

NEWS AND VIEWS

Can Hurricanes be Controlled?

PROJECT STORMFURY, the attempt by the United States to reduce the power of hurricanes by seeding with crystals, has just begun its 1970 experimental season. It is now eight years since the joint Department of Commerce/Department of Defense project was established, following preliminary experiments on Hurricane Esther in 1961. The verdict on the programme so far is that results have been promising but hardly startling; yet the need for success in hurricane control or modification is clear. As tracking and forecasting have improved, the death toll from hurricanes in the USA has been reduced from more than 8,000 between 1900 and 1909 to slightly more than 500 during the 1960s, but the increase in property damage has been equally dramatic. During the 1920s, hurricane damage totalled less than \$400 million (at 1957-59 prices) but rose to more than \$4,000 million during the last decade as the concentration of expensive buildings along vulnerable shorelines increased.

The principal object of Project Stormfury is to alter the conditions in the clouds surrounding the eye of the hurricane in order to bring about a redistribution of the energy concentrated around the storm centre. In theory, the injection of silver iodide particles into the clouds should convert supercooled water droplets to ice crystals, thereby releasing heat into the storm system. It is hoped that this heat will reduce the pressure adjacent to the low-pressure centre of the hurricane and thus reduce the pressure gradient across the wall of the eye, the region which produces the strongest winds.

But does it work in practice? The seedings of Hurricane Esther in 1961 and Hurricane Beulah in 1963 produced encouraging qualitative results. The

seeded portion of Esther's eyewall faded from a radar-scope that detects water droplets, indicating either a change of liquid water to ice crystals or the replacement of large droplets by much smaller ones. And soon after Beulah was seeded, the central pressure of the eye rose and the region of maximum wind speeds moved away from the storm centre.

But the really critical quantitative experiment was the seeding of Hurricane Debbie in 1969. By August 18, Debbie was a mature hurricane with maximum wind speeds exceeding 100 knots, located about 650 nautical miles east-north-east of Puerto Rico. On that day it was seeded five times in an eight-hour period, each time with 208 small silver iodide generators. Before the first seeding, maximum wind speeds at 12,000 feet were 98 knots. Wind speeds decreased after the second and third seedings; and five hours after the fifth seeding they were down to 68 knots—a reduction of 31 per cent (see diagram). The complete seeding procedure was repeated on August 20 when wind speeds decreased by 15 per cent, from 99 to 84 knots.

Whether these reductions were actually due to the seeding or whether they would have occurred naturally is a moot point, although available evidence suggests that it was more than a coincidence. Analyses of past storms show that the rates of decrease of wind speed observed on August 18 are rare, but not unknown, in unseeded hurricanes. Furthermore, on the intermediate day, August 19, when no seeding was carried out, wind speeds actually increased.

Even so, more experiments are obviously required; and first priority will be given in this year's programme simply to a repetition of the 1969 experiments in order to determine whether the results were typical. Attempts will also be made to seed features, such as rainbands, which lie further from the storm centre. The silver iodide generators to be used are chemically the same as before (78 per cent silver iodate, 11 per cent aluminium, 5 per cent magnesium and 6 per cent binder), and will be dropped on hurricanes—subject to availability—in the Atlantic, the Caribbean and the Gulf of Mexico.

The Department of Commerce is fond of pointing out that if hurricane modification research continues at the present level for a decade and if, in that time, one severe hurricane such as Camille can be weakened so that its damage is reduced by 10 per cent, the investment will have been returned ten-fold. Ostensibly, this is simply a comment on the worth of Project Stormfury, but it also suggests, perhaps intentionally, that the project is grossly underfunded.

