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CANADA AND THE WORLD METEOROLOGICAL ORGANIZATION

(Prepared by the Atmospheric Environment Service of Environment Canada, Downsview, Ontario.)

The World Meteorological Organization is one of 13 Specialized Agencies linked with the United Nations through special agreements arranged by the Economic and Social Council and approved by the General Assembly and by the organization concerned. The Specialized Agencies of the United Nations are expert in their respective fields: labour, health, education, food and agriculture, finance and banking, civil aviation, postal matters, telecommunications, meteorology, international development and maritime matters.

History

Weather and climate move across the earth's surface without regard for national boundaries and thereby create similar problems all over the world. Realizing that large-scale international co-operation was necessary to solve these problems, the nations of the world have made a common effort to apply available knowledge of the weather and its evolution to the main activities of man. Canada, occupying as it does a considerable portion of the northern hemisphere, including a large part of the meteorologically-vital Arctic, became one of the earliest participants in this international exchange of weather data.

From 1853 on, efforts were made to draw up a program of meteorological observations over the oceans, based on the collaboration of shipping belonging to most of the maritime countries. This was 14 years before Confederation made Canada a nation.

In 1873, the First International Meteorological Congress was held in Vienna. This event is generally considered as marking the beginning of organized international co-operation in meteorology.

In 1878, the International Meteorological Organization, composed of the directors of national meteorological services, was created during an international conference at Utrecht in the Netherlands. The infant Meteorological Service of Canada, established in 1839, was not represented at this meeting.

In 1882, the head of the Canadian Meteorological Service, C. Carpmael, sent a full report of the state of the Canadian service to the second meeting of the International Committee held at Copenhagen that year.

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During the present century, the tremendous development of transport and communications (sea and air navigation, radiotelegraphy and, more recently, meteorological and communications satellites) and the increased requirements of modern economic activity have given rise to a large number of technical problems, as well as unprecedented opportunities for improvement. A universal appreciation of the importance of meteorology, coupled with the surprising development of technology, has enabled this relatively young science to make considerable progress. These new developments showed that reorganization at an international level was necessary in view of the increased interest in meteorology.

Consequently, the Conference of Directors of the National Meteorological Services, which met at Washington in 1947 under the auspices of the International Meteorological Organization, adopted the World Meteorological Convention establishing a new organization founded on an agreement between governments. Just prior to this Conference, Canada had played host to the sessions of the Technical Commissions of the IMO, which met in Toronto in the summer of 1947.

The Convention adopted at Washington was ratified by a large number of states, and in 1951 the new World Meteorological Organization became active, the IMO having been dissolved. Furthermore, the General Assembly of the United Nations approved, in December 1951, the agreement between the United Nations and the World Meteorological Organization. The latter was thus recognized by the United Nations as a Specialized Agency.

The objectives of the WMO are:

- (1) to facilitate international co-operation in the establishment of networks of stations and centres to provide meteorological services and observations;
- (2) to promote the establishment and maintenance of systems for rapid exchange of meteorological information;
- (3) to promote standardization of meteorological observations and ensure the uniform publication of observations and statistics;
- (4) to further the application of meteorology to aviation, shipping, water problems, agriculture and other human activities;
- (5) to encourage research and training in meteorology.

Structure and activities The administrative and technical machinery of the WMO consists of:

- (1) A World Meteorological Congress in which 138 member countries and territories are represented by the heads of their meteorological services. It meets once every four years to adopt technical regulations on meteorological practices and procedures and to determine general policy. The Sixth Congress was held in Geneva from April 5 to 30, 1971.
- (2) An Executive Committee that supervises the carrying-out of resolutions of the Congress, initiates studies, and makes recommendations on matters requiring international action. It provides members with technical information, advice and assistance. It meets at least once a year, its membership comprising the President and the three Vice-Presidents of the WMO, the President of the WMO's six Regional Associations, and 14 elected members.
- (3) Six Regional Meteorological Associations (Africa, Asia, South America, North and Central America, Europe and the Southwest Pacific), composed of member countries whose meteorological networks lie in or extend into the region.
- (4) Eight Technical Commissions established by the Congress to study and make recommendations on technical subjects including aeronautical, agricultural and marine meteorology; operational hydrology; special applications of meteorology and climatology; basic systems; instruments and methods of observation; and atmospheric sciences.
- (5) A Secretariat under the direction of a Secretary-General.

The Sixth Congress approved a revised implementation plan for the World Weather Watch (WWW) for 1972-76. This plan does not represent a new beginning or a sharp break in continuity from the earlier plan for 1968-71; rather, it proposes the direct, logical continuation and development of the WWW as the global meteorological operational system. This system makes available to each member the basic meteorological and other related environmental information it requires in order to enjoy the most efficient and effective meteorological service possible. The plan for 1972-76 differs from its predecessor primarily because it incorporates the results and experience of all members and constituent bodies of the Organization in working together to implement the plan. Furthermore it reflects the many scientific and technological developments in meteorology during the previous four years.

In brief, it can be stated that the WWW is a basic program that provides support for and benefits from the WMO Research Program and the WMO Program on the Interaction of Man and his Environment, and that these three programs are complemented by the WMO Technical Co-operation Program and the WMO activities in education and training. The intent of the WWW is to establish throughout the world facilities meeting minimum standards for weather observations, data-processing, communications, education, training and research. The program is based on the following principles:

- (1) All activities under the WWW on the territory of individual members are in principle the responsibility of the countries themselves.
- (2) Where national resources are inadequate, financing from outside is arranged by bilateral or multilateral agreements, through the United Nations Program or, where necessary, through a WMO Voluntary Assistance Program (VAP);
- (3) WWW implementation in regions outside national sovereignty (oceans, Antarctica, outer space) is based on voluntary participation of members.

The WWW is a system by which co-operation and efficiency are fully exploited. Three World Meteorological Centres -- at Washington, Moscow and Melbourne -- are responsible for providing global analyses of weather patterns and large-scale, long-range forecasts of the basic processes taking place. Regional meteorological centres serve many of the common needs of countries and avoid much duplication of effort within a region, and national meteorological centres, operated by individual nations, in turn provide the full range and number of weather services appropriate to the needs and the developing resources of each country.

The WMO does not merely draw up regulations. It also carries through projects of interest to all states, calling for action on more than a national scale. The Organization's program includes assistance to member countries in developing their water resources, participation in tropical research, assistance in overcoming serious world-wide or regional deficiencies in meteorology. Weather forecasting for agriculture, international comparison of meteorological instruments and publication of a wide variety of international manuals and technical studies are other examples of the Organization's work. In recent years, the WMO has been giving close attention to such matters as air-quality, the meteorological aspects of ocean affairs and operational hydrology.

weather science by means of fellowships, scholarships and courses. Experts are appointed to contribute their experience and skills and to co-operate with national authorities in solving the problems of the countries concerned. The Organization is responding to the recommendations from the United Nations Conference on the Human Environment (Stockholm 1972) and is participating in the implementation of the United Nations Environment Program, both at the global and regional level.

Canadian participation

The Atmospheric Environment Service (formerly the Canadian Meteorological Service) has always played an active part in international meteorology. The first meeting of some of the Technical Commissions after the WMO was founded took place in Toronto in 1953. In 1954, and again in 1959, the Commission for Aeronautical Meteorology held sessions in Montreal simultaneously with the Meteorological Division of ICAO. The Commission for Agricultural Meteorology met in Toronto in July 1962. The joint fourth session of the Commission for Aeronautical Meteorology and the Fifth Air Navigation Conference of ICAO was held in Montreal in 1967. An extraordinary session of the Commission for Aeronautical Meteorology (a conjoint session with the sixth Air Navigation Conference) was held in Montreal in April 1969, and a further extraordinary session, to be held conjointly with the eighth Air Navigation Conference, is scheduled to be held in Montreal in April-May 1974. The head of the Atmospheric Environment Service is a member of the Executive Committee and is also President of Regional Association IV (North and Central America). Members of the Atmospheric Environment Service have served on all Technical Commissions, either as chairman, full member, or technical adviser.

Canada has undertaken to add the few additional observing stations needed in accordance with the World Weather Watch plan, and its communications system has been converted to an automated system. The Canadian Government has contributed \$500,000 since 1968 to assist developing countries in the implementation of improvements required of them by the World Weather Watch plan.

Canadian ships on the high seas report their weather by radio to the nearest land-station, and receive in return forecasts and storm-warnings for the area through which they are sailing. In return, vessels of foreign registry frequently provide reports of their local weather to Canadian coastal stations, and receive Canadian forecasts and storm warnings for marine areas contiguous to the Atlantic and Pacific shores of Canada. There is no charge for transmissions to ships. The national weather service in question bears the cost of transmitting the ship reports to its own forecast centres and to those of neighbouring states. Under

The WMO also keeps abreast of the spectacular current developments in science and technology and uses them to obtain a better understanding of the atmosphere. The meteorological satellite is undoubtedly the most important single development in meteorology in many years. Progress in this field is extremely rapid and a broadening of its potential in the coming years is certain.

The WMO also takes part in arid-zone research and contributes to the development of arid lands by studying the climatic conditions knowledge of which would help to improve living conditions in these areas. Locust-control and the protection of crops from this pest is a collective undertaking to which the WMO contributes. Another important activity of the Organization is to encourage by all possible means scientific research and instruction in meteorology.

The Global Atmospheric Research Program (GARP), one of the most complex and ambitious international research projects ever conceived, is being jointly planned by the WMO and International Council of Scientific Unions (ICSU). Steps have been taken to initiate the first phases of this program, notably a large experiment in the tropical Atlantic Ocean (GATE) designed to study the small- and large-scale motions in the tropics. The results from this experiment, to be held in the summer of 1974, will be used in developing a final design for the First GARP Global Experiment (tentatively scheduled for 1977). The latter will be a comprehensive attempt to define the circulation of the whole atmosphere up to a height of about 30 km, using modern observing techniques and data-processing facilities. There is convincing evidence that the realization of the basic elements of GARP is essential for developing an optimum plan for the WWW global observing system and equally for the effective use of such a system once it has been created. Thus, the two programs complement each other. GARP is the research phase of WWW and, conversely, WWW provides necessary facilities without which a research program of the magnitude of GARP could not be realized.

An information periodical, the *WMO Bulletin*, keeps members and all interested persons informed of the Organization's activities and new developments in meteorology generally.

The WMO plays a very active part in the United Nations programs of technical co-operation and assistance towards economic development. It provides advice to facilitate the establishment and development of national meteorological services. It also promotes the training of meteorologists and specialists in all branches of

the aegis of the WMO, a substantial increase has also taken place in international co-operation by the facsimile exchange of analyzed weather-maps among the countries of the northern hemisphere.

Through the good offices of the WMO and other organizations, there exists an agreement to operate ocean weather-stations aboard ships located in the Atlantic and Pacific. Reports from these ships greatly facilitate transoceanic flights by Canadian air-carriers. Canada operates "Station Papa" in the Pacific, 900 miles west of Vancouver. One of Canada's ocean weather vessels, the C.C.G.S. *Quadra*, will take part in the GARP Atlantic Tropical Experiment. Not only will it serve as a platform for the regular and highly-specialized oceanographic and meteorological observations called for but as a communications centre for the relaying of messages to and from the many aircraft and ships participating in the experiment and to and from the data-collection shore-based centres.

The meteorological history of Canada and of other WMO members is filled with almost daily examples of the benefits of international co-operation in meteorology. The tracking and forecasting of the life-history of hurricanes (e.g. Hurricane "Hazel" in October 1954) is a tribute to the co-operation achieved internationally through the WMO. In September 1973, the international community celebrated a century of international co-operation in meteorology. The centenary was celebrated in Vienna, where the first International Meteorological Congress met, and in Geneva, where WMO headquarters are located.

Canada pays 2.6 per cent of the regular budget of the WMO. In 1974 the net budget of this Organization for assessment purposes will be \$6,750,030 (U.S.).

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