior, causing them to skip and weave down their destructive paths. Tornadoes should move in a straight path, he told SCIENCE NEWS, but "according to my study ... when a tornado makes a significant turn, it's caused by a downburst." On the other hand, he says, if the downburst is strong enough, it may "kill" the tornado. "It can be medicine or poison," he said. "An overdose can kill it, and the right amount can help it."

Fujita also estimates that 75 percent of the mobile home damage claimed to be caused by tornadoes is actually due to downbursts. On the basis of his study, it may be possible, he says, to prevent much tornado-related mobile home damage simply by securing the homes better. Tornado and downburst destruction can be distinguished using aerial photographs — which may aid in determining insurance claims. The downburst path ranges 10 to 20 miles wider than the tornado path and buildings appear smashed rather than scattered, he said.

So far, Fujita's project (called Northern Illinois Meteorological Research on Downbursts — NIMROD) has concentrated on northern Illinois — an area classified as a "tornado alley." Using three Doppler radar units and 27 automatic weather stations, Fujita has found that downbursts, though still unpredictable, can be picked up by the radar system. Several downbursts have been detected within eight miles of Chicago's O'Hare airport, he said. "This is the real success of the project. We have been able to detect downbursts 10 to 15 minutes away."

Such success may be most beneficial to aircraft, if the researchers can design a suitable radar system following completion of NIMROD in June. Based on earlier research, Fujita found that at least four airplane crashes — in New York, Denver, Tucson and Philadelphia — occurred in the last six years due to downbursts. □

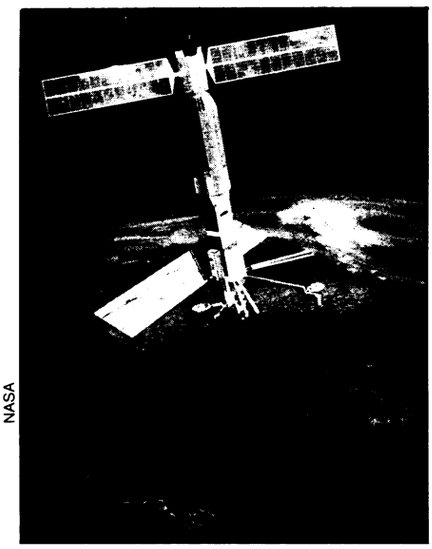
Seasat-A to monitor ocean surface

"It is *not,*" says Gene Gibberson, "just another weather satellite." In fact, Seasat-A is not really a weather satellite at all, even though its data will include such familiar quantities as temperature and wind speed. Scheduled for launch as early as June 24, Seasat-A will be concerned primarily with a single "level" of the earth below: the surface of the ocean.

It is not directly concerned, for example, with clouds, except to the extent that their water content must be measured to correct the readings from other instruments. Several of its devices, in fact, are microwave radar instruments that receive echoes of their own transmissions so that they can "read" ocean conditions in any weather, day or night, rather than depending on reflected sunlight. Nor is Seasat-A expected to provide vertical profiles of the atmosphere over a range of altitudes, nor of the ocean over a range of depths.

Instead, it will be devoted to measuring the heights and lengths of waves, to seeking paths through ice fields, to monitoring the temperatures and wind speeds right at the top of the sea. That's where the shipping is, where the fishermen go, where the navies sail and where the petroleum industry is towing increasing numbers of exploratory drilling rigs. There is also science, of course — project manager Gibberson (of Jet Propulsion Laboratory) predicts "a new era in oceanography" — and there is other Seasat interest from quarters as diverse as sea-floor mining and ocean thermal power.

Seasat-A: Looking down at the waves.



NASA

Seasat-A, although a NASA project, will be launched from Vandenberg AFB, Calif., in order to reach the planned 800-kilometer-high orbit from which it can cover 95 percent of the world's oceans every 36 hours. Designed for at least one year of duty, it will carry fuel for three. One major reason is that future Seasat launches will be done by the space shuttle, which will depend for near-polar missions on a Vandenberg launchpad that won't open before 1983. □

Shocking hydrogen in a Seyfert galaxy

Rare though it is on earth, hydrogen is the most abundant chemical element in the universe. Under the chemical conditions of the terrestrial atmosphere the most prevalent form of hydrogen is a molecule composed of two atoms, but in astronomical space the most widespread variety.

Molecular hydrogen is out there, too, but it has a harder time surviving, and it is harder for astronomers to find. Atomic hydrogen produces a characteristic radio signal at 21 centimeters wavelength; molecular hydrogen emits only infrared, and infrared spectroscopy is a touch more difficult than radio spectroscopy. Nevertheless, molecular hydrogen has been found in a number of places in our galaxy, and now it has been found for the first time in another galaxy. So report Rodger I. Thompson, M. J. Lebofsky and G. H. Rieke of the University of Arizona in the June 1 ASTROPHYSICAL JOURNAL LETTERS.

The galaxy where the molecular hydrogen has been found is NGC 1068, which is a Seyfert galaxy and therefore a highly interesting one for the first such discovery. Seyferts are peculiarly active galaxies for their sizes. They are compact spirals with bright nuclei and a status somewhere between normal galaxies and the extremely strong energy output for size of the quasars.

The presence of molecular hydrogen in a Seyfert galaxy both implies, and to some degree confirms, the presence of highly energetic processes. Molecular hydrogen can exist only in regions where there is a good deal of cosmic dust to shade it from infrared light, which would dissociate it into atomic hydrogen. It is in regions where there is a lot of cosmic dust that star formation takes place. To yield the infrared light observed, the hydrogen must be heated by shock waves, which come presumably from explosions. So the observation adds up to a lot of activity and a lot of new star formation in NGC 1068. □