

will have equipment to take ocean temperatures even from 2000 feet up—because it is believed that appropriate surface conditions have much to do with the initial development of a hurricane and at present it appears that locally an ocean temperature of at least 80 degrees must be recorded; new devices to record vertical windspeeds within the hurricane have been installed, and each plane contains the necessary computing machines to facilitate the preparation of the data in suitable form for the forecaster by the time it returns to base. At the base, in a renovated Casino building at West Palm Beach, Florida, there is a special staff of some 30 meteorologists working on the project, and they have the co-operation of teams of experts at five universities who act in a consulting capacity. It is expected that the first three years will be spent collecting all possible data; then a couple of years working on the amended material, testing theories, and analysing results.

At present it is known that hurricanes and typhoons originate about 50 degrees north and south of the Equator, except in the South Atlantic, where conditions for some reason as yet not understood, do not give rise to them. They form over a warmed ocean surface, where the air has become saturated with moisture, and any local rising warm air produces condensation and rainstorms. Many bodies of such rising air cause squally conditions, and nothing more comes of them while others seem to set up a chain of events that lead on to further falling pressures, and an anti-clockwise circulation is set up. The condensation as the air rises releases heat, and supplies the energy for the incipient hurricane. Why this should occur in some places and on some occasions and not in others remains a mystery. Conditions in the upper layers of

the atmosphere must somehow be also just right, in order to supply the necessary impetus. Even so, there may be 10 days of stormy weather before the hurricane has really got organised and is under way. Data on this early period is vital, and so far quite inadequately collected. In 1937 Coast Guard cutters were actually sent out in an attempt to get such data—but the attempt was soon abandoned. During the war in both Pacific and Atlantic theatres, regular reconnaissance flights were made, and some amazingly good radar photographs looking vertically down on to incipient hurricanes were obtained, but these did little more than introduce scientists to the problems ahead.

Once the hurricanes are under way, the forces generated become staggering. Rising air in the central area may carry up moisture at the rate of a million tons per second, and the peak fury of the destructive winds at ground level is felt at up to 10-15 miles out from the centre or "eye" of the hurricane, with winds of 125 m.p.h., and local gusts that reach over 200 m.p.h. As far out as 75 miles from the centre, gale force winds are experienced. The whole circulating system may travel across the ocean at 20-25 m.p.h. with the heaviest downpours occurring as a "rain-shield" just ahead of the "eye," bringing as much as 2 inches of rain per hour.

Within the "eye" at the centre, there is usually an area about 20-30 miles across of comparatively calm air, and clear skies, all around which dense clouds are seen towering up to 30,000 feet. It is planned to drop special balloons, with radio transmitters into the "eye" of hurricanes, where they may be trapped, and can be used to send out continuous weather reports. Rockets are being used to go up to 70 and 100 miles above the hurricanes, equipped to take motion pictures as they go, in

a nose cone that can be later located and recovered by the Navy as it floats in the sea, sending out messages from its own small radio transmitter. By these means it is hoped to reconstruct a continuous three-dimensional picture of the progress of hurricanes.

The violent circulating winds whip up the surface of the sea particularly to the right of the path of the northern hemisphere hurricanes, and a storm surge is normally piled up, which may reach 10 or 15 feet, above the expected tide levels along the coasts and is often the most destructive part of the storm. Not until 1954 was any organised attempt made to chart these storm surges as they passed up the coasts.

Obviously, forecasting the direction of movement of a whole hurricane system is the critical task of the weather men, and much criticism has been levelled at the forecasters for lack of accuracy. No firm principles can so far be used, however, and in any case, adequate reports have often been lacking, particularly when a hurricane is moving well off-shore. The course of such a storm, too, is often highly erratic; last year the hurricane "Carol" was "dawdling" for four or five days off South Carolina when it quite suddenly made an overnight dash of 500 miles northward to New England, sweeping up the coast, bringing floods as well as violent winds. It was 2.0 a.m. when the Weather Bureau realised it was suddenly moving, and it was impossible to warn people then. Damage and loss of life resulted on a terrible scale.

Radar echoes from rain-drops, and on a radar-screen may be seen the pattern of the rain distribution around the storm centre. A series of radar stations is to be set up.

Some large industrial concerns have installed their own radar detection

equipment in the coastal regions, as it pays them to know just when to expect to close down their plant, and do it in an orderly fashion; or, in view of a general warning in the region, to watch for themselves the course of a hurricane and decide *not* to close down if it passes possibly 100 miles away—in such an event, saving enormous sums of money by carrying on.

The most promising lines of research on forecasting hurricane movements lie in the field of an elaborate assessment of the entire forces in the atmosphere surrounding the hurricane, and a prediction of tendencies in pressure changes ahead of it, for it seems that movement is strongly influenced by conditions all around. With adequate data, it seems quite possible to utilise electronic computing machines to assess such pressures and tendencies over an area as vast as 1000 miles square, and to do it for various levels in the atmosphere. Millions of computations can be done in an hour or two, and several predictions last year were extremely encouraging, some strikingly so.

Nothing can stop a hurricane in full swing, but it may eventually prove possible to modify local conditions ahead of it in such a way as to divert its course, to lead it by the hand, as it were, and so avert calamities that at present seem inevitable.

Before we can expect proposals for breaking up the conditions likely to produce the birth of a hurricane, or for diverting a violent hurricane off its later course, there is a vast field of detailed knowledge to be acquired; but it is satisfying and exciting to know that at last a major attack on the whole problem is being made and, though we in New Zealand do not have a direct stake in the ultimate solutions, we can take a close interest in progress towards ameliorating this terrible scourge of Nature.

## The Maidens of Hiroshima

IN the ruins of the high school and elsewhere young girls whose faces and bodies were scarred and crippled were among the victims of the atomic bomb dropped on Hiroshima 12 years ago. Because of their injuries, which time did not heal, most of these girls—the Maidens of Hiroshima—could not find work, and their disfigured faces caused them to withdraw from the normal life of their community into their own close circle. It was a Methodist minister, the Rev. Kiyoshi Tanimoto, himself a survivor of the bombing, who first brought them help and hope; and when an American editor, Norman Cousins, met Mr Tanimoto and, later, the girls, he started a movement to bring them to the United States for surgical treatment. Plastic surgeons and a New York hospital soon offered their services. How these efforts brought new hope to these young war victims is told in *The Maidens of Hiroshima*, a feature written, narrated and produced by Colin D. Edwards, to be heard from YA stations and 4YZ at 9.30 a.m. on Sunday, August 4—just two days before the 12th anniversary of the destruction of Hiroshima. In this programme listeners will hear the voices of many of those who were involved in this humane project—including the Maidens of Hiroshima themselves.

RIGHT: Hiroshima after the Bomb

N.Z. LISTENER, JULY 26, 1957.

