

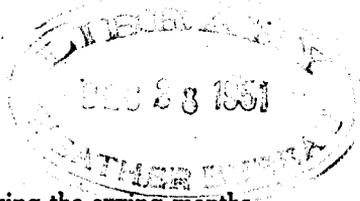
U. S. DEPARTMENT OF COMMERCE  
CHARLES SAWYER, Secretary

WEATHER BUREAU  
F. W. REICHELDERFER, Chief

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## REPORT OF THE CHIEF OF WEATHER BUREAU

YEAR 1949



Tornadoes in the Middle West and Southwest during the spring months, hurricanes in Florida and the Gulf States in September, and blizzards in the northern Plains States in January are rather normal meteorological occurrences, but during 1948-49 the frequency and severity of these storms broke records in many districts. In Oklahoma and northern Texas there were three times as many tornadoes as normal, the maximum number for one locality being six in the vicinity of Amarillo, Tex. In Nebraska, Kansas, and parts of adjoining States snowfall was so heavy and blizzard winds so severe that rail transportation was tied up at some points for weeks, and the Air Force and Corps of Engineers were called upon to carry emergency supplies to isolated communities. In Florida, although no records were broken, two severe hurricanes crossed the State during September-October 1948. That loss of life and damage to property were kept to a minimum is a testimonial to the improvement of the hurricane warning services of the Weather Bureau in recent years and evidence of its present effectiveness.

During the past year the Bureau gave special attention to research and development designed to increase the accuracy and scope of weather reports and forecasts in other phases of its meteorological services to the public. Many of these development projects were carried on in close cooperation with the research departments of universities and with the meteorological facilities of the Air Force, Navy, and Signal Corps. Of special interest but still unknown value is the research project financed largely by the armed services and carried on at the Institute for Advanced Study at Princeton where combined efforts are being made to develop mathematical techniques for prediction of weather. The project is based upon plans that would eventually utilize the electronics computer for work that is much too extensive and time-consuming to be solved in any other known manner. The results of this research are being watched with much interest. It has long been the opinion of many meteorologists that the future progress of meteorology depends upon development of mathematical methods for analysis of the causes and life cycles of weather phenomena.

# **National Oceanic and Atmospheric Administration Report of the Chief of the Weather Bureau**

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The first phase of the thunderstorm research project, begun in 1945, was nearing termination as the fiscal year closed. Detailed analysis of the results was scheduled for early completion and the final report was to be published promptly. It is evident that new devices for measuring significant elements in the formation of thunderstorms must be developed before much further progress can be made in identifying the factors which lead to severe turbulence and other storm conditions hazardous to aircraft. At the close of the fiscal year, plans for the next phase of severe storm research were being completed. This project is closely related to basic research in other weather conditions of importance to aviation and the general public. The research in cloud physics, for example, deals with phenomena in the atmosphere which are not well understood at present and which have to do not only with development of severe thunderstorms but also with plans for artificial production of rain and other forms of "weather control," about which much has appeared in the press during the past year. The best meteorological evidence is that the practical usefulness of these artificial methods is limited to certain infrequent situations. These research subjects all come within the provisions of Public Law 657, Eightieth Congress, which emphasizes the importance of research and development in the meteorology of severe storms.

Other special activities of the Bureau during the past year included a further improvement in the system of weather reports from the Far North in cooperation with the meteorological service of the Canadian Government. These reports are essential for the weather map of the Northern Hemisphere and furnish the first information of development of cold air masses in the Arctic which lead to blizzards and cold waves in the United States. The Bureau's cooperation in the rehabilitation of the Philippine Meteorological Service continued through the year and it is expected that by spring 1950, as scheduled, the Philippine service will again be prepared to continue without assistance of Weather Bureau personnel.

In the field of international cooperation, it is noteworthy also that the Bureau's work in training meteorologists in Latin-American Republics and its collaboration in world-wide development of meteorological services through the International Meteorological Organization are important factors in the improvement of meteorological services in the United States because the services are so greatly dependent upon exchange of weather information with other countries. The International Meteorological Organization continued its plans for adoption of the Convention which will establish the World Meteorological Organization. At the close of the year, 18 of the 30 ratifications required for adoption had been attained. Further plans were made for affiliation of the organization with the United Nations under UNESCO.

The regular services of the Weather Bureau operated essentially as described in the annual report for the previous fiscal year except that it was necessary to close 12 field stations of the Bureau because the increase in operating expenses incident to rising costs could not be met under current appropriations. A survey of regional administration led to the conclusion that regions 3 (Kansas City) and 5 (Chicago) could be consolidated at Kansas City without serious loss in administrative coverage and efficiency and with some reduction in administrative costs. This consolidation had been almost completed at the close of the fiscal year.

During the year the Bureau operated 387 regular service field offices. Nineteen of these were general forecasting centers, 22 of them served as domestic aviation forecasting centers, 12 as international aviation forecast-

ing centers, and 26 as flight advisory centers. The number of field offices designated for special hurricane services, fire-weather services, horticultural and climatological centers continued the same as in the previous year. Two hundred and fifty-one of the field stations were equipped to give local aviation weather services. The network of climatological stations manned by unpaid observers remained at approximately 6,600 during the fiscal year. In addition, there were more than 2,500 river stage observing stations. These cooperative stations continued to render outstanding public service as the basis for the climatological and river and flood forecasting functions of the Weather Bureau.

(Reprint from 37th Annual Report of the Secretary of Commerce)

## YEAR 1950

The United States Weather Bureau is responsible for providing the meteorological observations and reports, the weather forecasts and the storm, cold wave, and flood warnings required for aeronautics, agriculture, commerce, navigation, and the general public. In order to meet national and local needs for daily weather information used in planning activities in the air, on the ground, and at sea, and for protection of life and property in a country with weather conditions and business activities as diversified as they are in the United States, it is necessary for the Bureau to collect some 10 to 15 million weather reports and publish more than a million separate weather forecasts and warnings each year. During fiscal 1950 the needs for these services in our expanding air commerce and in agriculture and industry and the demands for research and development in meteorology for civil and military requirements of the country were greater than ever before. Through reductions in staff and facilities to a critically low level in some localities, the Bureau managed to satisfy the most urgent new requirements in other localities, but this was accomplished only through overtime work and, in many instances, employees' sacrifice of annual leave. The Bureau's offices in comparison with its Nation-wide responsibilities are considerably below the usual standards in staff and equipment. Its administrative costs are among the lowest.

### *ADMINISTRATIVE ECONOMIES*

Despite traditionally low costs of administration the Bureau during 1950 made further reductions through consolidation of several administrative centers in the field. The seven regional offices in continental United States were consolidated into four, and seven weather records processing centers established a few years ago to supersede the processing of climatological data by hand were reduced to three. Again, in order to facilitate study of field problems and developments through exchange of views between field officials and central office project leaders in technical and scientific matters, the work of field inspection and field correspondence was brought into direct relationship with the central office. These changes not only have made possible the elimination of some of the workload of regional offices, but also have aided program planning and management.

### *WEATHER SERVICES*

The accuracy of weather forecasts, which for common purposes averages about 85 or 90 percent, is always open to improvement and the Bureau has continually sought new techniques to give more exact results and permit extension of the forecasts for longer periods in advance. For several years the Bureau has experimented with a very general 30-day outlook for temperature and precipitation. After information of this longer range forecast reached the public there were repeated demands from business and

industry for its publication. Accordingly, during the year the 30-day outlook was made available through press and radio summaries. Although the outlook is experimental and far from complete in its development, reports from agricultural and commercial users testify to its economic value in planning their longer term operations. Another improvement in weather information services was introduced through a wire-photo weather map by which press associations give wide distribution to the map. Through cooperation of the telephone company the system of forecast distribution by automatic telephone was installed at Cleveland, Ohio, bringing to eight the number of cities which now have this service. Individual telephone calls for this service number about 50,000 per day and on stormy days exceed 200,000, a further evidence of the public interest in and value of this weather forecasting service.

In the South, weather forecasting for cotton growers was amplified to contribute to effectiveness of insecticide dusting and spraying for boll-weevil control and other phases of cotton cultivation, processing and marketing. This is one of several special services rendered to agriculture by the Weather Bureau, services which are instrumental in increasing production and preventing damage to crops in amounts worth many millions of dollars each year.

The growth of nonscheduled flying disclosed deficiencies in weather information for operation of private aircraft. Through conferences with representatives of nonscheduled flyers, the collection and dissemination of in-flight weather reports and other services for the private pilot have been improved. Facsimile weather maps have been installed in several Weather Bureau offices for use in pilot briefing and augmenting forecast services to the public. A definite program for future development through cooperation with State aviation officials has been organized. As a further aid in developing the best use of meteorological facilities for service to all branches of aviation, a CAA-WB planning group has been established. The group gives special attention to coordination of the field activities of these two agencies.

#### *OVERSEAS WEATHER SERVICES*

Through the regional conferences of the International Civil Aviation Organization and through the coordinating facilities of the International Meteorological Organization, weather reports and forecasts for international air commerce have been extended and improved. Among the several activities carried on by the Bureau under its responsibilities for international cooperation was its pilot briefing in Korea. Under the ECA program there the Bureau provided meteorologists who furnished flight weather forecasts to pilots and assisted in the training of Korean nationals who will take over the service eventually. Two Weather Bureau employees at Kimpo Airport near Seoul were among the last to be evacuated in 1950 when hostilities arose.

The work of the Bureau under the Philippine Rehabilitation Act of 1946 was brought to a conclusion on June 30 and members of the staff who had assisted in this project for several years returned to the United States. The Philippine Weather Bureau is now maintaining its national meteorological service with modern, well-equipped field stations and a competent forecasting center in Manila. Many Philippine meteorologists in key positions received special training during a year or more of study in the United States. The Manila forecast center serves not only aviation but also the extensive marine interests in that area and the general public. Its typhoon warning system for the islands and adjacent seas is the counterpart of the hurricane warning service in the United States. The library of the Philippine Weather Bureau, completely destroyed during Japanese occupation, has been partially restocked with books provided by the Weather Bureau from surplus in this country.

The network of Arctic weather stations established and operated through cooperation of Canada, Denmark (Greenland), and the United States, was augmented by establishment of a new station at Alert on the northern tip of Ellesmere Island about 450 miles from the North Pole. The station was opened on April 9, 1950, by personnel and matériel transported entirely by airlift through collaboration of the Royal Canadian Air Force, the United States Air Force, the Meteorological Office of Canada, and the United States Weather Bureau. Other stations in the Arctic were resupplied during the summer through transportation services furnished by the United States Navy. The Air Force provided airlift for less extensive fall and spring resupply. The daily weather reports and upper air soundings from these stations are vital to preparation of complete weather maps for the Northern Hemisphere from which forecasts of cold waves and other weather conditions affecting the United States are made.

Through special authorization by Congress two new weather stations were established in the Hawaiian Islands to meet growing meteorological needs in the Pacific. These stations at Hilo and Lihue furnish complete synoptic weather observations and upper air reports. The Bureau, recognizing the meteorological importance of Midway Island in the Pacific, provided a skeleton staff to continue weather observations there after the Navy closed its long-established weather station. When hostilities broke out in Korea the weather reports from this station proved their worth in the emergency airlift for support of military operations in the Korean area. In June, preparations were under way to strengthen meteorological services at Wake Island in mid-Pacific in further aid to increased air operations in this region.

#### **RESEARCH AND DEVELOPMENT**

In comparison with the importance of its meteorological problems the Bureau's research offices are small, but through cooperative projects with

49-50

other research institutions several important projects beyond those of its own staff were carried on during the year. One of the most promising, although still uncertain in its possibilities, is the forecasting of weather by numerical process based on the speedy calculations of the electronic computer. Because of the complexities of these problems and the inadequacy of present mathematical theory, the project is still in its preliminary stages.

Through funds transferred by the Atomic Energy Commission a weather station was established at Idaho Falls, Idaho. The meteorological work of the Bureau in connection with work of the Commission was continued from previous years at other laboratory sites.

In fundamental physical research the Bureau's research staff worked primarily toward design and installation of apparatus for simulating in the laboratory the processes of the free atmosphere. These studies look toward solving some of the mysteries of cloud and rain formation and providing knowledge essential to greater accuracy in weather forecasting. A pressure chamber for careful observations of the behavior of falling water droplets through distances of about 800 feet has been completed and research in the temperature, humidity and other characteristics of droplets is under way. The results are indicative of processes that enter into the formation and dissipation of clouds and storms under natural conditions.

Among other developments were the installation of radar equipment in Weather Bureau offices at Burrwood, La., Miami, and New York for experimental use in local shower and thunderstorm forecasting; an end-of-the-runway weather observation project in cooperation with the Air Navigation Development Board for improvements in ILS (instrument landing system) landings; a new ceilometer system to improve measurements of cloud heights; a study of line-squalls and associated barometric records looking to relationships which would permit more definite forecasting of tornadoes; and further development of machine card tabulation and analysis in study of atmospheric pollution, airport planning, high-level flight and agricultural correlations. The treatise on recent research in formation and mechanics of thunderstorms was published in a volume entitled "The Thunderstorm" and distributed in May 1950. In the machine processing of weather data, the huge collection of records in the punched-card library of the Weather Bureau, Air Force, and Navy at New Orleans gave the principal working material. The recently developed electronic flood routing machine has speeded up the accurate analysis of data for flood forecasting. Additional units of this equipment have been procured for installation in the Bureau's river forecasting centers on the principal river systems.

On June 30, 1950, the Bureau had 4,521 full-time employees, 3,372 part-time employees, and 8,440 cooperative observers who serve entirely without pay. The number of full-time employees was 127 less than in 1949. Cooperative and part-time observers were not greatly increased in number during the year. As has been the case throughout the history of its 80 years of

operation, the Weather Bureau is deeply indebted to its many cooperative observers and cooperating agencies, notably the CAA, the Coast Guard, and the military departments, who provide many of the weather observations and reports in the vast system of synoptic reports for the hemisphere weather maps without which the extended forecasts and warnings of destructive weather conditions could not be successfully made.

**(Reprint from 38th Annual Report of the Secretary of Commerce)**