

A CENTURY OF CANADIAN METEOROLOGY

by M.K. THOMAS

INTRODUCTION

The first Europeans who came to Canada, whether to explore and conquer, to teach and Christianize, or to trade and settle, learned the meteorology and climatology of Canada by hard experience. The first Canadians, the Indians and Eskimos, had adapted their way of life to the climate — their shelter, their clothing, their religion and their customs, were all shaped and moulded to meet the exigencies of the weather although perhaps their comfort standards were not equal to those which were demanded by the Europeans. As agreeable and pleasant as the summers often were, the Canadian winters always caused distress to newly arriving Europeans! However, the new Canadians learned quickly, borrowing in many cases from the Indians: clothing and dietary customs were changed, architecture was modified and habits and customs were altered in acknowledgment of the North American climate. Fortuitously, Canada was settled during the same century that the science of meteorology was being developed and put to use. Consequently, the Canadian meteorological service was launched shortly after Confederation and at about the same time as national services were established in the United States and in the old countries of Europe.

Meteorological observing activities began in British and French North America more than a hundred years before Confederation. The first observations of which we have any record today were taken in the 1740's at Montreal, and there was another short series observed in 1768-1769 at a location near Churchill, Manitoba. In the next century there were many weather diarists, but it was not until 1839 that the first official weather station was established — the Toronto Magnetic and Meteorological Observatory. The national service was organized at this observatory in the years following Confederation, and the next 60 years saw slow but steady progress made in expanding the service across the country. This era ended in the economic depression of the early 1930's, but the scientific groundwork had been laid for the significant advances in operational meteorology that were to come in the following era.

The tremendous and rapid development of aviation, especially during World War II, and the resulting demand for meteorological services, led to a tenfold increase in the size of the meteorological service during the second era from 1933 to 1946. With marked expansion of research and services the post-war quarter century, 1947-1971, proved to be another remarkable era — one that is still very fresh in the minds of most Canadian meteorologists and thus probably not really assessable yet. Finally at the close of the first century of a Canadian meteorological service, the federal Department of the Environment was created and meteorology was united with other services having to do with the environment. Within Environment Canada, the Atmospheric Environment Service will be able to provide not only better and expanded meteorological services, but also to assist Canadians in both the use and preservation of our environment.

OBSERVATIONS AND OBSERVATORIES

Beginning with Jacques Cartier in 1534, explorers, traders and missionaries noted and recorded weather events and impressions of Canada's climates in diaries, letters and reports. The first dated comments on the weather of which we have record were made in 1619 in the Hudson Bay area. Probably the best records were those kept by Arctic explorers and garrison soldiers, since reporting natural phenomena was often included in the duties of both groups of men.

Prior to the establishment of the Toronto observatory the first regular scientific series of observations of which we have record are those taken during the 1740's and 1750's in Montreal by Dr. J.F. Gauthier, and subsequently published by the French Royal Academy of Sciences. Another early series was recorded at Prince of Wales Fort (Churchill, Man.) on the southwest coast of Hudson Bay in the

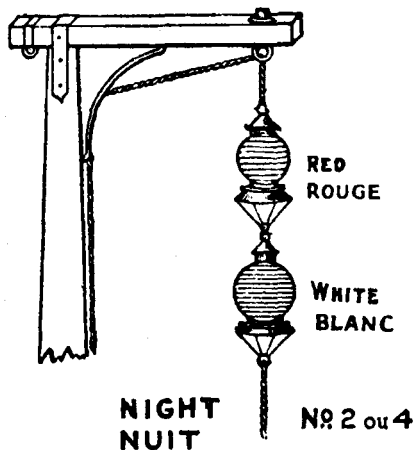
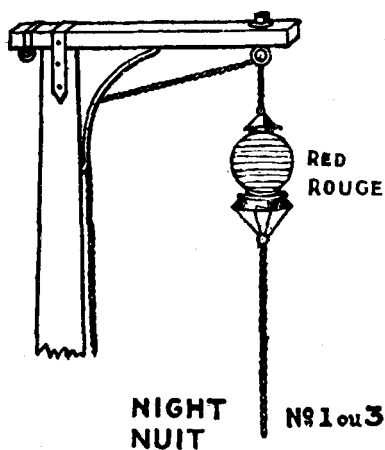
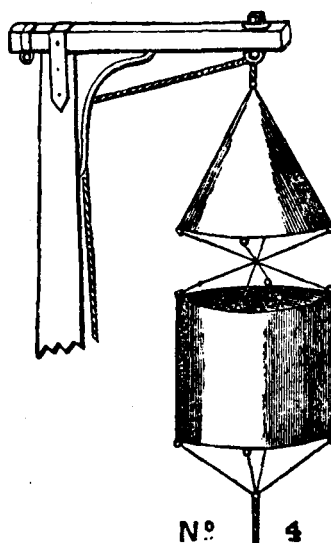
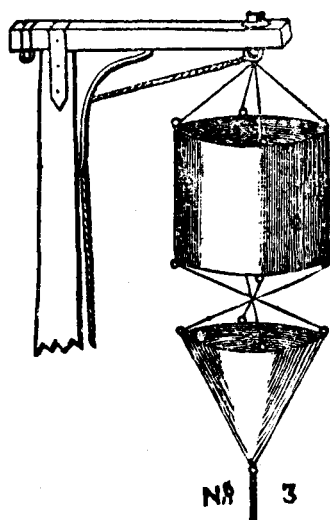
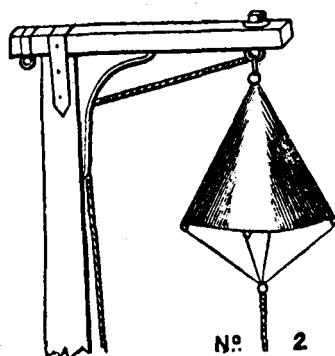
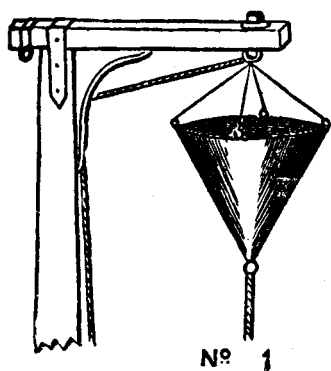
years 1768 and 1769 by two British scientists — J. Dymond and W. Wales, and some of their notes were published in the *Philosophical Transactions* (London) the following year.

During the 1830's the British Government, responding to pressure by British and European scientists for magnetic data from outposts around the world, decided to establish four overseas observatories and to locate one in Canada. Unable to successfully operate the magnetic instruments at Montreal because of the geomagnetic conditions of the St. Lawrence Valley, Lt. C.J.B. Riddell of the Royal Artillery, who had been given responsibility for the Canadian observatory, obtained permission from the military authorities to set up the observatory at Toronto and did so in the early winter of 1839-1840.

The observatory was located for several months in Fort York at the foot of Bathurst Street on the Toronto lakefront and then moved in September 1840 to a new log building a mile and a half to the north on the grounds of King's College. For the first decade complete terrestrial magnetism and weather observations were taken every two hours. In 1841 Riddell was succeeded by Capt. J.G. Younghusband (on a temporary basis) for two years, and permanently by Captain (later General Sir) Henry Lefroy, who directed the observatory work until 1853. During this time the observatory was one of a number under the overall jurisdiction in England of Colonel (later General) Edward Sabine, who in 1853 prepared and read before the Royal Society in London a scientific paper based on the first temperature data from the Toronto observatory.

The year 1853 proved to be a milestone in the history of the observatory; responsibility for the program passed from the British Ordnance Department to the Province of Canada that year. When Capt. Lefroy left, the detachment responsible for the observational program — Messrs. Walker, Stewart and Menzies remained, ultimately receiving their release from military duties to become the first permanent civilian observers. The Legislative Council of the Province of Canada passed the observatory over to the University of Toronto, and Prof. J.B. Cherriman, Professor of Mathematics and Natural Philosophy, was made provisional director. The Council provided £ 2000 for the support of the observatory; with this money a stone building was constructed enclosing the original log observatory. Its site is now occupied by the old Physics Building on King's College Road, University of Toronto campus; the original stone building now stands at the east end of University College directly in front of Hart House where it was reconstructed early this century.

In 1855 Prof. G.T. Kingston, who had been head of the Quebec Naval College, was appointed Professor of Meteorology at the University of Toronto and Director of the Observatory. Almost immediately he began contacting others whom he knew were interested in meteorology and attempting to promote and arouse interest in the possible employment of the electric telegraph for predicting storms. There were perhaps a dozen or so private observing stations in what was then Upper Canada, Lower Canada, and the Atlantic colonies, but there was no central collection of data until June 1863 when a Mr. Dunsford of Peterborough, Ont. sent a climatological report to the observatory thus starting the data collection, processing and archiving work which continues to this day. Such early Canadian scientific periodicals as the *Canadian Journal* and the *Proceeding of the Nova Scotia Institute of Science* often carried tables of observed climatological data. Complete observational data from the Toronto Observatory for the first decade of operation were published in three volumes in 1845, 1853, 1857, Egerton Ryerson, Superintendent of Education directed the grammar schools of Canada 'Vest into a program of taking weather observations in 1858, and 12 stations were established the first year. Near Montreal, a physician, Dr. Charles Smallwood, had established his own observatory; in 1862 he moved his instruments to the newly built McGill Observatory. But meteorological activity was limited and in an official report a year or two after Confederation, Prof. Kingston lamented that there were few meteorological observers in the Dominion, there was no true description of the climatology of the country and the existing agencies were inadequate to remedy the situation. Kingston continued his promotional activities, however, especially with the Department of Marine and Fisheries, and in a year or two he met with success.



Storm Warning Symbols

Wicker baskets of different shapes and sizes – displayed on poles on headlands near harbours.

****See original memo establishing MSC following this page**

A METEOROLOGICAL SERVICE

On May 1, 1871 in Ottawa, the Governor-General approved a Minute of a meeting of the Committee of the Privy Council which read – “On a memorandum, dated 28th April, 1871, from the Hon. the Minister of Marine and Fisheries submitting Professor Kingston’s report in reference to the proposed expenditure for Meteorological and Climatological purposes, and stating that he has carefully considered the scheme of expenditure proposed by Professor Kingston, and generally approves of the same – that he therefore requests authority to make such arrangements to carry out the intentions of Parliament in connection with this branch of the public service, and that the expenditure of the appropriation of \$5,000 made for that purpose be placed under the direction of the Department of Marine and Fisheries and the sum of \$4,000 be appropriated for the purpose recommended.

The Committee submit the above recommendation for Your Excellency’s approval.”

It is doubtful if any one in government realized the significance of the Minute, but with the approval of this small and what must have been fairly routine recommendation, a new federal service – the Meteorological Service of Canada – was initiated.

Meteorology, both the science and the service, was first being developed seriously in the mid to late 1800’s. The thermometer and barometer had been invented by Torricelli and Galileo in the mid-17th century. Physicists and other scientists in Europe and the United States had improved the original inventions and developed other instruments, formulated the gas laws, and had in general begun to take a quantitative as well as qualitative interest in weather conditions. Meteorology remained but a new and interesting science, however, until the mid-19th century when scientists began to realize the possibilities of employing the new electric telegraph to transmit data from one location to another and thus predict the onset of storms. Soon after 1850 several European nations created national meteorological services. It is likely that the establishment of a service in the United States early in 1870 further inspired Prof. Kingston to attempt to organize one in Canada. He corresponded with the Hon. Peter Mitchell, a member of the government and apparently convinced him of the value of a Canadian weather reporting and storm warning service. Early in 1871 the Deputy Minister of the Department of Marine and Fisheries advised Prof. Kingston that a sum of \$5,000 had been placed in the estimates for meteorological observations with a view of ultimately establishing storm signals, and in May of the same year the Minute mentioned above was approved.

THE FIRST SIXTY YEARS 1872 - 1932

Although he did not formally report to the Minister of Marine and Fisheries until 1874, Prof. Kingston effectively became the first “Superintendent of the Meteorological Office of the Dominion” in 1871 with the receipt of federal money for expanding the observational system. It was Kingston’s desire to bring the stations or observatories already established at Montreal, Quebec, Saint John, N.B. and Halifax, into his Service and to add stations in the eastern provinces; with the observational data he planned to study the weather patterns for at least five years before attempting to prepare and publish forecasts. This was the method advocated by the Royal Society of London – it was in marked contrast to the situation in the United States where the demand for storm warnings and forecasts was such that an operational forecasting system was being established at once.

Prof. Kingston was forced to compromise – he arranged for the taking of synoptic weather observations at Kingston, Port Dover and Port Stanley in southern Ontario. Telegraphic reports from these locations and from the Toronto Observatory were forwarded to Washington commencing January 2, 1872. In return Kingston received daily data from a dozen or so stations in the United States and American-predicted storm warnings for Canada, which were relayed to the relevant cities and ports. Early in 1872, Prof. Kingston’s original allotment of \$5,000 was exhausted, but additional funds were provided and observations were recommenced on July 1. The daily exchange of weather data between Canada and the United States has been continuous since that date. Later in 1872 the transmission of synoptic weather observations was commenced from Saugeen (Southampton), Ont., Montreal, Quebec, Halifax and Fort Garry (Winnipeg).

Certified to be a true copy of a Minute of a Meeting of the Committee
of the Privy Council, approved by His Excellency the Governor
General on the 1st May, 1871.



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Clerk of the Privy Council.



Possible site of first Victoria Weather Office Fisgard Lighthouse – Esquimalt Harbour, Victoria, B.C. 1895.

Courtesy British Columbia.

During 1872 and 1873 additional staff, notably C. Carpmael, a Cambridge University graduate, and two 15-year old boys, R.F. Stupart and B.C. Webber, were hired and trained in weather analysis and forecasting. On October 1, 1876, Stupart issued the first storm warning in Canada, and in 1877 Webber the first general forecast. In these early years the storm warnings were considered to be much more important than the general forecasts and networks of storm warning stations were established on the Great Lakes, along the St. Lawrence waterways and the Atlantic coast. Storm warnings were announced by the display of wicker baskets of different shapes and sizes on poles at or near harbours. This system of storm warnings was operative for nearly a century as it was not until the 1950's that the remaining seventy to eighty stations were closed. Meanwhile the daily probabilities were telegraphed to a hundred or so of the large cities and towns and displayed in the local post office and telegraph office and printed in the daily newspapers. Those methods of forecast dissemination were continued until World War II.

Suffering from ill health, Prof. Kingston retired in 1880, having served as Director of the Toronto Observatory for 25 years, and Superintendent of the new Service for nearly a decade. His assistant, Mr. C. Carpmael, succeeded him and the next decade or so proved to be one of great expansion for the Meteorological Service. The Canadian West was being settled and, as the railroad and telegraph lines were extended across the Prairies, additional synoptic observing stations were established. Carpmael was instrumental in having forecasts issued at midnight so that the information might be published in the Eastern Canadian morning newspapers. Another innovation was the display of specific symbols on the sides of railroad cars to carry the forecasts to rural areas. The display of a large disc on a special board indicated a forecast of fine weather, a crescent moon showers, and a star, rainy weather. Instructions on the proper discs to use were sent daily to the railroad offices, but unfortunately the signals were not always changed as often as they should have been and the system had to be dropped after a few years.

Carpmael died in October 1894 and was succeeded as Director by R.F. Stupart — the first native Canadian to lead the Service. By 1899 there were a sufficient number of stations in western Canada to enable the Toronto Central Office to begin issuing forecasts for Manitoba and services were extended to that part of the country which is now southern Saskatchewan and Alberta in 1903. Also during this period forecasting activities were decentralized to the extent that the office at Victoria, B.C. became responsible for the forecasting work for southern British Columbia.

By 1902, thirty years after its establishment, the Service was still being run on a very stringent and limited basis by today's standards. There were only 18 full time employees at the Central Office and of the other 150 working for the Service across the country, practically all were employed on a part-time basis to observe the weather or to display storm signals. There were 32 telegraphic stations from which reports were sent twice daily to Toronto and an additional 330 climatological station observers who sent in monthly reports of temperature and precipitation. Even considering the inflation of this century, it is incredible to read that meteorological services to the people of Canada during this period cost less than \$100,000 a year.

At this time forecasts were made each day at 10:30 a.m. and 10:30 p.m. at the Toronto Central Office where the forecasting was the prime responsibility of Director Stupart and his Deputy B.C. Webber. Daily forecasts for British Columbia were issued from Victoria by E.B. Reed and F.N. Denison. In 1902 Prof. C.H. McLeod was Superintendent of the McGill Observatory in Montreal, and the officers-in-charge of the Chief Stations were D.L. Hutchinson at Saint John, N.B. and A. Allison at Halifax, N.S., while at Winnipeg, officers of St. John's College served in that capacity.

Although climatological data were published with the Annual Report each year there were no publications of statistical data nor extensive descriptions of the Canadian climate available until about the turn of the century. As the Service was one of the few "scientific institutions" in the federal government, magnetic and astronomical observational work was continued along with the meteorological tasks; the Service provided a time service, became involved in a program of seismological observations and carried out tidal and hydrographic surveys from time to time. The Monthly Weather Map was first published in 1894 and the following year a program of preparing and issuing a daily weather map was commenced at the Central Office in Toronto.

The tempo of activities in the Meteorological Service increased markedly in the early years of the twentieth century. In 1901 Frank O'Donnell joined the Service as a clerk but by the time of his retirement in 1946, he had been head of the Forecast Section for a number of years. Highly qualified M.A. graduates were hired by the Service – in 1907 A.J. Connor, who was to become Dominion Climatologist from 1911 to 1950, and in 1910 John Patterson who was Director from 1929 to 1946. Chief meteorological stations were set up in Vancouver, Edmonton and Moose Jaw, and later, at the end of the war in Winnipeg. The observatories at Montreal, Quebec, Saint John and Halifax continued to provide information to the public as well as taking weather observations. At the Central Office an agricultural meteorologist was appointed to study weather – crop relations as a follow up to the establishment of several observing stations at experimental farms in 1889. Papers in agrometeorology were published and the Service began producing a climatic handbook series on the regions of Canada, but unfortunately only the British Columbia and Prairie Provinces' portions were ever published.

During the early years of the Service there were virtually no activities which today would be labelled "meteorological research." Although Canada, jointly with Great Britain, occupied a station at Fort Rae, N.W.T. during the International Polar Year of 1882-83, staff was sent from overseas to carry out the extensive meteorological, auroral and magnetic observations. At Toronto the magnetic observational program was moved to Agincourt in 1898 to free it from the influence of streetcars. The program continued to be administered from Toronto, however, until 1936. In 1910, a kite station was set up at Agincourt from where kites were flown to obtain upper air temperatures, pressures and humidities. During and following World War I, Patterson developed a self-recording meteorological instrument, a meteorograph, which was carried aloft by a balloon. Upper air data could be obtained, however, only after the instrument was found and returned to the office, but it is surprising to learn that about two-thirds of the instruments launched from Toronto were recovered. Subsequently meteorograph programs were carried out at Woodstock and Goderich in Ontario, and at Calgary for short periods of time. Pilot balloons (pibals) were first used to obtain the speed and direction of winds aloft in 1920 at Toronto. A network of pibal stations was organized in the late 1920's in eastern Canada in preparation for the flight of the R-100 to Canada in 1930. Also during this period, Patterson was doing valuable work in anemometry – his papers of 1919 and 1926 on the Canadian anemometer were very highly regarded internationally and are still of interest and value.

In retrospect, meteorological activities were apparently relatively stable in the mid-1920's. Forecasts were issued twice daily, late in the morning and late in the evening, with each forecast valid for 36 hours. Not only did newspapers publish the forecasts, but in some parts of the country these were delivered to telephone exchanges so that subscribers on rural lines could easily obtain them. It was during this period that meteorology began to use a new invention – marine weather forecasts, for the benefit of shipping on the Great Lakes and along the Atlantic coast, were broadcast by the new government wireless stations.

In the mid-1920's another new invention was beginning to affect meteorological services around the world. The development of aircraft would lead to the development of a gigantic transportation industry and the subsequent revolutionizing of all meteorological services. In the Canadian service an aviation section was set up at the Toronto Central Office in 1928. The first operational work for aviation was carried out in 1930 when the airship R-100 flew from Britain into Canada as far as Toronto and Niagara Falls. Meteorological services for an intercity airmail service across Canada were established and the expenditures of the service exceeded \$400,000 in 1931. However, just at this time so full of promise for a major expansion of the Meteorological Service, the world-wide economic depression of the 1930's began. Government expenses were slashed; the funds available to the Meteorological Service were reduced by about one-third and services to aviation all but eliminated.

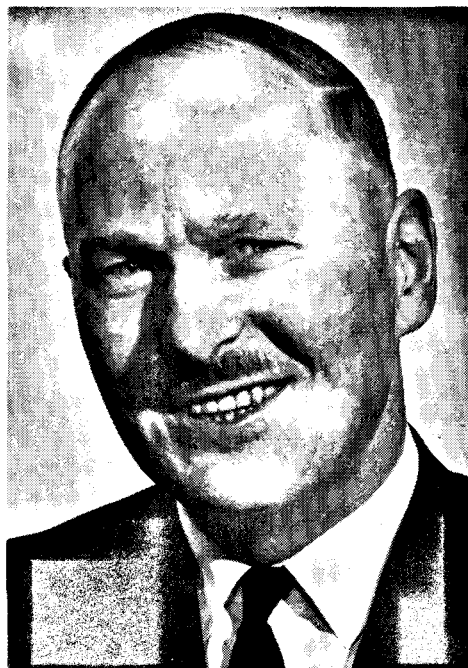
In retrospect the first sixty years of the Meteorological Service of Canada was the era of Sir Frederic Stupart. Hired as a 15-year old draftsman by Prof. Kingston in 1871, he wrote the first Canadian prepared forecasts in 1876, and with his colleague and deputy, B.C. Webber, not only developed the system of forecasting used during this period, but continued to be an active weather forecaster until his retirement in July 1929. Although Prof. Kingston might be considered the father of the Canadian meteorological service, Stupart, who became Sir Frederic in 1917, gave it a definite Canadian stamp.



John Patterson M.A., F.R.S.C. Director of the Meteorological Service of Canada, 1929–1946.



Andrew Thomson D.Sc., M.A., O.B.E. Controller of the Meteorological Division, 1946–1959.



Patrick D. McTaggart-Cowan D.Sc., L.L.D., M.B.E. Director of the Meteorological Branch, 1959–1964.



J.R.H. Noble, Assistant Deputy Minister, Atmospheric Environment Service, 1964–

AVIATION AND THE WAR 1933 – 1946

Coincident with the occurrence of rather unusual climatic conditions, the 1930's proved to be a turning point in the growth of the Service. In western Canada the economic depression coincided with the worst drought on record since the Prairies were settled, while in southern Ontario there were severe floods. Both low and high temperature extremes were recorded across the country – official readings as high as 113 degrees in July 1937 at several Prairie locations, and a low of -73° in northern Ontario during January 1935. Even the Headquarters of the Meteorological Service were affected – temperatures as low as -21° occurred in February 1934, and in July 1936 the maximum temperatures at Toronto reached 105 degrees on three consecutive days. Historically though, these were the years when meteorology began to come of age in Canada. This was due primarily to the development of meteorological services for aviation from the austere days of 1933-1935, through the planned and orderly expansion of the late 1930's when the new Trans-Canada Airlines began operations, to a period of completely unprecedented growth to service military aviation during the war. In retrospect perhaps the most surprising thing was the absence of a "meteorological depression" at the end of hostilities – meteorological activities continued to increase during the immediate postwar period.

Following the provision of special meteorological services for the visit of the airship R-100 to Canada in 1930, a system for the provision of forecasts and information for trunk and inter-city airmail services had been established in 1931 and 1932. Practically all of this activity came to an end in 1932, however, when economic conditions forced the cancellation of airmail contracts. By 1933 only the St. Hubert (Montreal) airport office continued to exist, although the Central Office at Toronto did provide considerable weather information and forecasts for special flights. During the depths of the depression in 1934 and 1935 a number of emergency landing fields were built across the country along the route that was being proposed for a national transcontinental airline. Planning for a civilian air transport system culminated in November 1936 when an Act was passed by Parliament establishing a new Department of Transport. The Meteorological Service of Canada was taken from the Department of Marine and Fisheries and became the Meteorological Division of the Air Services Branch of the new Department. John Patterson, Director of the Service, became the first Controller of the new Division, and Andrew Thomson the Deputy Controller. A year later, Trans-Canada Airlines (as the present Air Canada was called until 1956), came into existence and local services were commenced in western Canada. In June 1938 passenger services linked Vancouver with Montreal and Toronto, and in September 1939 transcontinental services were extended to Moncton, N.B.

As these planning and organizing activities were proceeding for transcontinental aviation, similar activities for trans-Atlantic services were also underway. In 1935 Canada assumed responsibility for trans-Atlantic weather information and forecasts for the area extending from Montreal through Newfoundland to 30 degrees west longitude. Experimental flights were carried out by British and American airlines in 1937 and 1938 after the organization of supporting services and the installation of a meteorological office at Botwood, Nfld. In the summer of 1939 a relatively large weather office was opened at the new Gander Airport primarily for trans-Atlantic aviation, although its routine services also included public weather forecasts and storm warnings for fishermen.

In retrospect, it was indeed fortunate that new scientific methods of weather analysis and forecasting had been initiated a decade or so before the demands for meteorological services for civil aviation became of paramount importance to the Canadian weather service. In 1933-34 the University of Toronto had begun, in cooperation with the Service, a Master of Arts degree program in meteorology. To lead this work Andrew Thomson, a Canadian meteorologist who had served in Samoa and New Zealand, was brought into the service early in 1932. A few years later Bernard Haurwitz, a German meteorologist, was also recruited. The graduates of the M.A. course were hired by the government to give the necessary additional support at Headquarters and to staff the new forecast centres that were being planned for several airports across the country. A new technical innovation, the teletype, had replaced Morse code telegraphy in 1931, and also during this period a number of stations were equipped with balloons for the taking of "pibals" which enabled the meteorologists to obtain the speed and direction of the winds below cloud level. Upper air temperature and humidity data were available during fine weather at one or two locations in the country by means of special airplane flights (apobs).

Thus by 1939 there had been considerable advancement in the provision of special meteorological services for aviation, although virtually no change had taken place in the provision of public weather services. All public forecasts from the Rockies across central and eastern Canada to Newfoundland were prepared twice daily by the Toronto office, while those for southern British Columbia were prepared and issued at Victoria. During the early 1930's radio stations had begun to broadcast the local forecasts, while in 1933 the Service undertook to provide trans-Canada forecasts for use in national broadcasts by the Canadian Radio Commission each evening. The storm warning service on the coasts and the Great Lakes was continued by displaying visual signals, but the government marine radio stations had commenced to broadcast these forecasts. In 1935 a special forecast office was set up to provide frost warning services for the Okanagan Valley fruit growers in British Columbia, while special fruit spraying and fire weather service forecasts were issued from Toronto for eastern regions. With the outbreak of war in September 1939, however, all public broadcasts and publication of weather forecasts had to be stopped.

The Meteorological Service of Canada participated extensively in the second International Polar Year which was held in 1932-33. Stations were established at Cape Hopes Advance, Chesterfield Inlet and Coppermine in the Northwest Territories, and at Meanook, Alta. where meteorological, magnetic and auroral observations were taken. Several young university staff and post-graduate students were recruited for a year or so as observers at these stations and their participation and subsequent knowledge of meteorology proved to be a boon to Canadian meteorology in subsequent years. During the early 1930's investigative work was largely concentrated in those natural phenomena that were causing economic distress — dust, drought, cold and floods. Dr. J.W. Hopkins of the National Research Council became interested in agricultural meteorology and prepared and published several papers dealing with climatic conditions in the grain growing areas of the Prairies. F.G. Millar published valuable work on evaporation theory which was probably a decade or two ahead of its time. In the late 1930's Haurwitz and various M.A. students conducted research on the Canadian troposphere and stratosphere and several papers were published. Also at this time E.W. Hewson and C.G. Gill conducted field research in the Columbia valley at Trail, B.C. to study atmospheric pollution by heavy industry. This work, for an international arbitral tribunal, was valuable in assessing damages by Canadian industry to American agriculture and established control methods which were subsequently applied. Mention should also be made of the first meteorology text books written and published by Canadians at this time, namely — Hewson, in cooperation with R.W. Longley, "Meteorology: Theoretical and Applied", and W.E.K. Middleton's, "Meteorological Instruments."

The beginning of flight operations by Trans-Canada Airlines in 1937 and 1938 necessitated the opening of Forecast Centres at Vancouver, Winnipeg, Toronto/Malton, and Montreal/St. Hubert. As previously mentioned a trans-Atlantic Forecast Centre had been opened in Gander, Nfld., while late in 1939 a new aviation Forecast Centre to service the Armed Forces was installed at Halifax. The demand for services grew rapidly and early in 1941 a new Centre was set up at Lethbridge, Alta., primarily for Trans-Canada Airlines. Near Montreal the St. Hubert centre was moved to the new Dorval Airport, and a Forecast Centre for Western Air Command was organized in Victoria, later moved to Vancouver. In 1942 Forecast Centres were opened in Edmonton and Whitehorse for the Northwest Staging Route; a second Dorval office was begun for trans-Atlantic forecasts, and a new office for the same purpose was opened at Goose in Labrador in 1943. In addition, new Forecast Offices were opened at River, Man., for air training on the Prairies, at Prince George, B.C. for military activities in northern British Columbia, and at Moncton, N.B. Late in the war there was a total of 15 major forecast centres in operation, a total never equalled in the post-war era.

In September 1939, at the outbreak of hostilities, there were only 51 graduate M.A. Meteorologists, 20 Meteorological assistants, 57 meteorological observers, 26 teletype operators, and 59 administrative and clerical personnel in the Meteorological Division. By the end of the war, in the fall of 1945, the number of full time staff exceeded 900 following the recruitment and training of an additional 350 meteorologists and a large number of assistants. The M.A. course could not produce meteorologists quickly enough and so it was suspended after the early graduation of the 1940-41 class. In late 1940 a new short (3½ months) Intensive Course in Meteorology was given to a class of new recruits. Over the next five years, 12 of these courses were held, and 350 meteorologists were produced. Most were posted to RCAF stations, although many were later brought back to Toronto for an Advanced Course — the first of which

was held in the fall of 1941. Over the next few years there were nearly 100 graduates of six Advanced Courses and most of these men were posted to the aviation Forecast Centres.

While planning, organizing and staffing for services to civil aviation were fairly orderly processes demands for the services by the military authorities were uncertain and eventually greatly exceeded all expectations. Prior to 1939 the Armed Forces had expressed little interest in meteorology and contacts between the Meteorological Service and the Department of National Defence were minimal. With the commencement of the British Commonwealth Air Training Plan activities, however, the Meteorological Division found it had a significant role to play as most of the flying training was to take place in this country. In March 1940 the Division was told to plan for the participation of 26 meteorologists at a like number of schools but, as the training program accelerated with the deteriorating war situation, and because of the impossibility of continuing to conduct training in Britain, the Meteorological Division was forced to speed up its recruitment and training programs tremendously. At the peak of BCATP activities, rather than the 27 meteorologists originally requested, there were more than 300 meteorologists serving the RCAF and RAF at 68 different stations in Canada.

In addition to the meteorological services provided at the air training schools of the BCATP, others of a different type were required at RCAF operational or Home War units. In contrast to the short-range forecasts for the next few hours required at training stations, operational stations required long-range and long-duration forecasts for patrol flying along the coasts and for aiding with North Atlantic convoys. As mentioned earlier, specific aviation Forecast Centres had been established at Halifax and Victoria/Vancouver for this purpose, while the trans-Atlantic forecast offices at Montreal, Gander and Goose also participated in this work.

Besides these coastal activities, the Meteorological Division undertook extensive programs along the Northwest Staging Route to meet American requirements. An air route, and later a highway, were constructed in northwest Canada from Alberta through British Columbia and the Yukon Territory to Alaska, and this required very extensive meteorological services for commercial and military aviation. Since the Meteorological Division was unable to expand fast enough to meet the demands for services, several dozen observing stations were opened and staffed by USAAF personnel, and at all air bases used by the Americans USAAF meteorologists provided briefing services. At the close of the war many of these stations were turned over to the Meteorological Division.

While not completely at a standstill, non-war effort activities were largely curtailed within the Meteorological Division during the 1939 to 1945 period. For two or three years the broadcasting and publishing of weather analyses and forecasts were prohibited, but special arrangements were made to supply vital weather information to groups of fishermen, farmers, other government departments, etc. The military forecast office at Vancouver became responsible for public weather information in that part of the country, as did Halifax and Gander on the east coast. Climatological information was gathered and processed, although no wartime data were published until after 1945. During the war, however, valuable data and information were supplied for the planning and construction of dozens of airports and for the undertaking of activities in northern Canada. The Canadian radiosonde system was developed during wartime; meteorologists became involved in weather radar research, in anomalous propagation of radio waves investigations and in the development of automatic weather reporting buoys. As with so many other things in wartime Canada, however, the need for ordinary meteorological services was dampened and suppressed – needs which would become quite evident with the coming of peace.

By 1944 the rate of growth of the wartime Meteorological Division was beginning to slacken and early in 1945 military requirements for meteorological services began to decrease. At the end of the European war in May, needs for services dropped markedly as dozens of RCAF stations were closed across the country. By the fall of 1945 more than 100 or approximately a third of the wartime meteorologists had left the Service, and by the end of the year there were but seven RCAF stations remaining at which Meteorological Division employees were stationed, compared to a peak of 68 two years earlier. It was a time of uncertainty – the administration could scarcely believe that there would be a need for anything but a fraction of the number of meteorologists employed during wartime, and so all professionals without an M.A. in meteorology were encouraged to leave the Service. Although the war was over, 1946

should be considered more a year of disengagement from wartime activities than one of organizing for the future. John Patterson, although well beyond the ordinary peacetime mandatory retirement age, remained with the Division as Controller until December 1946 when he was succeeded by Andrew Thomson.

The Meteorological Branch had gone through a decade of unprecedented growth following its inception in 1936. Staffing and training to meet the needs of Trans-Canada Airlines, trans-Atlantic flying, the British Commonwealth Air Training Plan, and RCAF and Navy patrol and convoy operations had increased the Branch's budget from \$300,000 in 1936 to a sum nearly ten times that amount in 1946. Wartime needs, primarily those of aviation had been met, but by the end of the war the need for a complete overhauling of the meteorological system was apparent. Modernizing the organization, consolidating forecast offices, decentralizing public weather forecasting and devoting a proper proportion of resources to research were but some of the major programs to be tackled and accomplished if the Branch was to effectively utilize the manpower base and reputation which it had gained during wartime.