

Service for the year ended March 31, 1972, amounted to \$4.5 million. In addition, assistance in the form of grants and contracts in the field of meteorology carried out by Canadian universities amounted to about \$386,000.

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. In the field of hydrometeorology, which involves that portion of the hydrologic cycle which is affected by or which affects the atmosphere, the main processes of interest are precipitation, energy exchange and evaporation. Specialized studies are carried out on storms, meteorology of lakes and rivers and the water balance of the natural environment. Many of these are of a co-operative, interdisciplinary and interagency nature, some in connection with international programs and others in relation to flood and water supply forecasting.

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. Topoclimatological studies, using mobile and stationary sensors, are a basis for optimum land use in fruit production and town planning; engineering studies are undertaken in support of the construction industry and analyses are used in the National Building Code; and an ice accretion climatology is being developed to aid in the design of support towers.

Atmospheric processes research. Progress continues in theoretical meteorology by using the basic dynamic and thermodynamic equations in conjunction with large computers. Topics studied include: energetics of atmospheric circulations; modes of development in extratropical and tropical cyclones; influence of moisture exchanges on the synoptic circulation; and new physical and mathematical modes for studying and forecasting circulation patterns.

Studies of atmospheric motions ranging from about one mile horizontally up to about 100 miles (mesometeorology) are of great importance in local weather variability and are of basic importance for air pollution control.

The study of radiation, both solar and terrestrial, is of fundamental importance in respect to atmospheric energetics and information on radiation is of great value in many human activities. Research programs include: basic properties of radiation instrumentation, their design and standardization by international comparisons; development and use of radiometersondes for measuring radiational variation with height; and use of radiation data for a number of applications including atmospheric dynamics, agriculture, and construction.

The atmosphere above 30 km contains only 1% of the earth's atmosphere but the nature and extent of the interaction, both physical and dynamic, between this region and the underlying atmosphere require examination. The coupling mechanisms, through circulation and radiative processes, require study both from the viewpoint of downward energy propagation and climatic modification, and upward in relation to radio communication and flight through these regions. Studies include: the measurement of ozone in the atmosphere both from ground-base systems and by Nimbus 4 Ozone Experiment Data Evaluation. Nimbus 4 was successfully launched from Vandenberg Air Force Base on April 18, 1970. The satellite has a near-circular orbit at 1,100 km above the earth and is close to the local noon/local midnight meridian. Backscattered ultraviolet instrumentation is used in the evaluation. High-level ozone profiles for the region above the main ozone maximum have been evaluated for over 30 orbits.

Air quality research includes the development of an air pollution climatology for Canada, experimental plume-rise studies, urban and regional multiple source dispersion, wind-tunnel modelling, visibility trends in Canada and the development of air quality indices, studies of the effects of pollution on climate and studies of urban meteorology.

Important additions to the research programs in air quality are environmental impact studies for existing and proposed industrial sites. In the past year, these special short-term investigations have taken on great importance as a result of the growing public concern about