Observational systems and data problems relating to improvement of the forecast system are continually being studied and evaluated. The work in this area touches on many basic questions that the Service must answer which means that a high degree of co-ordinated effort is necessary. For example, in one area, remote sensing satellite meteorology will have a very strong impact on the whole question of the quality and make-up of the atmospheric data base which, in turn, is related directly to the efficiency and effectiveness of the forecasting system.

Meteorological applications. The AES provides consultation, advice and information on the effects of weather and climate on a wide range of activities such as water resource management, agriculture, forestry, transportation, communications, industry, construction, air pollution control, aviation, tourism and recreation. The hydrometeorology and marine applications component is involved in the application of meteorology to the solution of problems of both the fresh and salt water environment. Analyses and studies are undertaken for the efficient design and operation of dams, power developments, storm sewers and other hydrologic structures, and for improved forecasting of lake levels, river flows and floods. Increased attention has been given to techniques for improving storm surge forecasting and to wind-wave climatologies required by both the shipping and oil drilling industries. Many of the programs are co-operative, interdisciplinary and interagency in nature; some are international and others are federal-provincial in character.

Climatic analyses and studies in support of natural resources, arctic exploration and development, industry and commerce are conducted within the Service itself, by the assignment of personnel to other agencies, through co-operative programs, or through contracts. Arctic studies are made in support of oil and mineral exploration, pipeline construction, the selection of airports, town and mining sites, the design and operation of communication systems, transportation and operations in severe cold weather. Topo-climatological studies, using mobile and stationary sensors, are a basis for optimum land use and town planning; engineering studies are undertaken in support of the construction industry and analyses are used in the National Building Code; and ice accretion climatology and wind loading problems are studied to aid in transmission design.

Instrument research and development. The gathering of quantitative atmospheric data is a basic requirement for knowledge of the past and present, and prediction of the future weather. To accomplish this, instrumental measurements of the atmospheric variables are taken at 2,500 representative surface locations in Canada and the vertical structure of the atmosphere is probed to 100,000 ft at a network of 38 stations by means of rawinsonde balloon ascents. In all, approximately 55 different types of instruments and instrument systems are used in operational measurements and a number of other types in specialized investigations. Continuing research and development are directed at improving existing measurements as well as in testing instruments to meet new needs. Some of the more noticeable areas where effort is expended are described here.

A new second generation automatic weather station is currently being installed at various locations throughout Canada. These computer-interfaced stations represent a breakthrough in the processing of observational data. The station reports observations directly into a central computer which processes the data. The data are then coded and distributed on the national teletype system. These observations and reports are comparable to observations from existing sources.

The development of ancillary processing equipment for use with weather radar is well advanced. The equipment under test involves a system controlled by a mini-computer which accepts the input from a C-Band weather radar. This radar is programmed to scan a horizontal volume of air of approximately 10,000 sq miles in area centred on the station to a depth of 30,000 ft above the surface. The computer sorts out the returns from the radar and issues a quantitative cross-sectional map of precipitation intensity of four levels from 5,000 to 30,000 ft superimposed on an area map. This information may be transmitted by telephone circuits for the information of a variety of users such as weather forecasters. To supplement data from manned C-Band radar sites, a new Radar Remote Output Monitoring System (RROMS) is being developed and tested. This system will be designed to supply on a paper chart a simple graphic representation of weather conditions observed by the scanning radar.