



The control console of the new WSR-57 radar at the Miami Hurricane Research Center. The entire system can be operated from the console which contains all operating controls, monitoring and metering indicators, RHI scope, A/R scope, PPI (direct and off-center) scope, and ranging unit plus all necessary power supplies. Photo courtesy of Gray & Rogers and U. S. Weather Bureau.

Notes on the National Hurricane Research Project

NEW WEATHER RADAR

THE first of 31 new high-powered WSR-57 radar systems was installed in July in the Hurricane Research Center at Miami, Florida. Other coastal and inland points will receive the new type radars during the next 12 months. A tentative installation schedule will be found on page 178.

The Weather Bureau radar system is designed to locate and plot precipitation areas and associated meteorological phenomena within a radius of 250 miles from a fixed

site. The system will operate 23 hours a day over extended periods of time in the face of a wide variety of climatic conditions. Three operating frequencies are available, each with a choice of three pulse widths. The equipment is designed to permit changing frequencies and pulse widths in a minimum of time so that varying types of meteorological events can be studied.

The system has two functions: (1) Searching—The radar set can be used as a search set to locate storm and precipitation areas

AIRBORNE WEATHER RECORDERS

The construction of detachable weather recorders to be flown on the Air Weather Service reconnaissance planes from Bermuda has been completed. These recorders, which are built into modified gasoline tanks and suspended from the wing, can be readily detached and shifted from plane to plane. They are photopanel recorders which will record latitude, longitude, wind direction, wind speed, frame counter, magnetic heading, air speed, pressure altitude, temperature, radar altitude, and time. They utilize the instruments already installed in the aircraft with the exception of the vortex thermometer and timer which are installed directly in the pod. Recording is by the photopanel method and the sampling rate can be varied at the discretion of the meteorologist aboard the plane.

STORM SURGE

The Weather Bureau is participating with others in a research program to investigate the mechanism by which wind energy is transferred to the sea in the generation of waves and storm surges. Two offshore research platforms operated by the Navy Mine Detection Laboratory south of Panama City, Florida, will be the scene of part of the program. The platforms are three miles from shore in 30 feet of water, and twelve miles from shore in 100 feet of water.

ROCKET PROGRAM

The Navy/Weather Bureau hurricane photographic rocket project will have ten complete heads available during the current season. They have been equipped with cameras which have a frame rate of three frames per second with a total film supply lasting 80 seconds. Frame size is $2\frac{1}{4} \times 2\frac{1}{4}$. A beam splitter has been designed so that the photographs are taken along axes at right angles to one another on each frame in order to increase the probability of photographing the area of interest.

HURRICANE BEACON

Plans have been completed for a series of hurricane-tracking beacon drops this season.

The range of the equipment enables the operator to locate these areas far enough away so that information gained as to their size and rate of travel can be used for advance forecasting of local weather.

(2) Analysis—the radar set can also be used to analyze storm areas. An off-center PPI permits enlarging a selected area for detailed study. A Range Height Indicator (RHI) provides an accurate indication of target altitude and slant range. A Range Indicator plots relative target intensity against distance in the form of a straight line graph. The antenna may be sector-scanned in either azimuth or elevation to permit concentrated study of a particular area. A remote PPI is provided primarily for photographic purposes.

DATA COLLECTION

Negotiations are proceeding with countries in the West Indies for continuation of the West Indies Rawinsonde Network. The agreement with Colombia has been concluded calling for a three-year continuation of a station at San Andres Island and for a new station at Bogota. An agreement has been reached with the Netherlands Antilles for continuation of the stations at Curacao and Sint Maarten. Negotiations are continuing with the French regarding the Guadeloupe station, with the Dominican Republic concerning the Sabana de la Mar location, and with the West Indies Federation for the observing points at Kingston, Jamaica, and Grand Cayman. Although negotiations with Mexico are proceeding rather slowly, it is expected that the rawinsonde station at Merida on the Yucatan Peninsula will continue and that there will be some expansion in the services elsewhere in Mexico.

AIRCRAFT PROGRAM

Three weather reconnaissance aircraft are being outfitted with new instrumentation and will be ready for the later part of the present hurricane season. A B-57 will be finished first and the DC-6's will follow.

The beacons which are equipped with a VHF radio transmitter will be dropped by the 59th Weather Reconnaissance Squadron operating out of Bermuda and will be tracked by aircraft of the Squadron. The beacons have been developed under the joint sponsorship of the Geophysics Research Directorate, U.S.A.F., and the Weather Bureau.

MACHINE PROCESSING

Plans have been completed for the installation of a 650 Computer at the National Hurricane Research Project headquarters in Miami. Data processing will commence this season. The new equipment will greatly speed the reduction of raw data which will be automatically recorded on magnetic tape in the new research aircraft.

RESEARCH UNIT

An experimental analysis program has been planned for the 1959 hurricane season. New types of analyses will be tested to assist in the solution of the hurricane prediction problem. The program includes the preparation of charts to show selected time section analysis at both low and high levels. Charts showing the distribution of precipitable water and other weather features will be maintained. It is planned to have several teams of research personnel work regular forecast and analysis shifts during the occurrence of an actual hurricane to test forecasts produced by various objective techniques. Statistics will be compiled for verification purposes and to furnish the basis for modification of the objective forecast techniques.

AMS Statement on Hurricanes

(Issued by the American Meteorological Society, June 1959)

HURRICANES affecting the United States are windstorms from the tropics in which the air revolves counterclockwise about a central calm area, the "eye." The strength of the winds must obtain at least 74 mph in order for a tropical weather disturbance to qualify for the title of "hurricane." Maximum wind speeds of 100-150 mph are quite common in hurricanes striking a coast, and as much as 200 mph has occurred according to estimates from structural damage.

The area affected by winds in excess of 74 mph may be as small as 30 miles in diameter, while in large storms this diameter may be as large as 100 miles. Outside of the high-wind core, most hurricanes approaching the United States have a large peripheral area in which the winds are less intense and diminish gradually with increasing distance from the center. The diameter of this peripheral circulation may be as large as 500 miles, but it is only the central area with winds above 74 mph for which hurricane warnings are issued. Most hurricane damage arises from inundations of coastal lands by the sea. Inland, heavy rains may produce river floods, especially in mountainous regions.

Rains in the peripheral zone seldom are damaging; more often they prove beneficial as relievers of drought.

Hurricanes are water-born storms. The ones affecting the eastern half of the United States originate in the Gulf of Mexico, the Caribbean Sea, and the tropical Atlantic Ocean. There are always precursors of hurricane formation. They start from weak weather disturbances; usually, though not always, a couple of days are needed for a hurricane to emerge from such a disturbance. When observations are available, these incipient centers can be clearly recognized and followed on weather charts. When intensification is suspected, military reconnaissance aircraft are dispatched to the crucial area to ascertain the state of development. When a hurricane or near-hurricane is found, it is present practice for reconnaissance aircraft to continue patrolling the storm until it strikes land or moves off into the central Atlantic Ocean. When the hurricane is close to the coast, it can be tracked with considerable accuracy with large shore-based radar sets.

From the foregoing statements, it will be seen that a surprise hurricane formation in the