

The International Meteorological Organization (IMO) 1879-1950

1. FROM VIENNA 1873 TO MUNICH 1891

The Permanent Meteorological Committee

An important outcome of the 1873 Vienna Congress was the formation of a Permanent Meteorological Committee – a group of seven distinguished meteorologists – all directors of meteorological services – who took on a number of tasks, one of them the drafting of the rules and statutes of an international meteorological organization. Famous scientist professor Buys Ballot was elected as President of Committee. The committee completed the drafting at their meeting in Utrecht in 1878 and the International Meteorological Organization came into being at the International Meteorological Congress held in Rome the following year. (Figure 1)

The committee also considered two proposals which in the 1870s were far ahead of their time: one that an International Meteorological Institution be established – a worldwide meteorological organization with a paid secretariat; the other that an International Meteorological Fund be formed – a fund for the establishment of meteorological observatories at remote locations on the earth's surface. The committee supported these proposals in principle but considered them both premature, mainly because of their daunting administrative and financial implications. However, the proposals were discussed repeatedly over the years, and the seeds planted in the 1870s eventually bore fruit.

The International Meteorological Committee

A resolution of the Rome Congress was that an International Meteorological Committee be formed, with terms of reference similar to those of the Permanent Meteorological Committee that it replaced. All nine members of the committee were directors of meteorological services. The Director of the Central Geophysical Observatory in St Petersburg, Swiss-born Heinrich Wild, was appointed President, and the head of the British Meteorological Office, Robert Scott, was appointed Secretary. In essence, the terms of reference were to promote international co-operation in meteorology, encourage meteorological research and establish uniformity in operational practices, with particular respect to weather observing and reporting and the exchange and publication of data.

The commitment of Wild and Scott to international meteorology is shown by the length of their service: Wild until 1896, Scott until 1900. With great skill and enthusiasm, they built upon the foundations laid by Buys Ballot and others and worked tirelessly to formulate and foster international co-operation in meteorology. Indeed, commitment and enthusiasm have been hallmarks of those who have helped to shape the history of IMO and the body which succeeded it, the World Meteorological Organization.

The First Years

From 1879 to 1891, the structure of IMO remained unchanged; and during this period the International Meteorological Committee turned its attention to a number of matters, including methods of observation, standardization of instruments and the publication of observations. Much was achieved. A conference on agricultural and forest meteorology took place in 1880, a set of International Meteorological Tables was published in 1889, and meteorological stations were established in many countries and regions where observations had hitherto been lacking. Efforts to establish an international telegraph service for the North Atlantic to meet the needs of weather forecasters were, however, unsuccessful.

The First International Polar Year

One of the decisions made at the Rome Congress was that an ambitious scientific enterprise conceived by Lieutenant Karl Weyprecht of the Austrian Navy be supported, this being a systematic study of meteorology and terrestrial magnetism in high latitudes of both hemispheres – a project which has come to be known as ‘The International Polar Year 1882-1883’. The project was significant in the history of IMO and WMO for two reasons: it was the first in a line of highly-organized international scientific programmes which continues to the present day; and the group of experts which was charged with organizing it and implementing it can be considered the first technical commission of IMO. The Commission for the Polar Year was, however, short-lived, for it was abolished in 1885, when its work was considered accomplished. Its existence was from the outset intended to be temporary. Not until 1891 was a permanent commission of IMO formed.

It is interesting to note that in May 2003 Fourteenth World Meteorological Congress had adopted the resolution on holding of an International Polar Year in 2007-2008. By this resolution Congress requested Executive Council to initiate the preparation for International Polar Year 2007-08 in collaboration with other international organisations. WMO had already negotiations with the International Council of Science and the Intergovernmental Oceanographic Commission of UNESCO to propose to world community to hold International Polar Year as a joint initiative.

The First Conference of Directors

Another of the decisions made at the Rome Congress was that a third International Meteorological Congress be called at an appropriate time. In the event, though, governments showed little enthusiasm for such a meeting and the International Meteorological Committee agreed at its meeting in Zurich in 1888 that the congress should not be reconvened. Instead, the committee decided, directors of national meteorological services should be called together and the committee dissolved. Wild and Scott were asked to convene a meeting of representatives of meteorological services, which they duly did. The First Conference of Directors of Meteorological Services was held in Munich in 1891 and was, it should be noted, a conference, not a congress, the distinction being that those who attended did so first and foremost as meteorologists, not officially as representatives of governments. (Figure 2).

Prior to the Munich conference, IMO had been a governmental organization from which meteorologists in universities and private institutions were excluded. After Munich Conference it became a non-governmental body in which all meteorologists could be involved, whether in government service or not. And in this body, all meteorologists were welcome to work as technical experts.

By the end of the Munich conference, the structure of IMO consisted of a Conference of Directors, a new International Meteorological Committee and an Executive Bureau. Initially, the latter comprised only the committee’s President (Wild) and Secretary (Scott), but it was enlarged later and renamed the Executive Council of the International Meteorological Committee. IMO had no funds of its own and depended on the generosity of the French, German and British meteorological services when expenses needed to be met.

The question of an International Meteorological Institution – or International Meteorological Bureau, as it was now called – was further considered at the Munich conference, and the idea of such a body was again supported in principle. However, the conference agreed that governments could not be committed on matters of finance, so a Bureau with paid international staff had to remain out of the question for the time being.

2. FROM MUNICH TO THE FIRST WORLD WAR

Structuring the IMO

The structure of IMO that was established at the Munich conference remained in place until the First World War, when international meteorological co-operation virtually ceased for more than four years. Between 1891 and 1914, the Conference of Directors met twice – in Paris in 1896 and Innsbruck in

1905 – and the International Meteorological Committee met eight times. Wild relinquished the Presidency in 1896 and was succeeded by Professor Éleuthère Mascart, who was both professor of physics at the Collège de France and director of the French Bureau Central Météorologique. He in turn stepped down in 1907, his successor being Sir William Napier Shaw, the scholar-scientist who was head of the British Meteorological Office.

During the period 1891 to 1914, a major achievement of IMO – some would say the most important achievement – was the establishment of permanent technical commissions – and the roll-call of these commissions reflects the principal meteorological developments of the late 19th and early 20th century, these being improvements in instrumentation, increases in meteorological knowledge, advances in dynamical meteorology and continuing efforts to establish best observational practice. In the latter respect, the Munich conference supported a project which had been in gestation since the Vienna Congress, when it was agreed that meteorological organizations and observatories should, as it was put in the minutes of 8 September 1873, “publish accurate diagrams of the forms of clouds regarded as typical in each country”. The Munich conference accepted the cloud classification of Abercromby and Hildebrandsson – a classification which had evolved from the one originally proposed by Luke Howard – and approved plans to publish an International Cloud Atlas. This was published in Paris in 1896 and a more-definitive second edition appeared in 1910.

The Establishment of Technical Commissions

The first of IMO’s permanent technical commissions was the Commission for Terrestrial Magnetism and Atmospheric Electricity (formed at the Munich conference in 1891). The second was the Commission for Clouds (formed at the International Meteorological Committee’s meeting in Uppsala in 1894); and two more were created at the Paris meeting of the Conference of Directors in 1896. The Commission for Aeronautics (renamed in 1902 the Commission for Scientific Aeronautics) was established to co-ordinate investigations of the upper atmosphere carried out by means of balloons and kites and newly developed instruments such as the Assmann ventilated psychrometer. The Commission for Radiation and Insolation was established to co-ordinate actinometric research programmes and review the instruments used for measuring solar and terrestrial radiation.

The need for a Maritime Meteorology Commission was first discussed at the meeting of the International Meteorological Committee held in St Petersburg in 1899, but approval for its formation was not forthcoming. Formation had to wait until 1907, when a Commission for Storm Warnings and Maritime Meteorology was created. The change of heart came about when the potential of an important technological development was recognized – the possibility of using wireless telegraphy to transmit to coastal stations weather reports from ships at sea. The matter was discussed by the Conference of Directors at their meeting in Innsbruck in 1905 and the Marconi company was consulted over the cost of such communications. The possibility of using wireless telegraphy to transmit storm warnings from coastal stations to ships at sea was also recognized around this time.

The “Réseau Mondial”

Another important outcome of the International Meteorological Committee’s meeting in 1907 was the formation of a Commission for the Réseau Mondial. The idea of establishing meteorological stations in the so-called “great centres of action” of the atmosphere had, in fact, been considered as early as 1896, when a paper on the subject by Dr Hildebrandsson had been discussed at the Paris meeting of the Conference of Directors. But interest in the idea proved lukewarm. Undeterred by this response, Hildebrandsson persevered and took up the matter again at the 1899 meeting of the International Meteorological Committee. This time, there was considerable enthusiasm for the idea but, alas, the only action that was taken was the unanimous adoption of a resolution which recognized the importance of making meteorological observations at places around the world which appeared to be especially significant for shedding light on the nature of atmospheric circulations. Not until 1905 did the idea appear again on any agenda of IMO – at the Innsbruck Conference of Directors meeting. Formation of the Commission for the Réseau Mondial was an important landmark in the history of IMO and WMO for it marked the beginning of formal endeavours to develop a worldwide network of meteorological stations. The global nature of meteorology had long ago been recognised, but only now were steps being taken to obtain the observations that were necessary to understand of atmospheric circulation on a planetary scale.

During the period 1879 to 1914, the International Meteorological Organization established a structure which served international meteorology well, with the technical commissions especially effective as means of promoting international co-operation, although there were complaints around 1910 that some commissions had too many members – and that meetings were too frequent, travel expenses too high and absences from home too long.

At IMO meetings, much attention was paid to the standardization and optimization of weather observing and reporting practices and to the needs of research workers. Advantage was rapidly being taken of the latest developments in instrumentation and technology; and by 1914 great advances had been made in the acquisition of upper-air data by means of meteorographs and other instruments attached to balloons, kites and even, at this early stage, aircraft. However, little progress had yet been made in respect of the exploitation of wireless telegraphy for meteorological purposes or the provision of meteorological services for air navigation.

3. THE INTER-WAR PERIOD

The Re-activation of the IMO after First World War

From August 1914 to the early part of 1919, truly international meteorological co-operation virtually ceased. IMO lay dormant. After the war had ended, though, the President of the International Meteorological Committee, Sir Napier Shaw, wasted no time. He was keen to revive IMO. Accordingly, he invited meteorologists from allied and neutral countries – most of them members of the pre-war International Meteorological Committee – to an informal meeting that took place in London in July 1919, a meeting at which arrangements were made for the Conference of Directors to meet in Paris two months later (Figure 3). This conference confirmed the pre-war structure of IMO and, indeed, created a new technical commission, one that reflected the developments in aviation that had occurred during the First World War. This was called the Commission for the Application of Meteorology to Aerial Navigation.

The Impetus of Aviation

After its revival in 1919, the Organization had been far from dormant, reacting and responding to developments that had occurred during and immediately after the war. The emergence of military aviation, for example, had created a demand for information about visibility, cloud heights and winds at flight levels. The importance of wireless telegraphy had increased when landline transmissions had become difficult; and scientific research had continued in neutral countries, notably Norway, where significant advances in dynamical meteorology had been made and the three-dimensional cyclone model of the Bergen School with its concept of fronts and air masses had been constructed.

The growth of civil aviation after the war created new challenges and opportunities for international meteorology. The navigators of aeroplanes and airships required, in standard formats, reliable information about, and forecasts of, the atmospheric conditions to be expected along flight routes; and new codes were required for the interchange of weather messages for aviation and maritime purposes. Wireless telegraphy was increasingly used by ships at sea, and an IMO Commission for Radiotelegraphy on the Oceans was established in 1923. That same year, the Commission for Wireless Telegraphy, which had been created at the 1899 St Petersburg meeting, was renamed the Commission for Synoptic Weather Information. The need for a new edition of the International Cloud Atlas was recognized in the early 1920s and so, too, was the need for internationally-agreed definitions of technical meteorological terms, the latter requirement being met initially by adoption and expansion of the British Meteorological Office's *Meteorological Glossary*, which had first appeared in 1916. The importance of the Commission for the Réseau Mondial remained as great as ever.

A New Dynamic

By 1923, when Dr Ewoud van Everdingen, director of the Royal Netherlands Meteorological Institute, succeeded Sir Napier Shaw as President of the International Meteorological Committee, the old pre-war leisurely approach to international meteorology had gone forever. Advances in science and technology and the requirements of mariners, aviators and others were now relentlessly driving

meteorology forward and creating new demands for international co-operation. Nevertheless, IMO remained, first and foremost, a body concerned primarily with administrative questions and general practice in respect of standardization and consistency of the methods used for making, collecting, recording and processing meteorological observations.

In both scientific research and applications of technology, co-operation between IMO and other organizations grew rapidly after the First World War, though relations were initially difficult at times between IMO and the International Commission for Aerial Navigation (ICAN), an inter-governmental body formed in 1919. For over a decade, there was competition between this commission and IMO's Commission for the Application of Meteorology to Aerial Navigation. In contrast, relations with some organizations were very close. They were especially close with the International Association of Meteorology and with the International Association of Physical Oceanography (both founded in 1919) and the International Association of Scientific Hydrology (founded in 1923).

The importance IMO attached to technical commissions was evident yet again at the meeting of the Conference of Directors in Copenhagen in 1929, when two more were formed – the Commission for Climatology and the Commission for the Polar Year 1932-1933 – the latter to organize, co-ordinate and implement a Second International Polar Year, almost exactly fifty years after the first one.

New forms of international meteorological codes were approved at the Copenhagen meeting, and the conference heard that another edition of the International Cloud Atlas was close to completion.

An International Meteorological Bureau

Again and again before the First World War, the question of an International Meteorological Bureau was raised at meetings of the Conference of Directors and the International Meteorological Committee. It was discussed yet again at the Paris meeting in September 1919, but this time both of the ideas put forward by Buys Ballot in the 1870s were considered – the creation not only of an International Meteorological Bureau but also of an International Meteorological Fund. The matter was listed on the agenda for the Paris meeting as a “Meteorological Bureau with international funds at its disposal”.

Support for the idea of such a bureau came from the recently reconstituted Commission for Maritime Meteorology (formerly the Commission for Storm Warnings and Maritime Meteorology), which suggested that the bureau could assume responsibility for collecting and statistically processing observations made at sea. The Commission for the Investigation of the Upper Atmosphere (formerly the Commission for Scientific Aeronautics) was supportive, too, suggesting that the bureau could be made responsible for publishing the results of upper-air soundings made on International Aerological Days – results which had previously been published by the Meteorological Institute at Strassburg, the organization directed by Hugo Hergesell, the commission's President from 1896 to 1919.

Creation of an International Meteorological Bureau with a paid secretariat was considered again at a meeting of the International Meteorological Committee held in London in 1921, and progress was eventually made at the meeting of the Conference of Directors held in Utrecht in 1923, when a Commission for the Establishment of an International Meteorological Bureau was formed. The report of this commission was discussed at length by the International Meteorological Committee at its meeting in Vienna in 1926, but the idea of a bureau was turned down yet again, even though the commission strongly recommended the formation of one and the League of Nations offered hospitality in Paris. The fundamental question was as follows: should international co-operation in meteorology take place as an inter-governmental activity controlled by an International Meteorological Bureau whose decisions were binding on governments, or should it continue to be fostered by a non-governmental IMO?

A classic solution to the problem was found: a compromise was agreed. A small secretariat with no policy-making functions would be established, its principal task being to reduce the administrative burdens borne by the President and Secretary of the Committee. It would also publish reports and proceedings of the Committee and commissions and serve as a documentation centre. Its cost would be apportioned among the countries whose directors of meteorological services took part in the Conference of Directors.

Pending a decision on the permanent location of the Secretariat, accommodation was provided in the headquarters of the Royal Netherlands Meteorological Institute at De Bilt. Work started in 1928, with the Dutch meteorologist Hendrik Cannegieter the Secretariat's chief.

4. NON-GOVERNMENTAL OR INTERGOVERNMENTAL?

The Concept of an Intergovernmental Organization

The existing structure of IMO was confirmed at the Copenhagen meeting – a Conference of Directors, an International Meteorological Committee, an Executive Council, Technical Commissions and a Secretariat. Further consideration of the status of IMO in Copenhagen led, however, to the adoption of a resolution, which moved that official recognition of the Organization by governments was desirable. **The possibility of IMO becoming an inter-governmental body had at long last been agreed.**

The question of an International Meteorological Bureau was a major item on the agenda for the meeting of the Conference of Directors in Warsaw in 1935, which some consider the most important meeting of the directors between the two world wars. A decision was made that invitations to future meetings of the Conference of Directors would be sent to governments – and these invitations would ask governments to designate directors of their national meteorological services to represent them at the meetings and to vote on their behalf.

Regional Commissions

An important decision made at the Warsaw meeting in 1935 was that regional commissions be established, their function being to ensure better implementation of IMO resolutions in distant parts of the world. The first to be created were the Regional Commissions for Africa and the Far East and they were followed, in 1937, by three more, the Regional Commissions for North and Central America, South America and the South-west Pacific. With the formation of these commissions, IMO's tendency towards Euro-centricity was much reduced. In fact, a Regional Commission for Europe was the last to be formed, in 1946.

Another important decision made at the Warsaw meeting was that IMO's Commission for the Application of Meteorology to Aerial Navigation be replaced by a Commission for Aeronautical Meteorology, whose members were appointed by governments. The consequence of this was that relations between IMO and the International Commission for Aerial Navigation improved greatly, but an abnormal situation was also created because, as Dr Hesselberg pointed out at the Berlin meeting in 1939, the new commission had a more official status than IMO itself. To him, this was a further reason why IMO should have inter-governmental status.

Draft of World Meteorological Convention

At the Warsaw meeting, Dr Theodor Hesselberg of the Norwegian Meteorological Service succeeded Dr van Everdingen as President of the International Meteorological Committee. He was very much an advocate of an improved international status for meteorology and very keen that IMO be transformed into an inter-governmental agency. Together with the Director of the French Meteorological Service, Monsieur Philippe Wehrlé, he built upon the decision made at Warsaw by drafting a World Meteorological Convention, which, if accepted by governments, would secure official status for IMO. When presenting this draft to the International Meteorological Committee at its meeting in Berlin in 1939, he pointed out a number of benefits of a changed status for IMO. In particular, he considered it desirable that governments should have a greater influence on the work of the Organization, given the steadily increasing practical importance of meteorology. He considered, too, that the Organization must be able to rely on adequate resources, so that efficient co-operation should not be hampered by financial difficulties. Moreover, he believed that governments should have greater control over the choice of representatives from their countries.

The International Meteorological Committee revised the draft Convention article by article and then referred what has come to be known as the Berlin Draft to the Commission for the Study of the Draft of the Convention, a commission which the Committee created at their Berlin meeting. The intention

was that this commission would refine and polish the draft and produce a definitive version for consideration at a meeting of the Conference of Directors in Washington DC in 1941. In the event, the Second World War intervened. Very little progress was possible before 1946.

The Secretariat Moves to Switzerland

At the meeting of the Conference of Directors in Copenhagen in 1929, a decision was made that the Secretariat would eventually be located in Switzerland, but no date for the transfer was set. Clamour grew during the 1930s for the decision to be implemented, and Dr Hesselberg lent his support. Devaluation of the Dutch guilder in 1936 caused difficulties for the Secretariat and strengthened the case for the transfer to be made sooner rather than later. At the meeting of the International Meteorological Committee in Salzburg in 1937, Dr Hesselberg proposed a transfer date of 1 January 1939, but no agreement for this proposal could be reached. Eventually, the Secretariat took matters into their own hands. They departed hastily from De Bilt soon after the Second World War began and removed to Lausanne. Meanwhile, Dr Gustav Swoboda from Prague had become Chief of the Secretariat in July 1938, when Dr Cannegieter succeeded Dr van Everdingen as Director of the Royal Netherlands Meteorological Institute.

5. THE ESTABLISHMENT OF THE WORLD METEOROLOGICAL ORGANIZATION

Second World War and the IMO

The work of IMO and the Secretariat continued during the war, though on a much reduced scale. Work on the Berlin Draft continued and some commissions continued to be active, particularly those concerned with scientific matters, such as the Commission for Solar Radiation and the Commission for Terrestrial Magnetism and Atmospheric Electricity. Very little progress was achieved by the Commission for the Réseau Mondial and the Commissions for Climatology, Maritime Meteorology and Agricultural Meteorology, mainly in the form of preparation of statistical tables.

After the war, the immediate priority for IMO was to restore international meteorological co-operation and refocus attention on matters which had been in abeyance since 1939. These were the main items on the agenda for the extraordinary meeting of the Conference of Directors that was held in London in February 1946. Before long, however, IMO began to respond to the meteorological and technological developments which had taken place since 1939.

The enormous importance of meteorology had been demonstrated over and over again during the war, and the scientific and technological developments of the war years had laid the foundations of the meteorological revolution which was soon to take place. The density of the global network of meteorological stations had increased during the war, and developments in radio, radar and radiosondes had made possible the establishment of aerological stations capable of making meteorological observations up to considerable heights in the atmosphere. The coming expansion of civil aviation, with ever-longer flights over continents and oceans, was clear to all, and the need for aircraft reconnaissance flights and ocean weather ships was also recognized.

Post Second World War and Preparations for the World Meteorological Organization

During the next, momentous, phase of its development, IMO moved ahead under the leadership of Sir Nelson Johnson, Director of the British Meteorological Office, who became President in February 1946.

The changed – and exciting – meteorological world which existed after the war was evident in the agenda for the Conference of Directors meeting which took place in Washington in September 1947. The 400 resolutions reflected the wide range of topics that had been considered at the meetings of the technical and regional commissions in Toronto the previous month – codes, units, diagrams, symbols, instruments, methods of observation, station networks, telecommunications, the safety of air navigation, climatological statistics, publications, documents, education, professional training, meteorological research, legal issues and administrative matters. Moreover, relationships between IMO and the International Civil Aviation Organization, the International Telecommunication Union and

the International Ice Patrol had been discussed, too. But the issue of greatest importance to IMO after the war was its status and structure.

Endeavours to resolve the matter began as early as February 1946, when the Conference of Directors asked the International Meteorological Committee to prepare a new IMO constitution, which would make the Organization an inter-governmental body. At the same time, the Committee was asked to review the composition and functions of the technical commissions and consider how the International Meteorological Organization might become associated with the newly-formed United Nations without compromising IMO's independence and character. The Berlin Draft as revised by Drs Hesselberg and Swoboda during the war was used as a basis for the new Convention.

The task of drafting the Convention was carried out at the meeting of the International Meteorological Committee held in Paris in July 1946. After much discussion, the so-called *Paris Draft, 1946* was adopted – a draft World Meteorological Convention with two annexes, one containing draft General Regulations, the other draft Technical Regulations. These three drafts were then submitted to national meteorological services and their governments for perusal.

Comments were considered at the Washington meeting of the Conference of Directors, along with four new drafts of the Convention, submitted by Canada, France, the United Kingdom and the United States. Eventually, after many disagreements had been settled and concerns over the independence and worldwide character of the new organization had been allayed, the World Meteorological Convention was approved unanimously and a resolution adopted that the new organization should seek affiliation with the United Nations. (Figure 4).

The Signing of the Convention and the Birth of WMO

The World Meteorological Convention was signed on 11 October 1947 and came into force on 23 March 1950. In the interim, the work of the International Meteorological Committee continued – in particular by making sure the many resolutions and recommendations of the Washington meeting were implemented. The Committee also secured recognition for itself by the United Nations as the preparatory body for the new organization and accordingly took part in relevant UN activities. The last meeting of IMO Conference of Directors was held in Paris in March 1951 and IMO formally became the World Meteorological Organization on the 17th March 1951.

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