M.O. 242.

AIR MINISTRY.

METEOROLOGICAL OFFICE.

REPORT OF PROCEEDINGS

OF THE

THIRD MEETING

OF THE

COMMISSION FOR WEATHER TELEGRAPHY,

HELD AT THE

AIR MINISTRY, LONDON,

November 22nd–27th, 1920.

Published by the Authority of the Meteorological Committee.

LONDON.
Printed by His Majesty's Stationery Office Press,
11–17, Hare Street, E.2.

1921.

LIST OF SOME OF THE PUBLICATIONS ISSUED BY THE AUTHORITY OF THE METEOROLOGICAL COMMITTEE.

Reports of Proceedings at International Meetings, etc.

International Codex of Resolutions adopted at Congresses, Conferences, and at Meetings of the Permanent International Committee, 1872-1907. (No. 200.) 1*s.* 3*d.* (8vo.)

Codes of Signals adopted and recommended by the International Meteorological Committee, 1910-13, for Storm Warnings, together with a list of the Maritime Weather Signals at present in use in the Various Countries of the Globe. (No. 206.) Fourth Edition, 1913, 4*d.* (8vo.)

Reports of Proceedings at International Meetings (8vo). (Prices ranging from 6*d.* to 3*s.*) :—

[20 reports were issued between 1872 and 1907.]

1909. London. Weather Telegraphy Commission.

1909. London. Maritime Weather Signals Commission.

1910. Berlin. Ninth Meeting of Committee.

1912. London. Second Meeting. Weather Telegraphy Commission. (No. 211.) 2*s.*

1912. London. Second Meeting. Commission for Maritime Meteorology and Storm Warnings. (No. 212.) 1*s.*

1913. Rome. Tenth Meeting of Committee. (No. 216.) 2*s.*

1919. London. (No. 237.) 1*s.*

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No. 16. Aids to Forecasting: Types of Pressure Distribution with Notes and Tables for the Fourteen years 1905-18. By E. Gold, F.R.S. (No. 220*f*.) 2*s.* 6*d.* Postage 2*d.*

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LIST OF INTERNATIONAL METEOROLOGICAL MEETINGS.

Congresses of Official Delegates. Vienna 1874, Rome 1879.

Conferences. Leipzig 1872, Munich 1891, Paris 1896, Innsbruck 1905, Paris 1919.

Permanent Meteorological Committee. Utrecht 1874, London 1876, Utrecht 1878.

International Meteorological Committee. Berne 1880, Copenhagen 1882, Paris 1885, Zürich 1888, Upsala 1894, St. Petersburg 1899, [Paris 1900], Southport 1903, Paris 1907, Berlin 1910, Rome 1913, London 1919.

Commissions.

Terrestrial Magnetism and Atmospheric Electricity. *Appointed* 1891. Munich 1891, Paris 1896, Bristol 1898, Paris 1900, Innsbruck 1905, Berlin 1910.

Scientific Aeronautics. *Appointed* 1896. Paris 1900, Berlin 1902, St. Petersburg 1904, Milan 1906, Monaco 1909, Vienna 1912.

Radiation. *Appointed* 1896, *reconstituted* 1910. Rapperswyl 1912.

Solar. *Appointed* 1903. Cambridge 1904. Innsbruck 1905, London 1909.

Weather Telegraphy. Appointed 1907. London 1909, 1912 and 1920.

Maritime Meteorology and Storm Warnings. *Appointed* 1907. London 1909 and 1912.

Réseau Mondial. *Appointed* 1907. Monaco 1909.

Meteorology and Agriculture. *Appointed* 1913. Has not met.

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INTRODUCTION.

The International Commission for Weather Telegraphy was first appointed at the meeting of the International Meteorological Committee at Paris in 1907 (*see also below*, Innsbruck 1905). Meetings of the Commission were held in London in 1909 and again in London in 1912. On the latter occasion a meeting of the Commission for Maritime Meteorology and Storm Warnings was held simultaneously.

The earliest reference in the reports of the International Meteorological Conference and its Committees to the subject of Weather Telegraphy is found in the proceedings of the Conference held at Leipzig in 1872. After some discussion as to the utility and practicability of weather telegrams, a committee was appointed by the Conference, and this committee presented a report to the Meteorological Congress held in the following year, 1873, at Vienna. No code is given in the committee's report and accordingly the Congress at Vienna appointed a sub-committee, consisting of Messrs. Scott and Wild, to report upon a telegraphic code. This report is printed on page 13 of the report of the permanent Committee of the Congress which met at Utrecht in 1875 under the presidency of Buys Ballot.

The system agreed upon consisted of telegrams containing six five-figure groups, two of which referred to the preceding evening and four to the morning of the report. The form of the morning report may be represented symbolically by :—

BBBDD FFWTT $T'T'RRR$ MMmmSea for the British reports, and

BBBDD FWTTT $T'T'T'RR$ MMmmSea for the Continental reports.

This system continued to be used until after the meeting of the Commission for Weather Telegraphy in 1909, although the question of changing it was considered by the sub-committee of the second Congress at Rome in 1879 and again in 1891 and 1896 (*see below*).

At subsequent meetings of the International Committee, subjects connected with Weather Telegraphy constantly arose, *e.g.*, the importance of telegraphic communication with the Faroe Islands and Iceland, with Greenland and the Azores (Berne 1880); the need for improving the transmission of the messages, especially those from Spain and Portugal (Paris 1885); the arrangements for telegraphic transmission of the leading features of the weather distribution of America (Paris 1885).

A proposal of Dr. Nils Ekholm to modify the telegraphic code was rejected at the Conference at Munich in 1891. The proposal

was, briefly, to give the barometer to whole millimetres only; the temperature to whole degrees; to substitute for the reading of the wet bulb thermometer the relative humidity reported by a single figure; to report the amount of cloud, distinguishing between upper cloud and lower cloud; to report the direction of motion of cloud and in the reports of weather to provide separate figures for hail and sleet.

A further suggestion for improving the telegraphic arrangements was put forward by Dr. G. Neumayer at the Conference at Paris in 1896. It was proposed to limit the information to two five-figure groups for each station in the symbolic form :—

BBBDD FWTTR

This proposal was not accepted by the Conference.

At the meeting at St. Petersburg in 1899 Professor Pernter proposed the appointment of a sub-committee to consider the improvement of the telegraphic weather service, and the proposal was accepted. This sub-committee reported to the meeting at Southport in 1903, recommending that steps should be taken to reduce the delays of transmission of messages and that an official International Committee, comprised of representatives of the telegraphic and meteorological services, should be formed for this purpose. The International Meteorological Committee approved of these recommendations. At the same meeting a report was made by M. F. A. Chaves, Director of the Meteorological Service of the Azores, which had been established after the previous meeting at Paris in 1900.

At the Conference at Innsbruck in 1905, a special Commission was appointed to report on questions connected with weather telegraphy; among other things it emphasised the importance of wireless messages from the Atlantic Ocean and the absolute necessity for devising means of an adequate check of the observations transmitted.

The main result of the meetings of the Commission in 1909 and 1912, was to introduce barometric tendency and some indication of the past weather into the reports, which took the symbolic form :—

BBBDD FWTTC cbbRR MMmmSea

but in the evening reports C was replaced by V, the characteristic of the past weather.

The present Commission was appointed at the International Meteorological Conference at Paris in October, 1919, and consisted of 16 members.

Subsequently two additional members were co-opted before the meeting, and at the beginning of the meeting further additional members (4) were co-opted. The list of members is given below p. 6.

LIST OF MEMBERS OF THE COMMISSION FOR WEATHER TELEGRAPHY.

*An asterisk is placed against the names of those who attended the meeting in London, 1920.

DENMARK.

*Captain C. Ryder, Director, Meteorological Institute, Copenhagen.

FRANCE.

*M. A. Angot, Director, Central Meteorological Bureau, Paris.

General Ferrié, Chief Wireless Officer of the French Army, Paris.

Captain P. Franck, Chief of the Communications Branch of the Department of Civil Aviation, Paris.

M. C. Goutereau, Central Meteorological Bureau, Paris.

GREAT BRITAIN.

*Lieut.-Colonel E. Gold, D.S.O., F.R.S., Assistant Director, Meteorological Office, London.

*Colonel L. F. Blandy, D.S.O., Controller of Communications, Department of Civil Aviation, London.

*Lieutenant H. D. Grant, Superintendent, Navy Services Division, Meteorological Office, London.

HOLLAND.

*Professor E. van Everdingen, Director, Meteorological Institute, De Bilt.

ICELAND.

*Mr. T. Thorkelsson, Director, Meteorological Institute, Reykjavik.

INDIA.

Dr. G. T. Walker, F.R.S., Director-General of Observatories, Simla, India.

ITALY.

*Lieut.-Colonel L. Matteuzzi, Director, Aerological Service, Rome.

Professor F. Eredia, Chief of the Forecast Service, Rome.

NORWAY.

*Dr. T. Hesselberg, Director, Meteorological Institute, Christiania.

SPAIN.

*Señor J. Galbis, Director, Meteorological Service, Madrid.

SWEDEN.

*Mr. A. Wallen, Director, Hydrographical and Meteorological Office, Stockholm.

SWITZERLAND.

*Professor A. de Quervain, Assistant Director, Meterological Institute, Zurich.

UNITED STATES OF AMERICA.

Dr. C. F. Marvin, Chief of Weather Bureau, Washington.

The following were invited to be present at the meetings:—

*†M. Rey, Chief of the Agricultural Meteorological Service, Paris.

*†M. C. Gain, Chief of the Meteorological Service of the Department of Civil Aviation, Paris.

*†Colonel E. Delcambre, Chief of the Military Meteorological Service, Paris.

*†Dr. W. van Bemmelen, Chief of the Meteorological and Magnetical Observatory, Batavia.

*Dr. G. C. Simpson, C.B.E., F.R.S., Director, Meteorological Office, London.

*Rear-Admiral F. C. Learmonth, C.B., C.B.E., Hydrographer to the British Navy, London.

Captain R. M. B. Mackenzie, Meteorological Office, London, acted as Secretary to the Conference.

† Were co-opted members of the Commission at its first session.

MEETING OF THE COMMISSION FOR WEATHER TELEGRAPHY.

LONDON, 1920.

PROGRAMME.

1. Co-option of new members.
2. Title of Commission. Proposal of Professor de Quervain to change the name to " Commission of Forecast Services."
3. Meteorological codes :—
   - A.—(i) General form of messages for international exchange. Uses of check figures.
   - (ii) General form of messages for reports from and between ships at sea.
   - (iii) General form of hourly or two-hourly messages special to aviation.
   - (iv) General form of messages for international exchange of winds, pressure, temperature, and humidity in the upper air.
   - B.—Specification of the telegraphic scales for—
     - (i) Wind.
     - (ii) Visibility and fog.
     - (iii) Weather, past and present.
     - (iv) Clouds.
     - (v) State of the sea.
   - C.—Specification of Barometric tendency.
4. The organisation of the issue of meteorological telegrams by radiotelegraphy for international purposes.
5. The organisation of reports issued by radiotelegraphy or telephony to aircraft *in flight*.
6. Transmission of Icelandic telegrams.
7. Meteorological reports from Greenland and Jan Mayen.
8. The use of the hyphen (-) instead of " x " in meteorological telegrams.
9. Annex G. of the Convention relating to air navigation, Paris, 1919.

THE CODES FOR INTERNATIONAL REPORTS ON LAND AND SEA, AND THE SPECIFICATION OF THE SCALES.

The decisions of the Commission are recorded below in the minutes of the meetings; the following statement is based upon these decisions, and is intended to enable instructions to observers and others to be framed as quickly and readily as possible. The first section deals with the code for land reports necessary for the preparation of synoptic charts: the second section deals with the code for reports from ships at sea; the third section deals with the code for hourly or two-hourly reports for aviation or other special purposes. In all sections the same letters have the same meaning, and for convenience of reference they are collected here, once in the approximate order in which the elements appear in the codes, and once in alphabetical order :—

BBB—barometer in millibars and tenths (initial 9 or 10 omitted) or in millimetres and tenths (initial 7 omitted). The values refer to sea level* and include all corrections for index error, temperature and gravity.

BB—barometer in whole millibars or whole millimetres (initial 9, 10 or 7 omitted). (For upper air reports of pressure, temperature and humidity, BB is in whole millibars with the hundreds figure omitted, whether this is 9, 8, 7, 6, or 5.)

DD—direction of the wind near the ground on the scale (01—32) in which 8 = East; 16 = South, etc.; 00 = calm.

F—force of the wind on the Beaufort Scale. (Forces above 10 reported as 9 in telegrams with the actual force in a word at the end, *e.g.*, force 10 is reported at the end as " storm ten "; force 11 as " storm eleven.") (Ships at sea, however, report " gale ten "; " storm eleven "; " hurricane twelve.")

ww—the actual weather at the time of observation, with which is combined, whenever possible, the general character of the weather. (The detailed specification is given below, page 39.)

TT—temperature of the air in whole degrees, Fahrenheit or Centigrade (50 added for negative values).

tt—temperature of the sea (surface water) in whole degrees.

c—characteristic of barometric tendency during the period of 3 hours preceding the time of observation. (For specification, *see* page 29.)

b—amount of barometric tendency in the same period of 3 hours expressed in half-millibars or half-millimetres. For tendencies 10-19 the *second* figure only is reported, and 33 is added to the wind direction number. For tendencies 20-29 the second figure only is reported, and 67 is added to the wind direction number. Tendencies greater than 29 are reported as 29.

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* For mountain stations the values refer to the level of the station.

W—the weather in the interval since the preceding time of report (p. 42) (this interval is 5, 6 or 7 hours for stations reporting 4 times daily. For special reports for aviation it is 1 hour or 2 hours).

V—visibility, or distance at which objects can be seen in daylight (or at which lights can be seen at night). (For specification, *see* page 26.)

H—relative humidity of the air. (For specification, *see* page 28.)

A—form of *predominating cloud lowest* in the scale of cloud forms (*see* page 27).

L—amount of sky (scale 0—10) covered by cloud of form A and of all forms of the same layer* as A, if " a " refers to a different layer*.

a—form of *predominating cloud highest* in the scale of cloud forms when more than one type of cloud exists.

N—*total amount of sky covered with cloud* (scale 0-10).

h—height of base of lowest cloud present (*see* page 28).

RR—rainfall in whole millimetres. (For specification of certain meanings, *see* page 30.)

MM—maximum temperature in the interval of 11 hours ending at 18h. G.M.T. (or at one of the hours, 1h., 7h., 13h., 18h. G.M.T., following not less than 4 hours after noon local time).

mm—minimum temperature in the interval of 13 hours ending at 7h. G.M.T. (or at the hour 13 hours after the time of reporting the maximum temperature).

S—the state of the sea and swell. (For specification, *see* page 29.)

V_s—visibility towards the sea (at coast stations only).

r—time of the commencement of rainfall (precipitation). (For specification, *see* page 30.)

C_1—form of cloud observed by nephoscope for special cloud reports (pp. 30, 27).

dd—direction of the wind in the upper air on the scale (01—36), *i.e.*, degrees from North divided by 10 and rounded off to the nearest whole number (00 = calm).

VV—the relative speed of clouds as determined by nephoscope, and such that if " h " is the height of the cloud in metres, the actual speed " vv " in kilometres per hour is obtained from the equation—

$$vv = \frac{h}{1000} \times VV$$

h_1—height at which the upper wind is reported (*see* page 33).

vv—speed of the wind in the upper air in kilometres per hour.

H_1—heights at which upper air temperatures and humidity are reported (*see* page 34).

C—form of predominating cloud according to the scale of cloud forms when only one form of cloud is reported as from ships at sea (*see* pages 27, 23).

* The word " layer " in these notes is used to refer to the three " layers " of loud, low, medium, high, of the International classification.

K—the characteristic of the swell *in the open sea*. (For specification, *see* page 36.)

d—the direction from which the swell comes (*see* page 36).

v—visibility at sea from ships at sea (*see* page 27).

The symbols in alphabetical order.

A—form of *predominating cloud lowest* in the scale of cloud forms (*see* page 27).

a—form of *predominating cloud highest* in the scale of cloud forms when more than one type of cloud exists.

BBB—barometer in millibars and tenths (initial 9 or 10 omitted) or in millimeters and tenths (initial 7 omitted). The values refer to sea level* and include all corrections for index error, temperature and gravity.

BB—barometer in whole millibars or whole millimetres (initial 9, 10 or 7 omitted). (For upper air reports of pressure, temperature and humidity, BB is in whole millibars with the hundreds figure omitted, whether this is 9, 8, 7, 6 or 5.)

b—amount of barometric tendency in the 3 hours preceding the time of observation expressed in half-millibars or half-millimetres. For tendencies 10-19, the *second* figure only is reported and 33 is added to the wind direction number. For tendencies 20-29, the second figure only is reported and 67 is added to the wind direction. Tendencies greater than 29 are reported as 29.

C—form of predominating cloud according to the scale of cloud forms when only one form is reported, as from ships at sea (*see* pages 27, 23).

C_1—form of cloud observed by nephoscope for special cloud reports (pp. 30, 27).

c—characteristic of barometric tendency during the period of 3 hours preceding the time of observation. (For specification, *see* page 29.)

DD—direction of the wind near the ground on the scale (01-32), in which 8 = East ; 16 = South, etc. ; 00 = calm

D_1—direction of motion of low cloud on scale 1-8 (2 = East ; 4 = South).

dd—direction of the wind in the upper air on the scale (01-36), *i.e.*, degrees from North divided by 10 and rounded off to the nearest whole number (00 = calm).

d—the direction from which the swell comes (*see* page 36).

F—force of the wind on the Beaufort scale. (Forces above 9 reported as 9 in telegrams with the actual force in a word at the end, *e.g.*, force 10 is reported at the end at " storm ten " ; force 11 as " storm eleven.") (Ships at sea, however report " gale ten " ; " storm eleven " ; " hurricane twelve.")

F_1—approximate speed of low cloud (*see* page 100).

GG—Greenwich time of observation (01 – 1 a.m. ; 12 = noon, G.M.T. ; 24 = midnight, G.M.T.).

* For mountain stations the values refer to the level of the station,

H—relative humidity of the air. (For specification, *see* page 28.)

h—height of base of lowest cloud present (*see* page 28).

H_1—heights at which upper air temperature and humidity are reported (*see* page 34).

h_1—height at which upper wind is reported (*see* page 33).

K—the characteristic of the swell *in the open sea*. (For specification, *see* page 36.)

L—amount of sky (scale 0-10) covered by cloud of form A and of all forms of the same layer* as A if " a " refers to a different layer*.

LLL—latitude in degrees and tenths, the tenths being obtained by dividing the number of minutes by 6 and *neglecting the remainder*.

lll—longitude in degrees and tenths, as for latitude.

MM—maximum temperature in the interval of 11 hours ending at 18h. G.M.T. (or at one of the hours 1h., 7h., 13h., 18h., G.M.T., following not less than 4 hours after noon, local time).

mm—minimum temperature in the interval of 13 hours ending at 7h. G.M.T. (or at the hour 13 hours after the time of reporting the maximum temperature).

N—*total amount of sky covered with cloud* (scale 0–10).

Q—quarter of the globe in which the ship is (*see* page 23).

RR—rainfall in whole millimetres. (For specification of certain meanings, *see* page 30.)

r—time of commencement of rainfall (precipitation). (For specification, *see* page 30.)

S—the state of the sea and swell. (For specification, *see* page 29.)

TT—temperature of the air in whole degrees Fahrenheit or Centigrade (50 added for negative values).

tt—temperature of the sea (surface water) in whole degrees.

V—visibility or distance at which objects can be seen in daylight (or at which lights can be seen at night). (For specification, *see* page 26.)

v—visibility at sea from ships at sea (*see* page 27).

V_s—visibility towards the sea (at coast stations only).

VV—the relative speed of clouds as determined by the nephoscope and such that if " h " is the height of the cloud in metres, then the actual speed " vv " in kilometres per hour is obtained from the equation—

$$vv = \frac{h}{1000} \times VV$$

vv—speed of the wind in the upper air in kilometres per hour.

W—the weather in the interval since the preceding time of report (page 42); this interval is 5, 6 or 7 hours for stations reporting 4 times daily. (For special reports for aviation it is 1 hour or 2 hours.)

* The word " layer " in these notes is used to refer to the three " layers " of cloud, low, medium, high, of the International classification.

ww—the actual weather at the time of observation, with which is combined, whenever possible, the general character of the weather. (The detailed specification is given below, page 39.)

x_1—check figure (pages 14, 23).

y_1—check figure (pages 14, 23).

z—key figure (pages 14, 23).

I.—Code for Land Reports.

1. The standard message for an individual station consists of four groups of five figures. It may be represented symbolically by—

BBBDD FwwTT cbWVH ALaNh

where the letters have the meanings explained in the introductory note.

2. Twice daily at 0700 and 1800 G.M.T., an additional group is added. The information contained in this group is slightly different at the two times of report, and it is different for inland and coast stations. The different forms may be represented symbolically as follows—

Inland Stations { RRmmr for reports at 0700 G.M.T.
RRMMr for reports at 1800 G.M.T.

Coast Stations { RRSV$_s$r for reports at 0700 *and* 1800 G.M.T.

3. From certain selected stations the direction of motion and the relative speed of clouds is reported by an additional group (or by two groups if clouds belonging to two layers are present). The groups may be represented symbolically by—

C_1ddVV

These groups (or two groups) will invariably be added after the *four groups* of the messages at 0100 and 1300 G.M.T. and after the *five groups* of the messages at 0700 and 1800 G.M.T. If no cloud observation has been made, the group or groups will be omitted entirely.

The observation of speed and direction of *high* cloud or medium cloud may be made *at any time not more than 2 hours before the hour of reporting* : no opportunity should be missed of securing an observation of high cloud in this interval. Observations of speed and direction of *low* cloud must be made at the hour of reporting.

4. From selected stations the velocity and speed of upper wind are given for certain heights, one five-figure group being used for each height. The form of the group may be represented symbolically by—

h_1ddvv

In collective messages giving reports from a number of stations these upper wind groups come *at the end of the whole message after the information referred to in paragraphs* 1, 2 *and* 3.* Thus if I_1, I_2, I_3, etc., denote the index numbers of the different stations

* It is advantageous to insert the word " Pilot " in the message at the point where the information of upper wind begins.

of the message, the symbolic form of the messages at 0100 and 1300 G.M.T. is—

I_1 BBBDD FwwTT cbWVH ALaNh C_1ddVV
I_2 BBBDD etc.
I_3 BBBDD etc.
I_n BBBDD etc.
I_1 $h_1$ddvv etc.
I_p $h_1$ddvv etc.

5. For one, two or three stations, information of upper air temperature and humidity obtained by means of aeroplanes or kite balloons is reported by a number of five-figure groups, of which the general form is symbolically—

BBTTH

This information is given for definite heights above ground for lower heights and above Mean Sea Level for greater heights. The scale for this, H_1, is given on page 34. The groups come in collective messages, after the groups reporting upper winds.* If the information is missing for any heights, a group of five hyphens - - - - - must be inserted; and the information must always be sent in the fixed order of the heights.

II.—Code for Reports from Ships at Sea.

1. Provision is made for two types of report. The first from ships not fully equipped with instruments or not able to make full reports; the second, which is the standard report, from ships fully equipped. The two types of report may be represented symbolically as follows:—

Type 1.—QLLLx_1 llllx_2 BBDDx_3 FVKdx_4 wwGGx_5 $y_1y_2y_3y_4z$

Type 2.—QLLLx_1 llllx_2 BBDDx_3 FVKdx_4 wwGGx_5 TTttx_6 CNWrx_7 $y_1y_2y_3y_4z$

The letters have the meanings given on pp. 9, 10 but the following additional letters are used:—

Q—quarter of the globe in which the ship is (*see* page 23).
LLL—latitude in degrees and tenths, the tenths being obtained by dividing the number of minutes by 6 and *neglecting the remainder*.
llll—longitude in degrees and tenths, as for latitude.
GG—Greenwich time of observation (01=1 a.m.; 12=noon, G.M.T., 24=midnight, G.M.T.).
x_1—is a check figure obtained by adding the first four figures of the group and taking the units figure in the sum so obtained.
x_2, x_3, etc.—are check figures obtained in a similar manner.
y_1—is a check figure obtained by adding together the first figures of all the preceding groups, *i.e.*, Q + l + B + F + w or Q + l + B + F + w + T + C and taking the units figure of the sum.

* It is necessary to insert some word such as "Temp" before these special upper air temperature groups.

y_2, y_3, y_4—are obtained in a similar way from the 2nd, 3rd, and 4th figures.
z—is a key figure obtained by adding together all the x's or all the y's.

III.—Code for hourly reports for aviation or other special purposes.

1. Reports from individual stations are of two forms. The first for reports at the standard hours for synoptic messages, or the hours midway between these: the second for reports at all other hours. These two forms may be represented symbolically by—

(*a*) DDFD$_1$F$_1$ ALaNh wwWVV$_s$ BBBS—
for reports at 0100, 0400, 0700, 1000, 1300, 1600, 1800, 2100, G.M.T.

(*b*) DDFD$_1$F$_1$ ALaNh wwWVV$_s$
for reports at all hours other than those specified in (*a*).

Upper winds reported from individual stations are sent in national codes to central offices or local centres.

The letters above have the meanings given in the introduction, but—

D$_1$—direction of motion of low cloud on scale 1—8 (2=East, 4=South).

F$_1$—approximate speed of low cloud (*see* page 100).

2. In collective messages of hourly reports, the same form is used as for individual stations, but a group of five figures reporting the direction and speed of the upper wind at a height of 2,000 feet (or 500 metres) is added in the form 2ddvv. This group follows the other groups for the individual station: it is not put at the end of the whole message.

3. In selected collected messages of hourly reports the full results of a pilot balloon ascent may be added *at the end of the message* for the following heights above ground:—

200, 500, 1,000, 1,500, 2,000, 3,000, 4,000, 5,000, 6,000 metres.

The report will consist of the word "Pilot" followed by five-figure groups of the form—

$h_1$ddvv

where h_1 denotes height according to the scale given on page 33.

London,
30th November, 1920.

List of Specification of Scales.

Table giving letters and symbols for the numbers of the weather code (p. 39).

—	0	1	2	3	4	5	6	7	8	9
0	bc−	bc	bc+	bcv	bc⊕	bc/f	bc/r	bc/s	bctl	bc/tlr
1	co−	co	co+	cov	co⊕	co/f	co/r	co/s	cotl	co/tlr
2	fb	fo	ifb	ifo	fb−	fo−	ffb	ffo	fb+	fo+
3	pr_o	ph_o	prs_o	ps_o	PR−	PR	PR+	PH	PRS	PS
4	d_o	d_od_o	d_o+	d−	d	dd	d+	D−	D	DD
5	r_o	r_or_o	r_o+	r−	r	rr	r+	R−	R	RR
6	s_o	s_os_o	s_o+	s−	s	ss	s+	S−	S	SS
7	rs_o	rs_ors_o	rs_o+	rs−	rs	r-rs	rs+	RS−	RS	RSRS
8	$h_o(r_o)$	rh_orh_o	$h_o(r_o)$+	h(r)−	h(r)	rhrh	h(r)+	H(R)−	H(R)	RHRH
9	tlr_o	$tlrh_o$	tlr	tlrh	TLR	TLRH	TLR⫽	TLRH⫽	KQ	KQH

A "solidus" divides actual existing weather from preceding conditions, thus:— bc/r = fair weather after rain; i = intermittent; − = "decreasing"; + = "increasing"; KQ = line squall; h(r) = "hail" or "rain and hail"; bc = cloud 0—5; co = cloud 6—10.

To find the symbol corresponding with 76, say, find 7 in the left-hand column and run the eye along the row opposite 7 until the column headed 6 is reached; this gives the symbol rs+ in this case.

MINUTES OF MEETINGS.

First Meeting, Monday, 22nd November, 1920, in the Council Chamber of the Air Ministry, Kingsway, London, W.C.2.

Members present:

Lieut.-Colonel E. Gold (*President*); M. Angot; Professor Van Everdingen; Señor Galbis; Lieut. Grant; Dr. Hesselberg; Colonel Matteuzzi; Professor de Quervain; Captain Ryder; Mr. Wallen; Mr. Thorkelsson.

There were also present:

Dr. Van Bemmelen; Colonel Delcambre; M. Gain; Captain Mackenzie (*Acting Secretary*); M. Rey; Dr. G. C. Simpson, F.R.S.; Major-General Sir F. H. Sykes, G.B.E., K.C.B., C.M.G.

1. The Conference opened *in camera*, only members of the Commission being admitted. The following resolutions which had been agreed upon were presented to the full meeting :—

" That the members of the Commission have decided :—

(a) That the following gentlemen who have received an invitation to the Conference shall be co-opted as members of the Commission:—

Colonel Delcambre.
M. Gain.
Dr. Van Bemmelen.
M. Rey.

(b) That in the case of a vote, each nation represented shall be entitled to one vote.

2. The President welcomed the delegates and read letters from the members of the Commission, Dr. Marvin, General Ferrié, Captain Franck, Dr. G. T. Walker, M. Goutereau and Professor Eredia, who were unable to be present at the Conference, and tendered a message of regret from Sir Napier Shaw, who was unable to be present owing to indisposition. He then gave a general description of the proposed programme for the week.

3. Professor Van Everdingen spoke on the question of co-option by the Commission of delegates from countries not represented at the Paris Conference, which had been a subject of correspondence between the President and Professor de Quervain. He expressed the opinion that as the delegates from these countries would be invited to the next general Conference under the decision taken at Paris, that " Directors of Independent Meteorological Services and Observatories should be invited to the next Conference," it would be desirable to co-opt members on this Commission, not for the present meeting, but for the next meeting of the Commission. After considerable discussion, in which

diverse views were expressed, it was decided to adjourn the discussion of this question until a later date of the present meeting. But it was agreed that :—

(1) the decisions of the present meeting should be communicated to these various countries; and

(2) that before any subsequent meeting of the Commission, papers and agenda should be forwarded to the Directors of their Meteorological Services in order that they might have the opportunity of furnishing their observations upon the proposals before the Commission met.

4. Professor de Quervain moved that the name of the Commission should be altered to the " Commission of the Forecast Services," but after considerable discussion and a general expression of opinion that questions of forecasting came within the domain ef the Commission, he begged leave to withdraw his motion.

5. Professor Van Everdingen raised the question as to how far the present Commission should be bound by the decisions taken at the Paris meeting of 1919. It was decided that as the present time was one in which changes are taking place rapidly in meteorological needs and organisation,

the Commission should regard the decisions of the Paris meeting as a guide in formulating their decisions at this meeting, but that they should not be expressly bound by them.

The Conference adjourned at 12.40 p m.

In the afternoon the session opened at 2.35 p.m.

6. Major-General Sir F. H. Sykes, G.B.E., K.C.B., C.M.G., Controller-General of Civil Aviation, gave a welcome to the delegates and emphasised the fact that one result of the war had been to teach us how much nations were interdependent, and that this was specially so in meteorology. He explained that in England the different meteorological services had been united and were now part of a unified Air Service, which had, moreover, a special Communications Section to deal with the transmission of reports, not merely for meteorological purposes, but for all reports of aviation.

7. After a brief survey of the papers which had been placed before the Commission on the subject of codes, the meeting proceeded to the consideration of the use of check figures in the general international code. The practical advantages of a system of check figures in India were explained by Dr. Simpson, who was of opinion that the messages from ships at sea ought to have such figures, although it might not be necessary to incorporate them in the ordinary land messages. M. Angot concurred as regards reports from ships at sea because these were reports from isolated points without other reports in the neighbourhood to give a meteorological check. The President referred to the new

difficulties which the introduction of W/T for the transmission of meteorological reports had brought, owing to the greater frequency of mistakes in such reports. He pointed out, further, that isolated stations on land, such as Blacksod Point, Thorshavn or the Azores, were in a similar position to ships at sea. The general opinion of the meeting was that even the substitution of check figures could not replace the repetition of the messages, and that such repetition would be necessary even if a proposal to introduce check figures were adopted. It was therefore decided to

proceed with the consideration of the codes on the assumption that check figures would not be used for the general reports on land.

8. The meeting then proceeded to discuss the general form of the message. After much discussion it was decided, by 6 votes to 4, that :—

barometric tendency should be reported by one figure instead of two.

It was also decided, by 6 votes to 5, that :—

barometric characteristic and tendency should replace the direction of the wind in the first group of the messages.

The first group of the message was therefore fixed in the form BBBcb where " c " represents characteristic in accordance with the decision of the Paris Conference.*

9. The question of reserving 3 figures for reports of temperature was raised by Mr. Hesselberg. It was decided, by 10 votes to 1, that :—

the present practice of using 2 figures for this element should be continued.

10. The meeting adjourned at 5 p.m. to give Mr. J. Bjerknes an opportunity of placing before the members a short resumé of the work in Norway on the use of the reports of the time of beginning and ending of rainfall.

(Signed) E. GOLD,
President.

23rd November, 1920.

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* *See* however Fourth Meeting, paragraph 3, p. 26.

Second Meeting, Tuesday, 23rd November, 1920.

Members present:

Lieut.-Colonel Gold (*President*); M. Angot; Dr. Van Bemmelen; Colonel Blandy; Colonel Delcambre; Professor Van Everdingen; M. Gain; Señor Galbis; Lieut. Grant; Dr. Hesselberg; Colonel Matteuzzi; Professor de Quervain; M. Rey; Captain Ryder; Mr. Thorkelsson; Mr. Wallen.

There were also present:

Rear-Admiral F. C. Learmonth, C.B., C.B.E.; Captain Mackenzie (*Acting Secretary*); Dr. Simpson.

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1. The minutes of the first meeting were read and confirmed as amended.

Professor de Quervain suggested that the morning session should commence at 9.30 a.m. instead of 10 a.m., but after some discussion it was decided to retain 10 a.m. as the time of the morning meeting but to begin the afternoon meetings at 3 p.m. instead of 2.30 p.m.

The title "Synoptic Meteorology" was suggested by the President as a possible alternative to "Weather Telegraphy."

2. The consideration of the general form of the code was resumed, and it was decided that:—

The two last places of the second group should be allocated to temperature, so that the form of the second group becomes DDFTT.*

A lengthy discussion ensued upon the question of inclusion of rainfall in the third group. It was found to be impracticable in most countries to arrange for the measurement of rainfall four times a day, but the majority of services were now in a position to measure it either twice a day or three times a day if that were found to be desirable. The principal disadvantage of measuring it three times a day would be that the periods to which the measurement referred would be 6 hours, 5 hours, and 13 hours, and it was generally felt that so great irregularity was not desirable. It was eventually proposed by Professor Van Everdingen, and decided, by 8 votes to 1, that:—

it should be obligatory in international messages to give rainfall twice a day in the morning (7 a.m.) and evening (6 p.m.) messages.

3. After a lengthy discussion, it was decided, by 6 votes to 3, that:—

the beginning of the message should be reserved for information which can be reported by every station at every hour of observation.

* *See* however Fourth Meeting, paragraph 3, p. 26.

4. After the last decision, the discussion was resumed on the number of figures to be allocated to reports of weather. It was decided, by 7 votes to 1, that:—

for reports of present weather, 2 figures should be used,

and that:—

for reports of past weather, 1 figure should be used.

Professor Van Everdingen gave a short account of the reason why humidity was excluded from the International reports when the barometric tendency was introduced, and pointed out that, under the new conditions, humidity would have an importance which it did not have when mid-day messages were not available, and in many cases, evening messages also. After some discussion it was decided, by 7 votes to 3, that:—

the form of the third group should be wwWVH,*

where ww refers to present weather.

W refers to past weather.
V refers to visibility.
H refers to humidity.

The meeting adjourned at 12.35 p.m.

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5. The afternoon session commenced at 2.35 p.m.

Rear-Admiral Learmonth, Hydrographer to the Navy, was present and spoke on the question of reports from ships at sea from the point of view of the seaman. He explained that these reports were necessarily voluntary reports and that simplicity and brevity in the code adopted were therefore essential. He explained that the British Admiralty were prepared to use in the Navy a code on the lines of that circulated to the members in Circular 201A, which could, for brevity, be called Dr. Simpson's code. He anticipated that it would be possible to get reports in this code twice daily at least and perhaps more frequently. Professor Van Everdingen agreed to the necessity for simplicity, and explained that owing to shortness of time it had not been possible to consult all the members of the Commission for Marine Meteorology, of which he was the President. He also emphasised the importance of giving the seamen meteorological information in return for the observations which they reported, so that they would realise that the observations which they made were of benefit to sailors and were not merely for use in preparing forecasts for landsmen. He observed that the barometric tendency was not provided for in the code circulated;

* *See* however Fourth Meeting, paragraph 3, p. 26.

and although he realised that barometric tendency on board a moving ship had not the same definite meaning as the barometric tendency at a fixed station, nevertheless it would perhaps be worth considering if it could be included, as it certainly had importance. He further expressed the opinion that where the general codes for land and sea were similar the same specification should be used, *e.g.*, in the visibility code of Circular 201A the lower figures were nearly identical with the visibility code in use on land, whereas in the higher numbers there was appreciable difference.

6. After discussion of check figures, in which the following members took part :—Captain Ryder, Dr. Hesselberg, M. Angot, Señor Galbis, Dr. Simpson, and the President, it was decided, *nemine contradicente*, that :—

check figures should be adopted in the code for reports from ships at sea.

It was further decided, *nemine contradicente*, that :—

the check figures should come at the end of each 4-figure group and should not be given separately at the end of the message.

7. The question of the hours of observation was then discussed and several members emphasised the difficulty of arranging for additional observations in the case of those ships which kept 4-hourly logs, according to ships' time. It was decided, *nemine contradicente*, that :—

whenever possible, observations should be reported at 0100, 0700, 1300, 1900, G.M.T., but that in the case of ships keeping 4-hourly logs, it should be permissible to report the ordinary observations nearest to the standard time of report. In the case of an ordinary observation coming exactly 2 hours from the standard time of report, the observation preceding the standard time should be transmitted.

8. The discussion of the form of the message was then resumed. It was agreed, *nemine contradicente*, that :—

The form of the first 2 groups should be as given in Circular 201A, namely, QLLLx llllx, and as only 4 figures were necessary for reporting Q, this figure should be utilised also to indicate whether the reports were in millibars and degrees Fahrenheit or in millibars and degrees Centigrade.

9. A lengthy discussion ensued upon the form of the succeeding groups for giving meteorological information, in which the following members took part :—Dr. Hesselberg, M. Angot, Captain Ryder, Professor Van Everdingen, Mr. Wallen, Dr. Simpson, and the President. The importance of providing a code which could be used by ships not fully equipped with instruments or not able to furnish all the information desired was emphasised. It was

finally proposed by M. Angot and resolved, *nemine contradicente*, that :—

the fundamental message should be one of 6 groups in the following form :—

QLLLx.
llllx.
BBDDx
FVKSx
wwGGx
yyyyz

the barometer being given in whole millibars or whole millimetres, the force of the wind being given by 1 figure and forces above 9 to be reported as 9 and a note added at the end of the message giving the actual force in the form " Storm ten," or " Storm eleven," or " Storm twelve."*

For those ships which could report additional information, it was agreed that :—

one or two further groups should be added in the form :—

TTttx.
CNWrx.

The meaning of the letters in this code is as follows :—

Q denotes the quarter of the globe in which the ship is.

		Code No.	*Latitude.*	*Longitude.*	
1	—	1	N	W	Barometer in millibars. Temperature in degrees F.
2	—	2	N	E	
3	—	3	S	W	
4	—	4	S	E	
5	—	5	N	W	Barometer in millibars or millimetres. Temperature in degrees C.
6	—	6	N	E	
7	—	7	S	W	
8	—	8	S	E	

LLL—latitude in degree and tenths, the tenths being obtained by dividing the minutes by six and neglecting the remainder.
llll—longitude in degrees and tenths, as for latitude.
BB—the last two figures of the barometer reading in whole millibars or whole millimetres.
DD—direction of the wind.
F—force of the wind.
V—visibility.
K—characteristic of the swell.
S—direction from which the swell is moving.
ww—present weather.
GG—Greenwich time of observation.
TT—temperature of the air.
tt—temperature of the sea.
C—form of the predominating cloud.
N—total amount of cloud.

* *See* however Sixth Meeting, § 6, page 35.

W—past weather.
r—time of beginning of rainfall.
xyz—check figures.

10. Professor Van Everdingen said that he wished to place the proposed code before the Commission for Marine Meteorology before it was submitted to the International Meteorological Committee. This proposal was accepted on the understanding that the code would, in the meantime, be tried on specified ships.

The meeting adjourned at 5 30 p.m.

(Signed) E. GOLD,
President.

24th November, 1920.

Third Meeting, Wednesday, 24th November, 1920.

Members present:

Lieut.-Colonel Gold (*President*); M. Angot; Dr. Van Bemmelen; Colonel Delcambre; Professor Van Everdingen; M. Gain; Señor Galbis; Lieut. Grant; Dr. Hesselberg; Colonel Matteuzzi; Professor de Quervain; M. Rey; Captain Ryder; Mr. Thorkelsson: Mr. Wallen.

There were also present:

Captain Mackenzie (*Acting Secretary*); Dr. Simpson.

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1. The minutes of the second meeting were read and confirmed as amended.

2. The discussion of the general form of the code was resumed It was generally agreed that information about the clouds should be included in the messages with more detail than was given before. The different alternatives were carefully examined and it was decided that—

as Nephoscope observations could not be obtained from all stations, the information about cloud in the general message should be restricted to form and amount, but that for selected stations in each country an additional group should be added giving the direction and relative speed of the cloud as observed by Nephoscope.

The number of stations from which this information could be given was at least one for each country represented, and in some cases a large number of stations could, if necessary, furnish the information.

3. After a discussion of the order in which the information should be given, it was decided, *nemine contradicente*, that—

the first 4 figures of the cloud group should be in the form ALaN,

and it was further decided by 9 votes against 1, that—

the last figure should be h.

Where A and a refer to the form of the cloud.

L refers to the amount of cloud of type A.
N refers to the total amount of sky covered with cloud.
h refers to the height of the base of low cloud.

4. The arrangements for reporting rainfall, sea disturbance, maximum and minimum temperatures, were then discussed and the following tentative forms were suggested:—

rsSRR
MMmm
RRMM } S
mm } r

The meeting adjourned at 12.30 p.m.

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5. In the afternoon the members visited the aerodrome at Croydon and on their return were shown the Radio station of the Air Ministry.

(Signed) E. GOLD,
President.

25th November, 1920.

Fourth Meeting, Thursday, 25th November, 1920.

Members present:

Lieut.-Colonel Gold (*President*); M. Angot; Dr. Van Bemmelen; Colonel Delcambre; Professor Van Everdingen; M. Gain; Señor Galbis; Lieut. Grant; Dr. Hesselberg; Colonel Matteuzzi; Professor de Quervain; M. Rey; Captain Ryder; Mr. Thorkelsson; Mr. Wallen.

There were also present:

Captain Mackenzie (*Acting Secretary*); Dr. Simpson.

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1. The minutes of the third meeting were read and confirmed.

2. A letter from Dr. Marvin, Chief of the United States Weather Bureau, stating the general position of the United States in regard to the work of the Commission, was read, and it

was agreed that a reply should be sent thanking Dr. Marvin for his communication and expressing the hope that, for reports issued by long range wireless telegraphy for the use of distant countries and in reports from American ships in the open ocean, it would be possible for the United States to adopt the figure codes which resulted from the deliberations of the Commission.

3. In view of Dr. Marvin's letter the form of the first group of the general message was reconsidered, and it was decided by nine votes to one that :—

the direction of the wind should replace the barometric tendency in the first group and that the latter should come as the first two figures of the third group.

This amendment of the first three groups takes the following form :—

BBBDD FwwTT cbWVH

4. The consideration of the form of the fifth group was resumed and it was decided, by six votes to five, that :—

the time of beginning of rainfall should be given as the fifth figure of this group.

After further consideration it was decided unanimously that :—

the fifth group should have a different form for land stations from the form used for coast stations. The form for land stations should be RR$\frac{MM}{mm}$r, and for sea stations the form should be RRSsr, where Ss gives information regarding the sea.

5. The question of using figures proportional to the speed of the wind instead of the Beaufort Scale was then considered, and it was decided unanimously that :—

the Beaufort Scale should be used for International messages.

6. The specification of the code for visibility was then discussed and it was agreed unanimously **to adopt the following code for reports from land stations** :—

			Code number.
Objects* not visible at	**50**	**metres or yards ...**	**0**
,, ,,	**200**	**,, ,, ...**	**1**
,, ,,	**500**	**,, ,, ...**	**2**
,, ,,	**1,000**	**,, ,, ...**	**3**
,, ,,	**2,000**	**,, ,, ...**	**4**
,, ,,	**4,000**	**,, ,, ...**	**5**
,, ,,	**7,000**	**,, (or 4 miles)...**	**6**
,, ,,	**12,000**	**,, (or 7 miles)...**	**7**
,, ,,	**30,000**	**,, (or 20 miles)...**	**8**
Objects visible at above	**30,000**	**,, (or 20 miles)...**	**9**

For ships at sea it was decided unanimously to adopt the same code with the substitution of " fog in patches " for the figure

* For details as to the selection of objects and the method of observation *see* M.O. 2630, Appendix xiii.

9 instead of " exceptional visibility." The specification for use at sea agreed upon is as follows :—

0. **Dense fog (objects not visible at 50 yards).**
1. **Thick fog (objects not visible at 1 cable).**
2. **Fog (objects not visible at 2 cables).**
3. **Moderate fog (objects not visible at $\frac{1}{2}$ mile).**
4. **Thin fog or mist (objects not visible at 1 mile).**
5. **Hazy (objects not visible at 2 miles).**
6. **Horizon not visible from 40 feet (or objects not visible at 4 miles).**
7. **Horizon only just visible (or objects not visible at 7 miles).**
8. **Horizon well defined, but visibility not exceptionally good (or objects not visible at 20 miles).***
9. **Fog in patches.**

7. The Commission next considered the specification of the form of clouds. Professor de Quervain moved that in code 2 of the President's memorandum one figure should be used for Alto-Cumulus and Cirro-Cumulus and that the figure thus saved should be devoted to differentiating between the small Cumulus of fair weather and the Cumulus of disturbed weather. This motion was lost by six votes to four.

It was then decided to **adopt the following specification for the form of the Cloud** :—

1 equals Ci.
2 ,, Ci. St.
3 ,, Ci-Cu.
4 ,, A-Cu.
5 ,, A. St.
6 ,, St. Cu [or Mammato-Cumulus].
7 ,, Nb.
8 ,, Cu. or Fr. Cu.
9 ,, Cu Nb.
0 ,, St. or Fr. St.

In the case of Stratus cloud of amount 10, when the corresponding figures in the cloud group would be 00, the figure for cloud height and the figures for present weather would prevent misunderstanding.

* If visibility is exceptionally good, the figure 8 should be reported and the appropriate figures in the present weather code for exceptional visibility should be utilised.

8. The specification of the height of cloud, h, was then considered. It was decided unanimously **that the following specification should be adopted** :—

0 =	0— 50	metres =	0—	150	feet.
1 =	50— 100	,, =	150—	300	,,
2 =	100— 200	,, =	300—	600	,,
3 =	200— 300	,, =	600—	1,000	,,
4 =	300— 600	,, =	1,000—	2,000	,,
5 =	600—1,000	,, =	2,000—	3,000	,,
6 =	1,000—1,500	,, =	3,000—	5,000	,,
7 =	1,500—2,000	,, =	5,000—	6,500	,,
8 =	2,000—2,500	,, =	6,500—	8,000	,,
9 =	no low cloud	=	no low cloud.		

For high level stations where the top of the cloud is sometimes below the level of the station and its height can be determined, it was decided that special arrangements should be made.

9. The specification of the code ww for present weather was then considered. It was agreed that a small sub-committee consisting of the President, M. Angot, Professor Van Everdingen, and Dr. Hesselberg, should consider this specification and should proceed on the basis that the first figure should indicate definitely the type of weather on the lines of the " present weather " code in the existing scale, but it was generally agreed that some modification of the present weather code ought to be made because of the additional information regarding the cloud which the cloud group gave. The consideration of the code W for past weather was also referred to the sub-committee.*

10. The specification of the code for relative humidity given on page 7 of the President's memorandum was adopted unanimously. It is as follows :—

Code figure.		*Code figure.*	
0	= 95—100 per cent.	5	= 50—59 per cent.
9	= 90— 94 ,,	4	= 40—49 ,,
8	= 80— 89 ,,	3	= 30—39 ,,
7	= 70— 79 ,,	2	= 20—29 ,,
6	= 60— 69 ,,	1	= 10—19 ,,

11. A discussion then took place on the characteristic of barometric tendency. Alternative proposals were put forward, but it was agreed to defer a decision until the members had had an opportunity of studying these proposals.

The meeting adjourned at 12.45 p.m.

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12. The afternoon session began at 3.40 p.m.

The discussion was resumed on the characteristic of barometric tendency. The proposal outlined by M. Angot was accepted

* *See* pp. 38–42.

unanimously and the code for barometric characteristic becomes as follows :—

0 = 0 or +	... Steady or rising	The barometer is now higher than, or the same as, 3 hours ago.
1 = + 0	... Rising then steady	
2 = + −	... Rising then falling	
3 = − + or 0 +	... Falling or steady then rising	
4 = Unsteady +	... Unsteady but rising	
5 = −	... Falling	The barometer is now lower than, or the same as, 3 hours ago.
6 = − 0	... Falling then steady	
7 = − +	... Falling then rising	
8 = 0 − or + −	... Steady or rising, then falling	
9 = Unsteady −	... Unsteady but falling	

13. Various proposals were examined for reporting the amount of barometric tendency by a single figure. After some discussion, it was resolved unanimously that :—

the barometric tendency should be reported in half millibars or half millimetres per 3 hours.

It was then decided that :—

for tendencies greater than 9 and less than 19 in this scale the number 33 should be added to the figures for reporting wind direction, and that for tendencies greater than 19, the number 67 should be added to the figures for reporting wind direction.

In both cases the number actually inserted for tendency in the telegram would be the units figure in the actual number for barometric tendency. A tendency greater than 29 should be reported as 29.

14. The figures allotted in the fifth group of the reports at 7 a.m. and 6 p.m. to the condition of the sea, were then discussed. It was agreed unanimously that :—

one figure should be used to report the state of the sea and that the second figure should be used to report the visibility towards the sea as distinct from the visibility towards the land at coast stations.

The following specification was agreed to unanimously for reporting the state of the sea* :—

0—no swell. 1—moderate swell. 2—heavy swell.	Calm or slight sea.
3—no swell. 4—moderate swell. 5—heavy swell.	Moderate sea.
6—rather rough sea.	
7—rough sea.	
8—very rough sea.	
9—mountainous sea.	

* At coast stations. The specification to be used by ships in the open sea is given on p. 36.

15. A discussion ensued upon the desirability of reporting temperature in $\frac{1}{2}$°C. for those countries in which the Centigrade scale is used. It was decided that **at present the scale in whole degrees Centigrade should be retained.**

16. For the specification of rainfall, it was agreed that **the reports should be in whole millimetres as in the existing scale,** but in view of the fact that amounts of 90 millimetres or more would be very rare, owing to the reports being made twice daily, it was decided unanimously that :—

the figures above 90 should be allocated according to the following scheme :—

91 = 0·1 millimetre.
92 = 0·2 ,,
93 = 0·3 ,,
94 = 0·4 ,,
95 = 0·5 ,,
96 = 0·6 ,,
97 = some rain but not measureable.
98 = more than 90 millimetres.
99 = measurement impossible or unreliable.

The time of commencement of rainfall should be specified by the following code, which was agreed to unanimously :—

0 = no rain.
1 = 0— 1 hours before the time of observation.
2 = 1— 2 ,, ,, ,,
3 = 2— 3 ,, ,, ,,
4 = 3— 4 ,, ,, ,,
5 = 4— 5 ,, ,, ,,
6 = 5— 6 ,, ,, ,,
7 = 6— 8 ,, ,, ,,
8 = 8—10 ,, ,, ,,
9 = above 10 ,, ,, ,,
— = no observation.

17. The general form of the message for the cloud reports from selected stations was next discussed, and it was agreed unanimously that **this should be C_1DDVV,**

where C_1 is the type of cloud observed by Nephoscope.

DD is the direction of motion.
VV is the relative velocity.

The meeting adjourned at 5,30 p.m.

(Signed) E. GOLD,
President.

26th November, 1920.

Fifth Meeting, Friday, 26th November, 1920.

Members present :

Lieut.-Colonel Gold (*President*) ; M. Angot ; Dr. Van Bemmelen ; Colonel Blandy ; Colonel Delcambre ; Professor Van Everdingen ; M. Gain ; Señor Galbis ; Lieut. Grant ; Dr. Hesselberg ; Colonel Matteuzzi ; Professor de Quervain ; M. Rey ; Captain Ryder ; Mr. Thorkelsson ; Mr. Wallen.

There were also present :

Captain Mackenzie (*Acting Secretary*) ; Dr. Simpson.

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1. Before the meeting began Colonel Delcambre gave a short account of his method of forecasting in which the observations of the clouds of the middle layer had great importance.

2. The minutes of the morning session of the fourth meeting were read and confirmed.

3. The discussion of the arrangements for the distribution of reports by W/T occupied the whole morning session. It was agreed that the arrangements for the issue of two-hourly reports for the purposes of aviation should be left for the consideration of the Commission on the Application of Meteorology to Aerial Navigation, but that the arrangements for these special reports ought not to be permitted to interfere with the distribution and reception of the general synoptic messages.

It was further agreed to be desirable that the issue of reports by different nations should be made from stations with a range of not less than 1,500 kilometres, and that it was undesirable that a nation should issue reports once for national purposes and a second time for neighbouring countries.

4. The number of stations from which reports should be issued in this way was then considered and the following list was prepared after discussion among the delegates present :—

Country.	*No. of Stations.*
Holland	4
Iceland	5
Sweden	8
Denmark	4
Norway	8
France and Belgium	20
Algiers and Tunis } Morocco ... }	20
Spain	15
Switzerland	5
Italy	20
Great Britain	20

A further discussion then took place on the number of reports which would be required from other countries not represented, and the following provisional list was prepared :—

Country.	*No. of Stations.*
Finland	5
Esthonia	3
Poland	6
Czecho-Slovakia	6
Austria	5
Germany	12
Jugo-Slavia	5
Roumania	5
Hungary	5
Greece	3
Portugal } Azores }	5

After further discussion, it was agreed that a sub-committee, consisting of the President, Colonel Blandy, Colonel Delcambre, Dr. Hesselberg and Professor de Quervain, should be appointed to consider this question.*

The following is a resumé of the opinions of the Commission prepared for the guidance of the Sub-Committee :—

(*a*) The reports issued nationally should be sent from stations with a range of not less than 1,500 kilometres.

(*b*) The reports ought to be issued as soon as possible after they have been collected at the Central Station. In any case, they should not be later than two hours after the time of observation.

(*c*) Simultaneous transmission of reports by different nations would be necessary, but it was desirable that not more than two transmissions should be in progress at the same time.

(*d*) Arrangements should be considered with a view to the issue of one or more abbreviated collective messages for the whole of Europe by a station or stations with a world wide range. As the question of paying for transmission would arise, it was necessary that the financial arrangements should also be considered.

(*e*) The arrangements prepared for the issue of these reports ought to permit of the inclusion for each hour of observation of three reports from the Atlantic and two from the North Sea, either in selected national issues or in abbreviated collective messages for Europe.

* See pp. 42–45.

(*f*) That the possibility of utilising land telegraphy or small power radio-telegraphic stations for assembling the reports ought to be considered.

The meeting adjourned at 12.45 p.m.

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5. The afternoon session commenced at 3.15 p.m. when the report of the sub-committee (p. 28) appointed for the consideration of codes was considered. It was decided unanimously that the codes prepared by the sub-committee should be accepted.*

6. The discussion of the number of cloud groups from the special stations was resumed and it was decided that the direction and velocity of the clouds should be given for one type of each of the two highest layers present. If only one layer was present, only one group would be given.

7. The code for the reports of upper wind was next discussed. It was decided by five votes to four that :—

upper wind reports should be in figures and not in letters.

It was further decided by six votes to four that :—

the upper wind should not be given in the 32 points of the compass, but should be given in 36 points obtained by dividing the direction in degrees by 10 ; and this scale should also be used for the direction of the cloud in the special cloud groups.

It was decided, *nemine contradicente*, that :—

the speed of the upper wind ought to be given in kilometres per hour, and that for speeds greater than 99 kilometres, 50 should be added to the number reporting wind direction at that level.

The heights at which the upper wind should be reported should be the three heights which give the best representation of the result of the pilot balloon ascent and the value of the height should be indicated according to the following code :—

Code Figure.		*Metres.*
1	equals	200
2	,,	500
3	,,	1,000
4	,,	1,500
5	,,	2,000
6	,,	3,000
7	,,	4,000
8	,,	5,000
9	,,	6,000

8. The code for reporting observations of temperature and humidity in the upper air was then considered, and after a lengthy discussion on the relative value of giving the temperature and

* *See* pp. 38–42.

humidity at different heights or at different pressures, it was decided, *nemine contradicente*, that :—

the reports should include the values of pressure in whole millibars or whole millimetres (last 2 figures only) at given heights, and that the humidity should be reported by one figure, and that the heights adopted should be :—

200 metres, 500 ,,	above ground.
1,000 metres, 1,500 ,, 2,000 ,, 2,500 ,, 3,000 ,, 4,000 ,, 5,000 ,, 6,000 ,,	above mean sea level.

The symbolic form of the code adopted is as follows :—

$B_1B_1T_1T_1H_1$ $B_2B_2T_2T_2H_2$ .....

9. The Commission expressed unanimously the opinion that the establishment of a station in Switzerland at a height of 3,500 metres, from which actual values of pressure and temperature could be reported, would be of the greatest assistance in synoptic meteorology, and they further agreed that the exact values of pressure and temperature at certain high level stations which already existed, ought to be included in the reports issued from Switzerland and other countries for International purposes.

The meeting adjourned at 6 p.m.

(Signed) E. GOLD,
President.

27th November, 1920.

Sixth Meeting, Saturday, 27th November, 1920.

Members present:

Lieut.-Col. Gold (President); M. Angot; Dr. Van Bemmelen; Col. Blandy; Col. Delcambre; Prof. Van Everdingen; M. Gain; Senor Galbis; Lieut. Grant; Dr. Hesselberg; Col. Matteuzzi; Prof. de Quervain; M. Rey; Capt. Ryder; Mr. Thorkelsson; Mr. Wallen.

There were also present:

Capt. Mackenzie (Acting Secretary); Dr. Simpson.

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1. The Minutes of the afternoon session of the 25th November, and of the fifth meeting on 26th November, were read and confirmed as amended. The confirmed minutes of the first, second and third meetings were circulated to the members present.

2. The President then outlined the business for the day, and it was agreed that the morning session should close at 12 noon, and that the sub-committee on the transmission of synoptic messages by radio-telegraphy should meet from 12 noon to 1 p.m., and that a short session should be held from 3 p.m. to 4 p.m. in the afternoon to take the minutes of the morning session and the report of the sub-committee, and to conclude the business of the Conference.

3. It was decided, after discussion, *nemine contradicente*, that :—

the present code for hourly reports should be modified in accordance with the decisions of the present conference, and that the code for these reports should be communicated to the Commission for the Application of Meteorology to Aerial Navigation for consideration by that Commission at its next meeting.

The symbolic form of the code for hourly reports thus becomes :

$DDFD_1F_1$ ALaNh wwWVV$_1$ (BBBS-) every 3 hours only. hDDVV

where " S " refers to the sea according to the scale adopted in paragraph 14 of the minutes of the fourth meeting.

4. The question of reports from Greenland was next discussed. After diverse views had been expressed as to the best position for a station on that Continent, it was unanimously decided that :—

the establishment at the earliest possible date of a high power Radio-telegraphic station in Greenland is of the utmost importance to the meteorology of Western Europe, and further, it is of such importance as to warrant the International provision of funds for maintaining it.

5. It was decided, with reference to the establishment of a station at Jan Mayen, that :—

(*a*) **The Norwegian Institute should be asked to communicate the observations being made at Jan Mayen this winter to the various meteorological services for inclusion in their synoptic charts.**

(*b*) **the further consideration of the proposal relating to the observations at Jan Mayen should be postponed until these results had been considered.**

6. Dr. Simpson raised the question of the specification of codes for reports from ships at sea, and the following decisions were carried, *nemine contradicente* :—

that for reports from ships at sea :—

(*a*) **Forces of wind above 9 should be reported as " Gale ten," " Storm eleven," and " Hurricane twelve."**

(*b*) **The code for swell in reports from ships at sea should be:—**

			Code number.
Sea smooth to moderate	and	no or slight swell ...	0
		moderate „ ...	1
		heavy „ ...	2
		long low „ ...	3
		confused „ ...	4
Sea rough ...	and	no or slight swell ...	5
		moderate „ ...	6
		heavy „ ...	7
		long low „ ...	8
		confused „ ...	9

(*c*) **The code for the direction of the swell should be as below:—**

0 = No swell.
1 = N.E.
2 = E.
3 = S.E.
4 = S.
5 = S.W.
6 = W.
7 = N.W.
8 = N.

(*d*) **The code for present and past weather should be the same as for the International land reports.**

(*e*) **Temperature should be reported in whole degrees F or C.**

7. It was decided unanimously that:—

a hyphen (-) could appropriately be used in international meteorological reports for indicating " *observation missing.*"

8. The meeting next proceeded to a discussion of the transmission of reports from Iceland, and it was decided unanimously that:—

(*a*) **it is urgent that an acceleration be made in the distribution of reports from Iceland, and the Commission is of the opinion that this could be obtained by the distribution by Radio-telegraphy of these reports by Great Britain.**

(*b*) **the afternoon messages should be sent immediately after the observations have been taken, but that no additional payment could be made in respect of these additional messages.**

(*c*) **Captain Ryder be asked to draw up a scheme of definite proposals, to be circulated to the Directors of those Services which at present participate in the Icelandic messages by sharing the annual subscription.**

(*d*) **that in these arrangements it should be permissible for the Icelandic messages transmitted to other countries by cable to contain for each station the first 3 groups of the new code with one special group giving direction and speed of cloud, for Reykjavik; but full information in the new code should be included for one station in addition to Thorshavn.**

Mr. Thorkelsson, in reply to a suggestion that the existing code might be continued if there were difficulties in transmitting the extra groups of the new code by cable, stated that the old code could not be continued in Iceland; it was essential that the new code should be used there for national purposes.

9. The Conference then returned to the question of the title of the Commission which had been raised earlier in the week; but it was unanimously decided that:—

the title of the Commission should remain unchanged.

10. The question of the admission to the Conference of delegates from countries which were not represented at the Paris Conference was again discussed, and it was decided that:

in the event of the Central or other Powers being admitted as members of the League of Nations, the President should circulate to the Commission the names of any delegates of these countries proposed for co-option on the Commission, and that the unanimous assent of the members of the Commission should be necessary for the co-option of such members.

The meeting adjourned at 12.10 p.m.

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11. The afternoon session commenced at 3 p.m.

The minutes of the morning session were read and confirmed as amended.

12. The report of the sub-committee on the arrangements for distribution of reports by radio-telegraphy, was received and adopted with slight amendments after some discussion. The amendments are incorporated in the revised report.*

13. It was agreed to recommend that the new code for synoptic messages should be introduced generally by January 1st, 1922, but that each nation should use the new code as soon as possible in its issues, giving at least one month's notice of its intention to do so.

14. The general introduction of the times of issue given in the table† in the Sub-committee's report (paragraph 2 (*g*)) should only be made after the report has been considered by the radio-telegraphic Conference, but it was agreed that changes might be made by individual countries in the existing times of transmission by radio-telegraphy of national synoptic messages, if the change were towards the times given in the table in paragraph 2 (*g*) of the report of the Sub-committee, and if at least one month's notice had been given.

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* *See* pp. 42–45. † *See* p. 44.

15. As uniformity in the report of clouds is desirable, and can be most readily achieved by the use of a common atlas, the Commission recommends to the International Meteorological Committee that a small cloud atlas should be prepared by an International Committee for the guidance of the observers at telegraphic reporting stations.

16. The Commission discussed the question of including national forecasts in the synoptic messages. It was recommended that the Directors of Institutes should forward to the President copies of any existing national codes used for the transmission of forecasts, and that the question of an international forecast code should be reserved for consideration at the next meeting of the Commission.

17. The meeting and conference concluded at 5 p.m.

18. To avoid delay in printing the report of the Conference, the minutes of Saturday afternoon's meeting were not circulated by correspondence, but were revised on Monday, November 29th, by the President, Captain Ryder, and Dr. Hesselberg.

(Signed) E. GOLD,
President.

30th November, 1920.

REPORT OF SUB-COMMITTEE.

Addendum to minutes of fourth meeting, Thursday, 25th November, 1920, held in the Council Chamber of the Air Ministry, Kingsway, London, W.C.2.

A sub-committee, consisting of the President, Dr. Van Everdingen, Dr. Hesselberg and M. Angot, appointed to consider the codes for present and past weather, met at 5.30 p.m. and prepared a specification of codes on the following principle. The first figures of the present weather code should have the meanings given below :—

0—Fair b or bc. (0-5).
1—6-10. c. or o.
2—Fog or mist.
3—Passing showers.
4—Drizzle.
5—Rain or rain and fog.
6—Snow or snow and hail.
7—Sleet.
8—Hail or rain and hail.
9—Thunderstorm (or line-squall).

The second figure in each case would be utilised for giving more precise information and an indication of the general character of the weather and the manner in which it was changing. The full detailed code is given below p. 39 [Code ww].

The sub-committee were unable to agree as to whether the most important phenomena should come first in the code or last, but on the whole, their opinion was that the code figures should be as arranged, but that in printing the code in national instructions, the order of the printing might be reversed so that the printed code would start with No. 99 instead of 00.

For past weather, a code agreeing as nearly as possible with the fundamental basis of the code for present weather was drawn up and it is given below p. 42 (Code W). In using this specification of past weather, observers should be instructed to choose the item lowest in the scale which has not been included in the report of present weather and general character; if in any case the past weather has been fully indicated by the two figures for present weather and general character, then the appropriate past weather figure will be reported in confirmation.

(Signed) E. GOLD,
President.

26th November, 1920.

CODE ww.

Code for weather at actual time of observation and general character of weather.

Fine or *Fair* ... (Cloud 0-5).	Cloud decreasing	00
	No apparent change	01
	Cloud increasing	02
	Visibility over 50 kilometres	03
	With solar or lunar halo	04
	After fog or mist (or dust storm)	05
	After rain or drizzle	06
	After snow or sleet	07
	With or after thunder and lightning in neighbourhood	08
	After thunderstorm	09
Cloudy or *Overcast.* (Cloud 6-10).	Cloud decreasing	10
	No apparent change	11
	Cloud increasing	12
	Visibility over 50 kilometres	13
	With solar or lunar halo	14
	After fog or mist (or dust storm)	15
	After rain or drizzle	16
	After snow or sleet	17
	With or after thunder and lightning in neighbourhood	18
	After thunderstorm	19

Fog or *Mist* ...	Fog or mist but clear in zenith	just begun	20
	Fog or mist and apparently overcast	just begun	21
	Fog or mist but clear in zenith	intermittent	22
	Fog or mist and apparently overcast	intermittent	23
	Fog or mist but clear in zenith	for some time,	24
	Fog or mist and apparently overcast	becoming thinner	25
	Fog or mist but clear in zenith	for some time	26
	Fog or mist and apparently overcast	for some time	27
	Fog or mist but clear in zenith	for some time,	28
	Fog or mist and apparently overcast	becoming thicker	29
Passing Showers.	Slight with rain		30
	,, ,, hail or rain and hail		31
	,, ,, sleet		32
	,, ,, snow		33
	Heavy with rain becoming better		34
	,, ,, rain		35
	,, ,, rain becoming worse		36
	,, ,, hail or rain and hail		37
	,, ,, sleet		38
	,, ,, snow		39
Drizzle ...	Slight occasional		40
	,, continuous		41
	,, but increasing		42
	Moderate but decreasing		43
	,, occasional		44
	,, continuous		45
	,, but increasing		46
	Thick but decreasing		47
	,, occasional		48
	,, continuous		49
Rain ...	Slight occasional		50
	,, continuous		51
	,, but increasing		52
	Moderate but decreasing		53
	,, occasional		54
	,, continuous		55
	,, but increasing		56
	Heavy but decreasing		57
	,, occasional		58
	,, continuous		59

Snow or *Snow and Hail.*	Slight occasional		60
	,, continuous		61
	,, but increasing		62
	Moderate but decreasing		63
	,, occasional		64
	,, continuous		65
	,, but increasing		66
	Heavy but decreasing		67
	,, occasional		68
	,, continuous		69
Sleet or *Rain and Snow.*	Slight occasional		70
	,, continuous		71
	,, but increasing		72
	Moderate but decreasing		73
	,, occasional		74
	,, continuous		75
	,, but increasing		76
	Heavy but decreasing		77
	,, occasional		78
	,, continuous		79
Hail or *Rain and Hail.*	Slight occasional		80
	,, continuous		81
	,, but increasing		82
	Moderate but decreasing		83
	,, occasional		84
	,, continuous		85
	,, but increasing		86
	Heavy but decreasing		87
	,, occasional		88
	,, continuous		89
Thunderstorm (or Line Squall).	Slight thunderstorm without hail		90
	,, ,, with hail		91
	Moderate thunderstorm without hail ...		92
	,, ,, with hail ...		93
	Heavy thunderstorm without hail	without gale	94
	Heavy thunderstorm with hail	without gale	95
	Heavy thunderstorm without hail	with gale	96
	Heavy thunderstorm with hail	with gale	97
	Line squall without hail		98
	,, ,, with hail		99

CODE W.

Code for Past Weather.

Without precipitation	0—Fair or fine (b or bc).
	1—Cloudy.
	2—Overcast continuously.
	3—Fog or mist.
	4—Thick fog.
Precipitation	5—Passing showers.
	6—Rain or drizzle.
	7—Snow or sleet.
	8—Hail or rain and hail.
	9—Thunderstorm.

In using this code the number should be taken which describes the most important feature of the past weather not already reported by the two figures for "present weather and general character." This is usually the largest number of the scale appropriate to the occasion. In any case in which the two figures "for present weather and general character" describe fully the past weather also, then the appropriate single past weather figure should be reported in confirmation, *e.g.* :—in the case of heavy continuous rain without fog or mist the present weather figures would be 59 and the past weather figure would be 6.

REPORT OF SUB-COMMITTEE ON THE ORGANISATION OF THE TRANSMISSION OF REPORTS BY RADIO-TELEGRAPHY.

Addendum to minutes of sixth meeting, Saturday, 27th November, 1920, held in the Council Chamber of the Air Ministry, Kingsway, London, W.C.2.

1. The Sub-Committee, consisting of :—

Colonel Blandy.
Colonel Delcambre.
Lieut.-Colonel Gold.
Dr. Hesselberg.
Professor de Quervain.

met at 2 p.m. on the 26th November, and at 12 noon on the 27th of November, to consider the necessary arrangements for :—

(*a*) The national transmission of reports to a distance of not less than 1,500 kilometres.

(*b*) The minimum interval between the hour of observation and the time of transmission of the last national report.

(*c*) The simultaneous transmissions least likely to interfere with reception of essential reports.

(*d*) The composition of a collective report for the European Réseau, and the station from which this should be transmitted.

(*e*) The reception and issue of meteorological observations from ships in the Atlantic.

(*f*) The employment of ordinary telegraphy or short range wireless for assembling reports from neighbouring countries.

2. Colonel Delcambre was elected Chairman. After some discussion, it was decided to recommend :—

(*a*) The times of transmission should be so arranged that the countries from which the observations are the most important should have preference.

(*b*) The radio-stations for national transmissions should have a range of 1,500 kilometres, but not necessarily greater.

(*c*) There should not be more than 2 simultaneous transmissions of synoptic meteorological reports from European radio-telegraphic stations.

(*d*) Until Switzerland has completed the organisation of a wireless service which will permit her to send observations 30 minutes after the time of observation, these will be transmitted by wire to France for issue with the reports from France and Belgium from the Eiffel Tower.

(*e*) Holland should, if possible, arrange for the issue of its reports by wireless 50 minutes after the times of observation.

(*f*) Reports from ships in the Atlantic should, for the present, be included in the national issues of the countries receiving them.

(*g*) Proceeding on the principles enunciated, and taking into account the times of transmission and wave lengths at present in use, the Sub-committee proposes the following hours for the different national issues. The issue of reports from Northern Africa (Algiers, Tunis, Morocco), might be made either simultaneously with those of Poland and Esthonia, or after that of Spain.

Time after hour of observation.		Country.	Country.	Country.
Transmission begins.	Transmission ends.			
0h. 30m.	0h. 35m.	Greece	—	—
0h. 35m.	0h. 40m.	Malta { ship's observations from Mediterranean.	—	—
0h. 40m.	0h. 50m.	Denmark	Serbia ...	—
0h. 50m.	1h. 00m.	Holland	Roumania	—
1h. 00m.	1h. 10m.	Great Britain	Finland...	—
1h. 10m.	1h. 20m.	Great Britain	Poland ..	Africa.
1h. 20m.	1h. 30m.	France ... Belgium ... Switzerland ...	Esthonia	Africa.
1h. 30m.	1h. 40m.	France ... Belgium ... Switzerland ...	Bulgaria	—
1h. 40m.	1h. 50m.	Sweden	Italy ...	—
1h. 50m.	2h. 00m.	Norway	Italy ...	—
2h. 00m.	2h. 10m.	Germany	Spain ...	—
2h. 10m.	2h. 15m.	Germany	Spain ...	—
2h. 15m.	2h. 20m.	Austria	Africa	—
2h. 20m.	2h. 30m.	Hungary	Africa	—
2h. 30m.	2h. 35m.	Czecho-Slovakia ...	Africa	—
2h. 35m.	2h. 40m.	Constantinople ...	—	—

The values in the first column give the period from the hour of observation until the time of transmission for the country indicated. The times of observation are at present 0100, 0700, 1300, 1800, G.M.T. Thus, for example, Holland completes its transmission of morning reports by 0800, having commenced after Denmark finishes at 0750. Great Britain completes its transmission by 0820, having begun at 0800 when Holland finished.

(*h*) A collective message giving a summary of the observations from Europe should be issued three hours after each hour of observation. This message should be issued (spark) by the Eiffel Tower.

(*j*) The collective message summarising the European observations should be composed of a certain number of stations for each country as indicated by the following table. The Meteorological Service of each country should inform the President of the Commission as soon as possible of the names of the stations selected for inclusion in these European collective messages.

Country.	Number of Stations.	Country.	Number of Stations.
Iceland	2 (with Thorshavn.)	Sweden	2
		Denmark ...	1
		Holland	1
Great Britain ...	5	Finland	1
France	5	Esthonia ...	1
Italy	5	Poland	2
Azores	1	Czecho-Slovakia	2
Spain	5	Rumania ...	1
Portugal		Constantinople ...	1
Germany	5	Bulgaria	1
Austria		Malta	1
Hungary		North Africa ...	5
Switzerland ...	1	Tripoli	1
Norway	3	Egypt	1

To these stations will be added 30 groups as a maximum for the United States and 20 groups for Canada and Greenland; these groups would include any ships observations from the Western Atlantic issued by the high power transmitting stations of the United States and Canada.

(*k*) Transmission by land line is required from Switzerland to France, but this method of communication will be employed normally only between neighbouring countries to obtain supplementary observations required over and above those transmitted by wireless.

(*l*) The order of the stations included in national issues should be such that if a particular section of the wireless message is not received, the observations in the section received may give an idea of the meteorological situation over the whole country and not merely the situation at a group of stations in some small part of the country.

For instance, if the following scheme (in which each letter stands for one station) represents the distribution of 20 stations over a country :—

A a B b
C c D d
E e F f
P p Q q
R r S s

then the synoptic message should *not* be arranged in the order A a B b C c D d . . . but in the order A D E Q R B C F P S a d e q r b c f p s, so that any 5 consecutive groups give stations distributed over the whole country.

30th November, 1920.

APPENDICES.

APPENDIX I.

MEMORANDUM ON METEOROLOGICAL CODES.

By Lieutenant-Colonel E. Gold.

(July 30th, 1920.)

There are at present in operation in Europe at least four codes, in addition to the pre-war International Code. These codes all indicate advances on the pre-war code in some direction; and there are more elements on which the codes are in substantial agreement than there are differences. At the same time there are certain important differences (*a*) in the details reported, (*b*) in the codes for the individual elements. Such differences constitute a source of great inconvenience to all meteorologists. It is important that an effort should be made to effect a reconciliation of these divergences and at the same time to secure those essential improvements of which the need has, in fact, evoked the different codes now in operation.

There are three broad divisions which are apt to be sometimes obscured by the details of codes. They are indicated by the questions:—

I. What is it necessary to observe?
II. What is it necessary to report?
III. What are the general and detailed codes in which the observations should be reported?

I. Observations made.

In the past it has been regarded as necessary to observe:—

1. Barometer.
2. Amount and characteristic of barometric change.
3. Wind direction.
4. Wind speed or force.
5 Temperature.
6. Maximum and minimum temperatures and minimum temperatures on the grass. Earth temperature.
7. Humidity.
8. Cloud forms and amounts and thickness. Cloud height.
9. Cloud direction and speed.
10. Duration of sunshine and intensity of Solar Radiation.
11. Amount and duration of precipitation. Time of beginning and ending.
12. Hydrometeors. Weather phenomena and their intensity.
13. Observations of wind in the upper air.
14. Observations of temperature and humidity in the upper air.

Under the heading "Hydrometeors" was included "Fog," and provision was made for differentiating between fog and wet fog and ground fog; and the usual "intensity" figures were used. Owing partly to the development of aviation and partly to the increasing recognition of the importance of atmospheric obscurity at sea, "fog" has become of sufficient importance to be taken out of the general group of Hydrometeors and to constitute a separate group.

15. Fog and visibility.

With this addition, the groups may perhaps still be taken as indicating what it is necessary to *observe*.

II. Information to be reported.

Of the 15 groups, the pre-war code provided for reports of numbers 1-5, 6 (partially), 9 (partially), 11 (partially), and 12 (partially).
It is still necessary to report groups 1-5.

Group 6 is of interest, but it is doubtful if it is of importance *except* at stations making no midday report, when the maximum temperature is certainly important in preparing general forecasts.

Group 7 was reported 20 years ago. It was omitted when "tendency" was introduced. Its re-introduction appears at least desirable.

Group 8 is of increased importance for aviation. But its importance for general forecasts must also be emphasized. Some provision must be made for this.

Group 9.—Only the direction was reported in the pre-war general code. The form observed and its angular speed are essential to a proper utilization of this information in forecasts. Either the figure should be saved or the full information given.

Group 10.—This is of interest and the *Intensity* may become of great importance in synoptic charts for the globe. It is not at present of sufficient direct interest to warrant its inclusion.

Group 11.—The amount only has been reported in the past. The time of beginning and ending is extremely desirable. There is, however, some difficulty in the case of occasional precipitation or showers. A convention on this point is required.

Group 12.—In the pre-war code only 5 "hydrometeors" were reported. This requires extension and provision for indicating the intensity; and provision for reporting important phenomena which can be co-existent.

Groups 13 & 14.—These are unlikely to be available as regularly at stations as surface observations, but reports of them should be obligatory on all occasions when they are available. But the question of limiting the stations in a given area from which reports of upper air information are sent requires consideration.

Group 15.—This was included among the hydrometeors reported in the pre-war code, but special provision is required now. The information will be found to be of considerable value in general forecasting when it comes from the sea or from representative exposed stations.

III. Code for reports.

(*a*) *General code.*

In considering any modification of the general code, it is desirable to proceed on the principle that the primary groups of figures should contain only information which is available at all the hours of observations at all standard stations, and that elements such as maximum temperature and rainfall, which are only measured at certain hours, should be provided for in supplementary groups; and that supplementary groups should also be utilised for upper air information which will be available only at selected stations.

It is further desirable to arrange the order of the groups so that the information of widest importance is included in the earliest groups.

The following 5 groups, of which the first 3 would be for general transmission, are suggested as a possible form satisfying the principles mentioned:—

BBBDD FwwTT cbbVH ALBMh WWrsS

where BBB—Barometric pressure.
DD—Direction of the wind.
F—Force of the wind.
ww—Present weather.
WW—Past weather.
TT—Temperature.
c—Characteristic of barometric tendency.
bb—Amount of barometric tendency.
V—Visibility.
H—Relative humidity.
A—Form of cloud.

L—Amount of cloud " A ".
B—Form of cloud.
M—Amount of cloud " B ".
h—Height of base of lowest cloud.
r—Time rain begins.
s—Time rain ends.
S—State of the sea.

The first three groups contain information which is obtainable at every hour and always has a definite importance.

The fourth group deals solely with cloud, and in a country with a cloudless season the group might be omitted.

The fifth group deals with past weather except for the last figure, sea disturbance. This group could be omitted, if desired, in countries with dry seasons when there is no precipitation. At inland stations where the sea disturbance is not reported, it would be possible to arrange for the direction of motion of the low cloud to be indicated by the last figure of group 5 (separate provision would be made for reporting the form, direction of motion, and speed of cloud observed by nephoscope).

With regard to the letters r and s, which have not been included before, it is suggested that a code similar to the code used at present in Norway should be adopted for these letters.

The whole five groups are given here and all contain information which it is desirable to have in N.W. Europe, but it is emphasised that the first three groups are more fundamentally important for general forecasting than the last two.

(*b*) To these five (or three) fundamental groups would be added, from at least a selection of stations in each country, a group giving the form, direction and speed of cloud observed by nephoscope.

A suggested form is CDDVH
where C is form of cloud.
DD is direction of motion; V is velocity-height-ratio.
H is height when obtainable; 9 when not.

(*c*) In morning reports at 7h. and evening reports at 18h. (or 19h.), a further supplementary group is required to give the rainfall and the maximum and minimum temperature.

A suggested form is $RRRM_xM_x$ at 18h. or 19h.
and $RRRM_nM_n$ at 7h.

(*d*) For reports of upper wind and upper air temperature and humidity, some agreement is required to prevent messages being unduly long and at the same time not to exclude important information. This means that a selection of heights must be made and that information must be normally confined to the selected heights.

Such a selection has the further advantage that it permits the height to be indicated in the message by a single figure.

IV.—The detailed codes will furnish opportunity for discussion and exchange of views on the different requirements of the various services.

The following notes indicate some points for consideration:—

BBB—Barometer to be expressed either in millimetres and tenths or in millibars and tenths. A uniform practice is desirable: how far can it be achieved? It appears to depend primarily on " instruments."

DD—Direction of the wind (1-32, or 1-72): the causes of differences in this respect arise partly from the extension of the practice of expressing direction of courses at sea in degrees; and partly from the introduction of upper winds determined by pilot balloons or by nephoscopes graduated in degrees.

F—Beaufort scale. Would it be desirable to substitute for this a scale in which the numbers were directly proportional to the speed of the wind?

$^{ww}_{WW}$—Hydrometeors. More extended information is required, but it is undesirable when a single figure code is used, to modify the existing International single figure code. The mere super-position of another single figure code does not give the same extended information

as a two-figure code. Thus everything points towards the desirability of a distinct two-figure code.

The information reported should be based on the observations made according to the schedule of hydrometeors prepared at Vienna in 1874 and extended at subsequent meetings.

The code printed in the report of the meeting of the International Meteorological Committee in July, 1919, was drawn up on these principles and offers a basis for discussion.

TT—Temperature in degrees F, degrees A, or degrees C?

c—Characteristic of barometric tendency: the code already existing meets the fundamental requirements. But certain simplifications have been suggested from Norway. Shall the code be changed?

bb—Amount of barometric tendency—half-millibars, half-millimetres, tenth millimetres?

It is noted that the tendency cannot be obtained normally from an aneroidograph to an accuracy of 0·1 mm., or 0·1 mb.

V—Visibility V—can the code of M.O. 2630 (*Appendix* XIII.) be accepted?

H—Relative humidity—one figure is sufficient to indicate the most important features of this. Differentiation between the cases 95-100 per cent. and 90-95 per cent. is required. The following code may prove acceptable:—

Code Figure.		*Code Figure.*	
0	= 95-100 per cent.	5	= 50-59 per cent.
9	= 90-94 ,, ,,	4	= 40-49 ,, ,,
8	= 80-89 ,, ,,	3	= 30-39 ,, ,,
7	= 70-79 ,, ,,	2	= 20-29 ,, ,,
6	= 60-69 ,, ,,	1	= 10-19 ,, ,,

A B Forms of Cloud. The International classification provides ten primary forms and some subsidiary forms. Is it desirable to adhere to one common code for A and B, or to specify high and low cloud by separate codes, which offers a wider choice of forms; and makes possible some indication of *thickness*? This is at present a debatable question.

Codes are:—

I	II	III	
A & B alike.	A & B alike.	A	B
0 = No cloud	1 = Ci	1 = Fr-' u	1 = Ci.
1 ,, Ci, Ci-St.	2 ,, Ci-St	2 ,, M-Cu	2 ,, Ci-St.
2 ,, Ci-Cu, A-Cu.	3 ,, Ci-Cu	3 ,, Low St-Cu (below 1200 m.).	3 ,, Ci-Cu.
3 ,, A-St	4 ,, A-Cu	4 = High St-Cu (above 1200 m.).	4 ,, False Ci.
4 ,, St-Cu	5 ,, A-St	5 = Nb	5 ,, Thin A-St.
5 ,, Nb	6 ,, St-Cu	6 ,, Cu	6 ,, Thick A-St.
6 ,, Cu	7 ,, Nb	7 ,, Cu-Nb	7 ,, A-Cu (below 3 km.).
7 ,, Fr-Cu	8 ,, Cu	8 ,, St	3 = A-Cu (above 3 km.).
8 ,, Str	9 ,, Cu-Nb		
9 ,, Cu-Nb	0 ,, St		

L M—Amounts of cloud of the specified types, or, if more than two types exist, total amounts of cloud of type similar to the specified type A and of type similar to the specified type B.

h—Height of base of lowest cloud. This can be obtained by balloon, by aeroplane, by searchlight. It can be estimated, roughly, from the type and appearance of cloud.

It can be estimated with some precision by an observer who has had experience of actual measurements of height. It is of great importance.

r s—Times of beginning and ending of precipitation; the existing code for this is as follows:—

1 = precipitation began between 7 and 8 (13 and 14) o'clock.
2 = ,, ,, ,, 8 ,, 9 (14 ,, 15) ,,
3 = ,, ,, ,, 9 ,, 10 (15 ,, 16) ,,
4 = ,, ,, ,, 10 ,, 11 (16 ,, 17) ,,
5 = ,, ,, ,, 11 ,, 12 (17 ,, 18) ,,
6 = ,, ,, ,, 12 ,, 13 o'clock (does not apply in the evening reports).
7 = ,, ,, before 8 a.m. (13) o'clock.
8 = ,, ,, unknown.
9 not known whether there was precipitation or not. In cases where the precipitation was in the form of showers, the time when the first shower started should be given.

0 = no precipitation since 7 (13) o'clock.
1 = precipitation ceased between 7 and 8 (13 and 14) o'clock.
2 = ,, ,, ,, 8 ,, 9 (14 ,, 15) ,,
3 = ,, ,, ,, 9 ,, 10 (15 ,, 16) ,,
4 = ,, ,, ,, 10 ,, 11 (16 ,, 17) ,,
5 = ,, ,, ,, 11 ,, 12 (17 ,, 18) ,,
6 = ,, ,, ,, 12 ,, 13 o'clock (does not apply to evening reports).
7 = ,, still continuing at 13 (18) o'clock.
8 = hour of ceasing unknown.
9 = not known whether there was precipitation or not. In cases when precipitation was in the form of showers the time of ceasing of the last shower should be given.

N.B.—The figures 8 and 9 in both codes are to be used in exceptional cases only.

Any modification necessary to permit of general adoption? Would it be better to indicate the number of hours *before* the actual time of report?

S—State of sea; no modification of existing code appears necessary.

The question of separate reports of "swell" ought, however, to be considered.

London,
July 30th, 1920.

APPENDIX II.

MEMORANDUM ON METEOROLOGICAL CODES.

By M. Hesselberg, Directeur de l'Institute Meteorologique, Kristiania.

(August 28th, 1920.)

I. The Code proposed by Colonel Gold.

In his memorandum of meteorological codes Colonel Gold has suggested as a possible form for weather telegrams from ordinary meteorological stations:—

BBBDD FwwTT cbbVH ALBMh WWrsS RRRmm

where BBB—Barometric pressure.
DD—Wind direction.
F—Force of the wind.
ww—Present weather.
WW—Past weather.
TT—Temperature.
c—Characteristic of barometric tendency.
bb—Amount of barometric tendency.
V—Visibility.
H—Relative humidity.
A—Form of lower clouds.
L—Amount of lower clouds.
B—Form of higher clouds.
M—Amount of higher clouds.
h—Height of base of lowest cloud.
r—Time rain begins.
s—Time rain ends.
S—State of sea.
RRR—Precipitation.
mm—Minimum temperature or maximum temperature.

II. Remarks.

BBB *Barometric pressure.*—It is very desirable that all countries use the same unit. In accordance with the resolution in Paris the unit should be millibar, and the barometric pressure should be given in millibars and tenths.

DD *Wind direction.*—It seems preferable to use the old scale 00-32. When not only the even numbers but all number are used the scale should be sufficiently accurate also for upper wind.

F *Wind force or speed.*—For the discussion of the question of the use of Beaufort scale or double metres per second as units the following table is given:—

Beaufort Scale.	0	1	2	3	4	5	6	7	8	9	10	11	12
The corresponding wind velocities after English investigations.	0·1	0·8	2·4	4·3	6·7	9·4	12·3	15·5	18·9	22·6	26·4	30·4	>35
Difference from double metres pro second.	+0·1	−1·2	−1·6	−1·7	−1·3	−0·6	+0·3	+1·5	+2·9	+4·6	+6·4	+8·4	>11
The same difference for Germany ...	—	−0·3	−0·9	−1·2	−1·3	−1·2	−1·3	−1·1	−0·6	0·0	+1·0	+4·5	—
The same difference for the ocean ...	—	−0·1	−0·9	−1·2	−1·2	−1·2	−1·8	−1·7	−1·5	−0·7	+0·4	—	—
The same difference for Norway ...	—	−0·5	−0·8	−1·1	−1·3	−1·3	−1·3	−1·2	−0·9	−0·6	−0·2	—	

The differences given in the table are moderate. It therefore will not bring any great confusion if some stations givė wind force in Beaufort's scale, while others give wind velocity in double metres per second. It should, therefore, be permitted that the stations which now are equipped with anemometers give wind velocities in double metres per second, while the other stations give wind force in Beaufort's scale. In due course all reporting stations should be equipped with anemometers and begin to give wind velocities in double metres per second.

ww *Present Weather.*—In the present International code there is only used one figure for the weather. Now it is proposed to use seven figures characterising the weather, namely, ww, V, A, L, B and M. It then should be discussed if it is necessary to have the two figures ww. We will therefore look over the proposed code (*see* Minutes of the Meeting of the International Meteorological Committee, London, 1919, Code 1).

Nos. 00-05 are unnecessary because the cloudiness is given in greater details in A, L, B, M.
Nos. 06-31 are unnecessary because cloudiness is given in A, L, B, M, and haze, mist and fog in V.
Nos. 32-42 must be omitted because they prevent any characteristic of the weather.
Nos. 43-44 are unnecessary because they are given in F.
Nos. 45-46 might perhaps be given from some good stations in special telegrams and in more complete form.
Nos. 47-49 might be given with one figure as thunderstorm.
Nos. 50-58 might be given with three numbers because fog is given in V.
Nos. 59-61 are unnecessary because wind force is given in F. The squalls might be given by adding 50 to the wind direction.
Nos. 62-64 might be given with one figure as hail.
Nos. 65-67 might be given with one figure as sleet.
Nos. 68-70 might be given with three figures, slight snow, moderate snow, heavy snow.
Nos. 71-73 must be omitted because they prevent any characteristic of the weather.
Nos. 74-76 omitted as reserve figures.
Nos. 77-79 might be given with one figure as drizzle.
Nos. 80-91 are given before (59-70).
Nos. 92-94 are given before (47-49).
Nos. 95-97 might be given with one figure as thunderstorm with hail.

Of the figures only eleven must be considered as important. All of these are not equally necessary, and a further reduction leads to the Code 1.

WW *Past Weather.*—For past weather a similar reduction might be done.

Nos. 00-01 might be given as "chiefly clear weather without precipitation."
Nos. 02-09 might be given as "chiefly clouded weather without precipitation."
Nos. 10-14 might be given as "overcast without precipitation."
Nos. 15-29 might be given as "chiefly foggy weather without precipitation."
Nos. 30-46 must be omitted because they prevent any characteristic of the weather.
Nos. 47-49 might be given as thunderstorm.
Nos. 50-61 might be given with two figures as "rainshowers (snowshowers, hailshowers) with patches of blue sky," and "overcast with rainshowers (snowshowers)."
Nos. 62-91 might be given with three figures as "fog and rain (snow)." "Occasional rain (snow)." "Continuous rain (snow)."
Nos. 92-97 might be given as "thunderstorm" (as Nos. 47-49).

Thus a reduction to ten numbers is made (Code 2a). The reduction is, however, here stronger than by the code for present weather, because past weather is only given by W, while present weather is given not only by w, but also by V, A, L, B and M.

It therefore might be found necessary to use two figures to give the past weather. This could perhaps be done as shown in code 2b.

TT *Temperature.*—It is proposed to give the temperature in whole degrees. It should, however, be given in degrees and tenths. Even if the temperature cannot be given with an accuracy of $\pm 0{\cdot}1°$, the accuracy will surely be greater than $\pm 0{\cdot}5°$. The changes of temperature will only be given with an accuracy of $\pm 0{\cdot}9°$.

Example 1.—Reported 5° from one station in two consecutive telegrams. That may mean:—

$t_1 = 4{\cdot}5°$ $\quad t_2 = 5{\cdot}4°$
or $t_1 = 5{\cdot}4°$ $\quad t_2 = 4{\cdot}5°$

In the first case the temperature has risen 0·9°, and in the second has fallen 0·9°.

Example 2.—Reported from one station 9°, and later 8°. That may mean:—

$t_1 = 8{\cdot}5°$ $\quad t_2 = 8{\cdot}4°$
or $t_2 = 9{\cdot}4°$ $\quad t_2 = 7{\cdot}5°$

In the first case the temperature has fallen 0·1°, in the second case 1·9°. In the first case there is no important change of temperature, in the second a squall-line might have passed the station.

c *Characteristic of barometric tendency.*—It might be given according to the Norwegian proposal (code 3a), or after the present international code. In this a small change is desirable. The figure 8 gives "rising then horizontal or rising then falling." It is inexpedient to have these two forms given by the same figure. It should always be possible to decide if the barometer now is falling, horizontal or rising. If the form "rising then falling" is removed to figure 6, this will give "horizontal now falling or rising now falling" (code 3b).

bb *Amount of barometric tendency.*—If code 3a is chosen for the characteristic of barometric tendency, the amount can be given in millibars and tenths. But if code 3b is chosen, the amount must be given in half-millibars and 50 added for negative amounts.

V *Visibility.*—In the English code there seems to be too many degrees of small and too few degrees of high visibility. A small alteration would make the code more internationally practicable (code 4a or 4b).

H *Relative Humidity.*—It should be better to use two figures instead of one, so that the humidity could be given in per cent. If only one figure is used the proposed code should be acceptable (code 5).

A *Form of lower clouds.*—In the proposed code it is given two forms for St Cu, namely, high and low. The observer will, however, scarcely be able to distinguish if the St Cu are low or high. It therefore should be preferable to have only one form St Cu. On the other hand, Fr Nb might be given in addition to Nb (code 6).

L *Amount of lower clouds* should be given as proposed in tenths of sky (10 telegraphed as 0).

B *Form of higher clouds.*—In the proposed code two A Cu forms are given, viz., high and low. As the observer scarcely will be able to distinguish if the A Cu is high or low, only one form A Cu should be used. On the other hand, A Cu lenticularis or A St lenticularis should be given, as they indicate clouds in dissolution (clouds in front of a squalline, in mountainous countries also fohn (code 7).

M *Amount of higher cloud.*—When there are lower clouds, it is not possible to give the amount of higher clouds. It is therefore preferable to give the cloudiness N, the amount of all present clouds, in tenths of sky (10 telegraphed as 0).

h *Height of base of lowest cloud.*—For the air traffic it will of course be very important to get this information. The observer at ordinary meteorological stations will, however, as a rule, not be able to estimate the height of base of the lowest cloud. It therefore seems unnecessary to have this information in the common code. It should, on the other hand, be given from aerological stations.

r *Time rain begins* can be given with one figure (code 8).

s *Time rain ends* can be given with one figure (code 9).

S *State of sea* might be given in the present international code. In the Norwegian translation is made a small alteration in order to inform the observer what he has to telegraph in the case of swells (code 10).

RRR *Precipitation* might be given in millimetres and tenths. If only two figures are used to give the precipitation, it should be given only in whole millimetres. The small amounts 0.1-0.9 millimetres might be telegraphed as 91-99.

mm *Minimum temperature and maximum temperature.*—It seems rather unnecessary to get this information from foreign countries and it might therefore be omitted from the international code.

C *Drift of cirrus clouds.*—It seems desirable to keep the drift of cirrus clouds in the weather telegram, either from all stations or from those stations that cannot give sea disturbance.

III. Special Codes.

Code 1.

w *Present weather.*

0—No precipitation neither on the station nor within sight.
1—Precipitation within sight but not on the station.
2—Drizzle.
3—Light or moderate rain.
4—Heavy rain.
5—Sleet.
6—Light or moderate snow.
7—Heavy snow.
8—Hail.
9—Thunderstorm.

Code 2a.

W *Past weather.*

0—Chiefly clear weather without precipitation.
1—Chiefly clouded weather (changing cloudiness) without precipitation.
2—Overcast without precipitation.
3—Chiefly foggy weather without precipitation.
4—Thunderstorm.
5—Rainshowers (snowshowers, sleetshowers) and patches of blue sky.
6—Overcast with rainshowers (snowshowers, sleetshowers).
7—Fog and rain (snow, sleet).
8—Occasional rain (snow, sleet).
9—Continuous rain (snow, sleet).

CODE 2b

W_1W_2 *Past weather.*

W_1
- 0—No precipitation.
- 1—Rain, 2—Sleet or snow, 3—Hail } showers.
- 4—Rain, 5—Sleet, 6—Snow } occasional.
- 7—Rain, 8—Sleet, 9—Snow } continuous.

W_2
- 0—Clear weather.
- 1—Only higher clouds.
- 2—Changing cloudiness.
- 3—Overcast, with blue patches.
- 4—Overcast.
- 5—Mist.
- 6—Occasional fog.
- 7—Continuous moderate fog.
- 8—Continuous dense fog.
- 9—Thunderstorm.

CODE 3a.

c *Characteristic of barometric tendency.*

- 0—Steady
- 1—Rising, 2—Rising, then steady, 3—Rising, then falling, 4—Falling, then rising or steady, then rising. } The barometer now higher than three hours ago.
- 5—Falling.
- 6—Falling, then steady, 7—Falling then rising, 8—Rising, then falling or steady, then falling. } The barometer now lower than three hours ago.
- 9—Unsteady

CODE 3b.

c *Characteristic of barometric tendency.*

- 0—Steady.
- 1—Unsteady.
- 2—Rising.
- 3—Falling.
- 4—Falling, then rising.
- 5—Steady, then rising.
- 6—Steady, then falling or rising, then falling.
- 7—Falling, then steady.
- 8—Rising, then steady.
- 9—Line squall.

CODE 4a.

V *Visibility.*

	Distance of most distant object visible.
9 or 0—	< 200 metres.
8 or 1—	200-1,000 metres.
7 or 2—	1- 2 km.
6 or 3—	2- 4 ,,
5 or 4—	4- 7 ,,
4 or 5—	7- 12 ,,
3 or 6—	12- 20 ,,
2 or 7—	20- 50 ,,
1 or 8—	50-100 ,,
0 or 9—	> 100 km.

CODE 4b.

V *Visibility.*

	Distance of most distant object visible.		
9 or 0=	< 50 metres.	4 or 5=	4- 7 km.
8 or 1=	50- 200 metres.	3 or 6=	7-12 ,,
7 or 2=	200-1,000 metres.	2 or 7=	12-20 ,,
6 or 3=	1- 2 km.	1 or 8=	20-50 ,,
5 or 4=	2- 4 ,,	0 or 9=	> 50 km.

CODE 5.

H *Relative Humidity.*

1=10- 19%	6=60- 69%
2=20- 29%	7=70- 79%
3=30- 39%	8=80- 89%
4=40- 49%	9=90- 94%
5=50- 59%	0=95-100%

CODE 6.

A *Form of lower clouds.*

0—No lower clouds.	5—St-Cu.
1—Nb.	6—Cu.
2—Fr-Nb.	7—Fr-Cu.
3—St.	8—Cu-Nb.
4—M-St or M-Cu.	9—Cloud form unknown.

CODE 7.

B *Form of higher clouds.*

- 0—No higher clouds.
- 1—Ci.
- 2—Ci-St.
- 3—Thin A-St.
- 4—Thick A-St.
- 5—Ci-Cu.
- 6—A-Cu.
- 7—A-Cu lenticularis or A St lenticularis.
- 8—False cirrus (?).
- 9—Cloud form unknown.

CODE 8.

r *Time rain begins.*

	In Morning telegram.		*In Mid-day telegram.*		*In Evening telegram.*
0—No precipitation since last observation.					
1—18-20	...	7-8	...	13-14	
2—20-22	...	8-9	...	14-15.	
3—22-24	...	9-10	...	15-16	
4—24-2	...	10-11	...	16-17	
5— 2-4	...	11-12	...	17-18	
6— 4-5	...	12-13			
7— 5-6					
8— 6-7					
9—Precipitation began before last observation.					

CODE 9.

s *Time rain ends.*

The same code as for r, only that 9 has another meaning.

9—Precipitation continues still.

CODE 10.

S *State of sea.*

0—Calm or glassy.
1—Very smooth or slightly rippled.
2—Smooth—rippled.
3—Slight—rocks, small boat or buoy, low swells.
4—Moderate—furrowed, moderate swells.
5—Rather rough—much furrowed, high swells.
6—Rough—deeply furrowed, very high swells.
7—High—rollers with steep points.
8—Very high—rollers with steep points.
9—Phenomenal—towering, precipitous.

IV. Possible International Codes.

Alternative Ia—BBBDD FwTTT cbbHH VNBAL SrsWW$_1$W$_2$ RRRmm
,, Ib—NBALV DDFwS rsW$_1$W$_2$cbbBBB TTTHH RRRmm
,, IIa—BBBDD FwTTT cbbVH NBALS rsWRR
,, IIb—NBALV DDFwS rsWRR TTTHc bbBBB.

Where BBB—Barometric pressure in mb. and tenths.
DD—Wind direction in scale 00-32.
F—Wind force in Beaufort Scale or wind velocity in double metres pro second.
w—Present weather (code 1).
TTT—Temperature in degree Celsius and tenths.
c—Characteristic of barometric tendency (code 3a or code 3b).
bb—Amount of barometric tendency in millibars and tenths or in half-millibars.
V—Visibility (code 4a or code 4b).
H—Humidity (code 5).
HH—Humidity in per cent.
N—Amount of clouds in tenths of the sky.
B—Form of higher clouds (code 7).
A—Form of lower clouds (code 6).
L—Amount of lower clouds in tenths of the sky.
S—State of sea (code 10).
r—Time rain begins (code 8).
s—Time rain ends (code 9).
W$_1$W$_2$—Past weather (code 2b).
W—Past weather (code 2a).
RR—Precipitation in millimetres (for 0·1-0·9 telegraphed 91-99).
RRR—Precipitation in millimetres and tenths.
mm—Minimum temperature or maximum temperature in degree Celsius.

In the alternatives b the two first groups give all information for the air traffic.

V. Possible Codes for weather telegrams from ships.

The international code from ordinary stations may be used, when RRR is replaced by $T_v T_v T_v$ temperature of surface water in degree Celsius and tenths. If precipitation is given with two figures only the temperature $T_v T_v$ of the surface water might also be given in degree Celsius and tenths, when in the water temperatures above 9.9° the first figure is omitted. At first or at last in the telegram, particulars about the observation's time, the latitude, the longitude, and the course of the ship can be given according to the code

tt $\phi\phi\phi$ $\lambda\lambda\lambda$ dd

where

tt—is the time of observation (Greenwich time).
$\phi\phi\phi$—latitude in degrees and tenths.
$\lambda\lambda\lambda$—longitude in degrees and tenths (add 500 for longitudes east from Greenwich).
dd—course of the ship in scale 01-32.

VI. Possible Codes for cloud—pilot balloon—and aerological stations.

Cloud Stations.

Colonel Gold gives the form CDDVH.

where C—Cloud form.
DD—Direction of cloud drift in scale 00-32.
V—Velocity height ratio.
H—Height of cloud.

As velocity ratio height scarcely can be given with one figure, the following form might be preferable.

Clouds $C_1D_1D_1F_1F_1$ $C_2D_2D_2F_2F_2$ . . . heights $h_1h_2h_3h_4h_5$

where

C=form of the cloud (Code 11).
DD=direction of cloud drift in scale 00-32.
FF=1000 x velocity height ratio.
h=height of the cloud (Code 12).

CODE 11.

C *Form of the cloud.*

0=Ci
1=Ci-St
2=Ci-Cu
3=A-Cu
4=A-St
5=St-Cu
6=Nb
7=Cu
8=Cu-Nb
9=St

CODE 12.

h *Height of the cloud.*

0=below 150 metres.
1=between 150-300 metres.
2= ,, 300-500 ,,
3= ,, 500-750 ,,
4= ,, 750-1,000 ,,
5=between 1,000-1,500 metres.
6= ,, 1,500-2,000 ,,
7= ,, 2,000-2,500 ,,
8= ,, 2,500-3,000 ,,
9=not obtainable.

Pilot Balloon Stations.

The proposed code is:—h'DDFF.

where

h'—height (Code 13).
DD—wind direction in scale 00-32.
FF—wind velocity in metres per second.

CODE 13.

h^1 *Height.*

0—ground.		5—2,000	metres.
1—200	metres.	6—3,000	,,
2—500	,,	7—4,000	,,
3—1,000	,,	8—5,000	,,
4—1,500	,,	9—6,000	,,

Aerological Stations.

Here the code could be:—

NNttt $B_1B_1T_1T_1H_1$ $B_2B_2T_2T_2H_2$ . . . . inversion BBBtt

NN=number of the station.
ttt=time of ascent in hours and tens of minutes.
BB=pressure in millibars (first figure omitted).
TT=temperature in degree Celsius.
H=humidity (Code 5).
BBB=pressure in millibars.
tt=rise of temperature in degree Celsius.

It is not necessary to give the height when the first group is referred to 200 metres, the second to 500 metres, and so on according to the height table of code 13.

APPENDIX III.

MEMORANDUM ON METEOROLOGICAL CODES.

BY DR. VAN EVERDINGEN, DIRECTOR OF THE METEOROLOGICAL INSTITUTE, DE BILT.

(September 20th, 1920.)

In offering some remarks and proposals regarding meteorological codes, I start from the code adopted at Paris October, 1919.

BBBDD FwwTT cbb (PP) NNN^1N^1S.
(WW)

Special groups for aviation purposes were to follow these four groups.

It seems to me that we ought to try not to modify these four groups unless very pressing arguments are brought forward.

The argument that V and H can be determined at every hour and PP not is open to objection, certainly V is more difficult to determine in the evening and night. H of little importance usually in morning, evening and night, whereas PP can be determined easily more than once a day at Standard stations—in Holland since several years rainfall and maximum-minimum temperatures are determined three times a day at a good number of stations. V and H at surface are of primary importance for aviation, h likewise, and would therefore fit very well in a fifth group followed by upper air data when available. This fifth group would contain then, f, i, V, h, H, r, s.

On the other hand, past weather is certainly as important for ordinary forecasting purposes as for aviation, and need not necessarily be included only in the groups following the fourth.

For these reasons I would prefer to maintain the order of data as adopted at Paris. Though past weather does not form part then of the morning message of four groops, it will appear from what follows that several particulars of past weather may be included in the code for present weather.

Detailed Codes.

F *Beaufort scale.*—In view of the effect of exposure of instruments and gustiness of the wind I do not think the introduction of numbers proportional to the speed of the wind would be an improvement.

ww *Hydrometeors.* (Present Weather).—More detail concerning the state of the weather and clouds is certainly desirable, but the code adopted in the Covention for the Regulation of Aerial Navigation, and that printed in the report of the meeting of members of the International Meteorological Committee, July, 1919, have certain disadvantages which might be avoided. This arises partly from the fact that too much attention is paid to the occurrence of haze and fog, which are indicated by the visibility figure, whereas, on the other hand, the total degree of nebulosity is left uncertain. It appears to me that a two-figure code, in which the first figure has the same meaning as in the old one-figure code, while the second gives detail or supplementary information, partly of the character of a "tendency" for cloud or rainfall, would present the advantage that the customary symbols in the weather charts may be at once derived from the first number, and that the details added give a clearer view on the more or less accidental character of the actual nebulosity.

The code I proposed (p. 62) below follows the principle that the numbers 00, 10, 20, etc., give the conditions most favourable or least unfavourable for flying purposes; the higher numbers in the second place less favourable conditions; it does not seen possible to follow up this principle rigorously throughout the scale.

Of course, this code, which is not in actual use, is only tentative; it is hoped that further consideration and discussion will lead to an improved definitive code.

If the time of commencement and ending of precipitation is introduced in a later group, I think past weather would no longer require a separate couple of figures, and I would prefer to see the amount of precipitation since the last report given instead.

No separate code for past weather is proposed; if necessary the same code might be used for both past and present weather.

Cloud group.—My proposal referred to on p. 46, 47 of the Paris Procès-Verbaux to use a code indicating as well kind as direction and velocity of cloud by two figures dates from the time when there was not sufficient room in the reports for something better. We have now to start from the assumption that four figures are available. It appears to me that if the present weather code proposed above gives a good deal of information about amount and nature of clouds, this space ought to be used for direction and velocity. These data may become very important for the weather forecasting if they are given by all or nearly all stations appearing on the international weather maps before the war, and, therefore, I think they ought to remain in the first four groups as was decided at Paris. We have to bear in mind, however, that the exact determination of height is often impossible, that even experts in cloud may be mistaken in their classification, and that a high degree of accuracy in determining direction is only possible with a constant type of cloud, when no lower cloud interferes. This would lead to the conclusion that a scale of 1-16 gives what may be expected from the average observer. If, then, the first two figures are allotted to high or medium cloud, the second two figures to low cloud, the code proposed as II (p. 64) gives velocity in three steps (like the scale actually used in Switzerland), whereas the velocity of the lower cloud, the height of which can often be measured or estimated with more accuracy, can be given in six steps.

A restriction to eight directions, as in practice for high cloud at present and in actual use in England, Switzerland and Holland now, would enable to distinguish between four classes of high and medium cloud, and to give the velocity of low cloud in ten steps, taking the first figure for velocity, and the second from 1-8 for direction.

A specimen of the code constructed in this way is given in III (p. 66). The use of letters instead of figures would allow more detail to be given. I should like, however, to restrict the use of letters to pilot balloon results, where a higher degree of accuracy can usually be warranted.

Fifth Group.—I have nothing to remark about the codes proposed for the various symbols in the fifth group. If r and s can be given with sufficient accuracy by a good number of stations, these data certainly would be useful, but I fear they will as a rule only be sufficiently accurate at standard stations provided with a recording rain gauge.

Reports of upper wind and upper air temperatures and humidity.

If a selection of heights is made, and I think it necessary to do so, it looks like waste of space to indicate the height even by a single figure, as it follows quite naturally from the order of the figures and groups. The system of reporting pilot balloon results by two groups of six letters in the Eiffel Tower weather reports works quite satisfactorily, and may be amplified if desired by choosing smaller velocity steps, *e.g.*, below 10 metres per second. For scientific research a more accurate indication of direction is necessary, but the French system appears quite sufficient for daily work.

If a majority should want more accurate information, I would recommend five-figure groups, hDDVV:—

h—Height in one-figure scale.
DD—Direction in multiples of 10 degrees from North.
VV—Velocity in K.M. per hour.

Temperature and humidity are given in the Dutch wireless reports for aviation by two figures each, in whole degrees Centigrade and per cent. combined to six-figure groups TTTTTT and HHHHHH, both for 500 M. steps. It would be a very great help for forecasting if even a small number of stations in every country (*e.g.*, three in the British Isles, two or three in France, one in Denmark, &c.) would send information of this kind; a higher accuracy is not required for humidity, even a one-figure code would perhaps suffice.

The practice in Holland has shown that by using aircraft, motor-cycling, and telephone or wireless, reports of this kind are usually available in time to be inserted in a collective wireless morning report.

(Sgd.) E. Van Everdingen.

De Bilt,
20th September, 1920.

00	Absolutely cloudless, exceptional visibility.				
01	,, ,, since several hours.				
02	,, ,, ,, dust horizon				
03	,, ,, ,, horizon obscured.				
04	,, ,, high clouds before observation.				
05	,, ,, med. ,, ,, ,,				
06	,, ,, low ,, ,, ,,				
07	,, ,, dew.				
08	,, ,, hoar frost.				
09	,, ,, rime.				
10	¼	clouded,	high	clouds	clouds decreasing.
11		,,	medium	,,	
12		,,	low	,,	
13		,,	high	,,	nearly constant.
14		,,	medium	,,	
15		,,	low	,,	
16		,,	high	,,	increasing.
17		,,	medium	,,	
18		,,	low	,,	
19		,,	very low	,,	

20	½	clouded,	high	clouds	decreasing.
21		,,	medium	,,	
22		,,	low	,,	
23		,,	high	,,	nearly constant.
24		,,	medium	,,	
25		,,	low	,,	
26		,,	high	,,	increasing.
27		,,	medium	,,	
28		,,	low	,,	
29		,,	very low	,,	
30	¾	clouded,	high	clouds	decreasing.
31		,,	medium	,,	
32		,,	low	,,	
33		,,	high	,,	nearly constant.
34		,,	medium	,,	
35		,,	low	,,	
36		,,	high	,,	increasing.
37		,,	medium	,,	
38		,,	low	,,	
39		,,	very low	,,	
40	Overcast,		high	clouds	increased during last hours.
41	,,		medium	,,	
42	,,		low	,,	
43	,,		high	,,	since several hours.
44	,,		medium	,,	
45	,,		low	,,	
46	,,		mixed	cloud	moderate rain before observation.
47	,,		,,	,,	slight rain before observation.
48	,,		,,	,,	heavy rain or showers before obs.
49	,,		very low clouds		

50	Slight rain, before obs. little or no rain.
51	Moderate rain, before obs. slight rain or intermittent rain.
52	Heavy rain, before obs. moderate rain or occasional showers.
53	Slight rain }
54	Moderate rain } since several hours.
55	Heavy rain }
56	Slight rain }
57	Moderate rain } before obs. more rain.
58	Heavy rain, before obs. heavy showers.
59	Heavy rain and squalls.
60	Slight snow.
61	Moderate snow.
62	Heavy snow—snow driving.
63	Slight sleet.
64	Moderate sleet.
65	Snow and sleet.
66	Rain and hail.
67	,, ,, also at intervals before obs.
68	Slight or moderate hail.
69	Heavy hail and squalls.
70	Slight haze (1f), sky overcast.
71	Haze (2f), sky overcast.
72	Slight haze (1f), and drizzle.
73	Haze (2f), and drizzle.
74	Slight haze and slight rain.
75	Haze and slight rain.
76	Slight haze and moderate rain.
77	Haze and moderate rain.
78	Slight haze and heavy rain.
79	Haze and heavy rain.

80 Fog 3-5f sky clear in zenith.
81 ,, 6-8f ,, ,,
82 ,, 3-5 and drizzle.
83 ,, 6-8 ,,
84 &c.
85
86
87
88
89

90 Distant thunder.
91 Thunder threatening, gloom, ugly.
92 Slight thunderstorm } without hail.
93 Moderate ,, }
94 Heavy ,, }
95 Slight ,, }
96 Moderate ,, } with hail.
97 Heavy ,, }
98 Line squall and thunder.
99 Obs. fails.

High Cloud (Ci, Ci.St, Ci.Cu).

Nephoscope Besson. Time sec.	Velocities.	Direction.	Calm.	N.N.E.	N.E.	E.N.E.	E.	E.S.E.	S.E.	S.S.E.	S.	S.S.W.	S.W.	W.S.W.	W.	W.N.W.	N.W.	N.N.W.	N.	—
>60 ...	Small ...	—	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	—
60–30 ...	Moderate ...	—	—	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	—
<30 ...	Large ...	—	—	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49 no high cloud or no observation.

Medium Cloud (A.St, A.Cu, St.Cu).

Nephoscope Besson. Time sec.	Velocities.	Direction.	Calm.	N.N.E.	N.E.	E.N.E.	E.	E.S.E.	S.E.	S.S.E.	S.	S.S.W.	S.W.	W.S.W.	W.	W.N.W.	N.W.	N.N.W.	N.	—
>30 ...	Small ...	—	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	—
30–15 ...	Moderate ...	—	—	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	—
<15 ...	Large ...	—	—	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99 no medium cloud or no observation.

Low Cloud (Cu, Fr, St, Fr, Nb).

Nephoscope Besson. Time sec.	Velocities.	Direction.	Calm.	N.N.E.	N.E.	E.N.E.	E.	E.S.E.	S.E.	S.S.E.	S.	S.S.W.	S.W.	W.S.W.	W.	W.N.W.	N.W.	N.N.W.	N.	—
	<4 m.p.s.	—	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	—
	4–8 ...	—	—	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	—
	8–12 ...	—	—	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49 no low cloud.
	12–16 ...	changeable.	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	—
	16–20 ...	—	—	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	—
	>20 ...	—	—	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99 no observ.

CODE FOR 8 DIRECTIONS.

Nephoscope Besson. Time sec.	Calm.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	N.	—
					Ci–Ci.St.					
>60 ...	00	01	02	03	04	05	06	07	08	—
60–30 ...	Ci–Ci.Cu. or Ci.St.	09	10	11	12	13	14	15	16	—
<30 ...	—	17	18	19	20	21	22	23	24	—
					Ci.Cu.					
>60 ...	—	25	26	27	28	29	30	31	32	—
60–30 ...	—	33	34	35	36	37	38	39	40	—
<30 ...	—	41	42	43	44	45	46	47	48	49 (no high or medium cloud).
					(A.St.)-A.Cu.					
>30 ...	50	51	52	53	54	55	56	57	58	—
30–15 ...	A.Cu. or St.Cu.	59	60	61	62	63	64	65	66	—
<15 ...	—	67	68	69	70	71	72	73	74	—
					St.Cu.					
>20 ...	—	75	76	77	78	79	80	81	82	—
20–10 ...	—	83	84	85	86	87	88	89	90	—
<10 ...	—	91	92	93	94	95	96	97	98	99 (no observation).
					Low Cloud.					
Velocity	No low cloud.									
<2 m.p.s.	00	01	02	03	04	05	06	07	08	—
2–4 ...	—	11	12	13	14	15	16	17	18	—
4–6 ...	—	21	22	23	24	25	26	27	28	—
					Etc.					
16–20 ...	—	81	82	83	84	85	86	87	88	—
>20 ...	—	91	92	93	94	95	96	97	98	99 (no observation).

APPENDIX IV.

REMARQUES ET SUGGESTIONS POUR LA CONFERENCE DE LONDRES,

par

PROFESSEUR A. DE QUERVAIN, ZURICH.

(October 1st, 1920.)

I. Organisation des émissions radiotélégraphiques des dépêches météorologiques internationales.

L'arrangement de cette question nous paraît de même importance au moins que celle des codes, préparée par M. Gold; nous l'avons prié de bien vouloir la préparer également et de la mettre à l'ordre du jour.

Base générale. Nous nous trouvons devant la situation suivante:

1. Les propositions et prescriptions de la *convention* internationale (oct. 1919) pour la navigation aérienne, contenues dans l'annexe G. de cette convention (et basées sur les propositions de la commission EU.F.G.B.I.).

2. Les délibérations de la conférence météorologique de Paris (oct. 1919).

3. Une proposition du gouvernement anglais (mai 1920) de s'entendre, même en dehors de cette convention, mais sur la base de ses prescriptions et des propositions de la commission de radiotélégraphie " EU.F.G.B.I."

4. Les essais faits par les différents services pendant la dernière année d'introduire des émissions radiotélégraphiques météorologiques; essais pas encore coordonnés au point de vue international.

Le moment de cette coordination paraît venu, pour sortir du chaos actuel.

Pratiquement nous serons encore tout â fait *libres* dans nos résolutions. Car même les états qui ont adhéré â la convention ne sont liés, pour l'organisation mêteorologique, que " dans la mesure du possible " (Art. 35 de la convention).

L'intention principale de l'annexe G. de la convention, de répandre des renseignements les plus *rapides* et *fréquents* possibles a été approuvée par la conférence de Paris, comme étant absolument dans l'intérêt de la météorologie synoptique générale.

Mais la proposition d'arriver à ce but par des émissions *simultanées quadruples* paraît en même temps *très coûteuse* (personnel et appareils) et d'une complication *inutile*.

1. REDUCTION DE LA SIMULTANÉITÉ.

Les informations que nos collègues d'Europe ont bien voulu nous donner prouvent qu'actuellement on pourrait probablement, sinon *éviter* complètement au moins réduire beaucoup les émissions simultanées.

EVENTUALITÉ A.

Si l'on met dans *une* série les états.

(*a*) qui actuellement pourraient *devancer* l'heure d'emission prévue dans la convention,

(*b*) qui peuvent satisfaire à cette heure et

(*c*) qui doivent se réserver d'émettre un peu plus tard que la convention ne prevoit, on peut *eviter* pratiquement *toute simultanéité* au moins pour le present et l'avenir immédiat. Ainsi l'émission pourrait commencer 30 à 45 min. après l'observation et elle serait terminée, pour les regions les plus importantes pour la prévision 2½ heures apres l'observation.

On aurait pour le matin la série (combinée a titre *d'exemple*):

Heure de Greenwich:

7.30	7.45	8.00	8.15	8.30	8.45
Hollande et Belgique.	Danemark.	Suisse.	Norvège et Suede.	Grande Bretagne.	(actuellement 9.45) France

9.00	9.15	9.30	9.45	10 h.
Allemagne.	Etats autrichiens.	Bologne et Tschecho-slovaquie.	Espagne.	Italie.

EVENTUALITÉ B : DEUX EMISSIONS SIMULTANÉES.

Au cas, ou des emissions simultanées seront inevitables, ou pourra en tout cas les restrendre au nombre de *deux*.

Exemple :

	8.00	8.15	8.30	
(*a*)	Hollande.	Pologne.	Norvège et Suede.	
(*b*)	Danemark.	Suisse.	Belgique.	
	8.45	9.00	9.15	9.30
(*a*)	Angleterre.	France	Allemagne.	Italie.
(*b*)	Autriche et Hongrie.	Espagne.	Tschecho-Slovaquie.	Afrique du Nord.

On pourrait considérer aussi une division géographique en deux groupes, dont l'un comprendrait les pays qui subissent plus directement l'influence des depressions du nord-ouest (la Suisse y serait encore comprise), et ceux situés plus loin à l'est et sud-est; parmi ces derniers se trouveraient l'Italie, la Yougoslavie, la Grece, la Pologne, la Tschechoslovaquie.

1. *Nous voudrions suggérer la discussion sur la base d'une série, ou de deux séries simultanées* en laissant aux différents membres le soin de préparer dès maintenant et d'apporter à la conférence le matériel nécessaire (terme plus prompt possible, portée, longueur d'ondes) à l'établissement d'un accord.
2. *La question de la portée minime* devrait également figurer à l'ordre du jour. Cette portée devra être choisie de façon à ce que l'Europe centrale (y compris la Suisse) puisse encore recevoir *directement* les premières émissions du nord-ouest de l'Europe, indispensables à nos prévisions. La portée de 1,500 km., prévue dans la " convention " semble bien choisie pour cela. Une portée sensiblement inférieure mettrait en question le but de l'organisation.
3. La question des *longueurs d'onde* devient importante s'il s'agit de régler des émissions simultanées. Il faudrait donc la considérer; notre pays désirerait en tenir compte pour l'installation d'un poste d'émission.

   Les questions suivantes de l'organisation générale devraient, à notre avis également être prises en considération et préparées.
4. *Révision du réseau international.*—Bien que le choix de ces stations appartienne à chaque pays, la question de changements éventuels en vue de la rapidité de transmission à la station centrale, de la qualité des observations plus complexes (nuages) des intérêts spéciaux (aéroplaces) semble être d'un intérêt international et justifier un échange d'idées général, avec rapports individuels. Question spéciale: choix du réseau des observations *de nuit* (1 h).
5. *Heures d'observation.*—Il semble désirable de faire les observations du soir à une heure telle que la prévision basée sur elle puisse encore être communiquée au grand public par T.S.F. en temps utile (21 h). (Donc observation pas plus tard que 18 h Greenwich —si possible plus tôt.)
6. *Observations de marine.*—Il serait très désirable que l'état actuel de la question de compléter les dépêches internationales par des *observations de marine*—soit communiqué par les instances compétentes; et que cette question relevée depuis longtemps soit amenèe à une solution. (Proc.-Verb., Paris, 1919, pag. 49.)
7. *Terme d'introduction* et *caractère provisoire* de la nouvelle organisation.

   Nous proposons de considérer dès maintenant le terme d'introduction le plus rapprochè possible; p.e. le 1er avril 1921.

   Vu la situation de transition dans laquelle nous nous trouvons, tant pour les besoins des reseignements (développement de l'aviation) que pour les conditions extérieures de l'organisation des échanges, il faudrait, à notre avis, considerer *dès maintenant* le caractère *provisoire* des nouveaux arrangements, et leur revision après l'expérience de 2 ou 3 ans.

II. Remarques concernant les Codes.

(Comparer les mémoranda de M. Gold et M. van Everdingen.)

Remarques Générales

Les points de départ correspondent à ceux mentionnés Sub. I. Nous nous joignons à la proposition de M. Gold (identique avec celle qui à été adoptée à Paris en Octobre 1919) de distinguer les dépêches synoptiques

générales de celles destinées surtout aux intérêts de l'*aviation* et furnies par un plus petit nombre de stations. (Pag. 5 du mémor.)

Cette dernière partie des dépêches avait été laissée par notre commission, dans les délibérations de Paris 1909, à la disposition de la commission *aéronautique* (proc.-verb., p. 39). A défaut de propositions émises par celle-ci, *un rapport sur les indications exigés actuellement par les aviateurs* formerait une introduction désirable, de la part d'un ou de plusieurs membres compétents—de même, pour la partie générale des dépêches, un rapport sur les besoins des nouvelles méthodes de prévision—tout ceci dans le sens des questions I et II du mémoire de M. Gold.

Dans cet ordre d'idées général nous nous permettons d'attirer votre attention sur les points suivants.

1.—La Question des Prévisions à Ajouter aux Dépêches.

La commission aérienne, dans les délibérations de Paris 1919 (pag. 32 et 38 des procès-verbaux), a été unanime à exiger l'addition de prévisions pour les 24 heures et éventuellement les 6 heures suivantes. Les décisions de la conférence obligent notre commission à en tenir compte.

Ces prévisions seront-elles ajoutées aux dépêches collectives—c'est ainsi que la chose était considérée à Paris—ou bien feront-elles l'object d'une émission particulière (comme ce sera le cas sans doute pour les services internes) après le dépouillement des dépêches internationales?

Ces prévisions seront-elles exprimées à l'aide d'un code—ce qui paraît impossible si l'on veut entrer dans les détails—ou bien donnera-t-on les en mots? Ne doit-on pas prévoir un code au moins pour les centres " regionaux "—qui pratiquement ne seront autres que les stations du reseau international—en restreignant ces prévisions à l'indication d'une tendance, p.e., pour les éléments du vent et de l'état du ciel (l'état actuel: devient plus favourable—se maintient—devient moins favorable). Le code pour W W proposé par M. van Everdingen prévoit déjà l'indication de la tendance (pour l'état du ciel).

2.—Restriction du Choix.

Le choix de ce qu'il faut transmettre est entre autres nécessairement limité par la quantité de nouvelles qu'il est possible de dépouiller et d'examiner à fond, en temps utile (c.-à-d. jusqu'au moment de la prévision).

Nous pensons que *chaque* élément doit pouvoir être représenté immédiatement et régulièrement sur une carte de travail; if faut avoir du temps pour le faire. Il semble inutile d'émettre des indications—aussi importantes qu'elles soient en elles-mêmes—mais que les bureaux récepteurs n'auraient probablement pas même le temps d'utiliser. Notre service de prévision y voit une grande difficulté; nous prions MM. les membres de la commission de se prononcer sur l'organisation, par laquelle les services de prevision de leurs pays arrivent à *vaincre* cette difficulté (il serait intéressant de connaître p.e. le fonctionnement de l'excellent service de prévision de l'Air Ministry de Londres).

3. *Nature des codes.* Le désir de la condensation devrait s'arrêter devant le principe que *les codes doivent être faciles a déchiffrer* et sans qu'on soit obligé derecourir trop souvent à des clefs compliquées.

Remarques sur le détail des groupes.

ad Gold pag. 2 groupe 8 et 9. (Group de nuages).

La conférence de Paris 1919 a prévu du double groupe " Forme-Direction " pour les dépêches générales. M. Gold doute, si toutes les stations pourront fournir des observations, dignes de foi, de *direction* (et

j'ajouterai, au même rang: de forme!). (En effet ce sont des observations plus délicates que toutes les autres et pour les obtenir il faut prévoir des efforts et dépenses particulières). Je suis d'accord qu'il serait inutile de prendre des décisions qui ne pourront pas être executées et me permets de suggérer que les membres s'informent dès maintenant lesquelles des stations de leur réseau pourront fournir ces observations. Peut-être fera-t-on intervenir certains changements dans les stations? (Pour ce qui est du réseau suisse nous prévoyons un crédit spécial pour compléter l'instruction, etc., des observateurs des 7 stations en question et pour augmenter un peu leur traitement en vue de garantir la bonne exécution de ces observations supplémentaires). Il serait utile d'indiquer les stations qui fourniront les observations de *nuit*.

D'après l'expérience je me range à l'opinion de MM. Gold et van Everdingen, que direction *et* vitesse relative sont nécessaire, et j'adopterais le système de M. van Everdingen. Mais je crois que l'indication de 3 niveaux est insuffisante, et qu'il faut donner la *forme* même (p.e. différence prognostique entre A-Str et A-Cu, ou Str-Cu et Ni, du même niveau).

On ne doit hésiter à donner à ce groupe l'étendue qu'il lui faut pour remplir son but, c.-à-d. un groupe de 6 chiffres, comme CDD C,D,D, qui soit suggéré ici (et qui éventuellement sera identique avec celui proposé par M. Gold pour la partie avistique). La vitesse serait combinée avec la direction d'une manière semblable que dans la proposition de M. van Everdingen. Mais en vue de la facilité de dépouillement des dépêches, la même unité correspondrait toujours à la même direction, pour toutes les 5 vitesses, avec une différence de 20.

16 *directions et* 5 *vitesses*:

		Niveau des nuages.		
		supérior	moyen	inférieur
		(Néphoscope Besson)		mètres p.s.
C0	Immobile.	sec.	sec.	
1-16 =	vitesse très faible ...	60	40	0-4
21-36 =	,, faible ...	60-45	40-30	4-8
41-56 =	,, moyenne ...	45-30	30-20	8-12
61-76 =	,, forte ...	30-15	20-10	12-16
81-96 =	,, très forte ...	15	100	16

Les deux derniers groupes des dépêches générales seraient ainsi: CDDC,D,D, vHrsS ou bien, si l'on renonce à l'humidité, pas prévue en général et insiste sur des groupes de 5 chiffres:

CDDC,D, D, vrsS.

ad pag. 5 (*b*). Groupe eventuel additionnel de *nuages*.

Il semble entendu qu'il y aurait souvent *plusieurs* groupes CDD V H?— Il sera difficile d'exprimer par un seul chiffre la vitesse relative, sans l'emploi d'un code spécial—à moins qu'on se contente d'indications un peu vagues pour les nuages très élevés et qu'on renonce aux très grandes vitesses des couches inférieures à 2000 m. Pour les nuages élevés et moyens il suffirait d'indiquer le premier chiffre de secondes mesurées au néphoscope Besson pour les nuages inférieurs: 1/3 vitesse en mètres.
On gagnerait un chiffre en adoptant le code précédent.

ad pag. 5 (*c*). Groupe additionnel: maximum et minimum.

A la conférence de Paris on a prévu la suppression du maximum et minimum en présence des 3 dépêches journalières. Nous admettons que les 3 dépêches du jour prévues seront données en principe pour *toutes* les stations, tandisque pour les observations de *nuit* il y aura un choix restreint.

Detail des Codes.

ad p. 6 *DD.* Direction du vent.

Il semble un peu illusoire d'aller au delà de 0 à 32, dans l'exactitude de la direction du *vent*, parce que la représentation sur les cartes, dessinées assez rapidement, n'ira guère plus loin, pratiquement.

ad p. 6 *WW.* Groupe de deux *chiffres* pour l'état du temps, adopté à Paris.

Nous renouvelons la proposition (procès-verbal de Paris, 1919), de réserver en tout cas les chiffres 0—9 à *l'ancien* code. Nous nous permettons également de rappeler la nécessité de représenter sur des *cartes* les indications W. Le code proposé ne peut guère être déchiffré sans l'aide d'un tableau spécial; cela nuit à sa comprehension rapide. Cette dernière condition paraît remplie par les propositions de M. van Everdingen (ici nous voudrions suggérer une transposition du commencement et de la fin du groupe 4 et 5 pour une raison logique).

ad pag. 8.

Code de la forme des nuages.

Pour le moment les codes I ou II semblent préférables au codes III pour la raison de simplicité. Dans le code I il y a pour la mémoire des coincidences heureuses (9=orage et nuages d'orage, 8=Str, voisin de brouillard, 5=Ni, et pluies). Les chiffres pairs indiquent des nuages à tendance prognostique pas immédiatement menaçante; les chiffres impairs sont des formes de mauvais augure.

Concernant le code II: Au point de vue prognostique Ci-Cu et A-Cu qui sont le plus souvent des formes différentes et variables de *la même couche*, n'ont pas grand besoin d'être distingués au point de vue du service de prévision, de même Ci et Ci-Str. En rangeant les " Ci-Cu " dans le niveau supérieur (Ci) on commettra une erreur dans la plupart des cas. Il semble désirable (confusions!) de reserver le chiffre 0 à l'*absence* de nuages.

Concernant III, A: On peut se demander pourquoi Mammato-cumulus qui ne représente qu'un certain *détail de forme*, (soit du Cu-Ni, soit du A-Str), est cité comme forme *indépendante*. Ce serait à remplacer utilement par Cu tendant vers Cu-Ni. Inversement, il y aurait lieu d'admettre ici une forme importante pour la prévision et si bien établie par Clément Ley, c.-à-d. son Cumulostratus (ne pas à confondre avec celui de Howard qui est maintenant Cu-Ni): on aurait tort de perpétuer ce qui est une vraie lacune de l'atlas international.

Concernant III, B: " False Ci." Ne semble-t-il pas établi définitivement que les anciens " cirrus faux " sont un bien des Ci-Cu ou des A-Cu? (Vincent). Ou bien est-ce qu'on vise ici les cirrus provenant de Cu-Ni dissouts et que Besson distingue avec raison et appelle des Cirrus " denses " (" Ci Cu-Ni-gen "), En ce cas nous serions bien d'accord d'accepter ici cette forme, d'interêt prognostique, mais en changant la désignation.

ad pag. 8 *h.* : *hauteur de la base*:

Quelle est l'unité proposée en 1 *chiffre?*

En Suisse (et dans d'autres régions un peu montagneuses), il sera *toujours* possible d'indiquer la limite *supérieure* du brouillard ou stratus. C'est une donnée qui reviendra régulièrement en hiver. Cela ne devrait-il pas figurer dans le code?

ad pag. 8, *Group rs. Commencement de la pluie.*

Pour rendre les dépêches plus commodes à rédiger et à lire, nous proposerions de choisir pour ce groupe un code qui indique *l'heure directe* du jour comme suit:

7h.		(= terme.)
7.30 - 8.30	... ...	= 8
8.30 - 9.30	... ...	= 9
9.30 - 10.30	... ...	= 0
10.30 - 11.30	... ...	= 1
11.30 - 12.30	... ...	= 2
etc.		etc.
16.30 - 17.30	... ...	= 7
18		(= terme.)

L'indication des heures 7h. et 18h. ne serait pas nécessaire parce que la donnée de l'observation directe (WW) intervient ici.

APPENDIX V.

MEMORANDUM ON THE USE OF "CHECK" FIGURES IN TELEGRAMS

by

Lt.-Col. F. Gold.

(October 6th, 1920.)

With reference to the meeting of the International Commission for Weather Telegraphy on November 22nd, it has been suggested that figure groups should be added to the messages from individual stations to check the accuracy of the transmission of the figures representing the observations. There are two separate ways of doing this. The first may be represented schematically as follows:—

A_1	A_2	A_3	A_4	X_1
B_1	B_2	B_3	B_4	X_2
C_1	C_2	C_3	C_4	X_3
D_1	D_2	D_3	D_4	X_4
E_1	E_2	E_3	E_4	X_5
Y_1	Y_2	Y_3	Y_4	Y_5

A_1 A_2 A_3 A_4 B_1, etc., are figures referring to the observations.
X_1 X_2 X_3 X_4 X_5 Y_1 Y_2 Y_3 Y_4 Y_5 are the check figures.

The following equations show how X_1, &c., are obtained:—

$$A_1 + A_2 + A_3 + A_4 = 10n_1 + X_1$$

etc.,

$$A_1 + B_1 + C_1 + D_1 = 10m_1 + Y_1$$

etc.,

$$X_1 + X_2 + X_3 + X_4 + X_5 = 10p + Y_5$$

The second method is to use the existing method of 5-figure groups for the actual data and to add the check figures in separate groups at the end of the message. This method may be represented schematically as follows:—

A_1	A_2	A_3	A_4	A_5
B_1	B_2	B_3	B_4	B_5
D_1	D_2	D_3	D_4	D_5
X_1	X_2	X_3	X_4	X_5
Y_1	Y_2	Y_3	Y_4	Y_5

$$A_1 + A_2 + A_3 + A_4 + A_5 = 10n_1 + X_1$$

etc.,

$$Y_1 + Y_2 + Y_3 + Y_4 + Y_5 = 10p + X_5$$

By either of these methods if a mistake is made in one or more of the data figures, or if one or two figures are actually missing from the message, the erroneous figure can be corrected or the missing figure can be obtained from an examination of the check groups.

This suggestion involves the use of at least two extra groups in the telegraphic reports, but it may be possible in spite of that to ensure a saving of time by the adoption of the method, in that it will render unnecessary the double transmission of the figure groups which is at present usually done by telegraphic services to avoid mistakes.

As our experience of the receipt of reports by W/T emphasizes the necessity of a check on the messages, I have put down the following as a form of message for International Exchange, which we may find it useful to consider. In it I have endeavoured to incorporate some of the suggestions made in the various memoranda which have already been circulated.

No provision is made for sea disturbance: this can be deduced fairly well usually from the chart and the reports of wind: the swell cannot, however, be so obtained, and if provision is made for the inclusion of information about the sea, an appropriate scale of swell should be utilised.

Symbolic form of message:—

B	B	β	b	x							
D	D	F	V	x							
w	w	T	T	x							
W	W	A	N	x							
H	H	r	s	x							
M	M	R	R	x	or	m	m	R	R	x	(at 18h. and 7h.
y	y	y	y	y							respectively).

Here "x" represents a check figure and "y" also a check figure. "N" is the total amount of cloud, and "A" is the form of predominating cloud. "b" should be barometric tendency in half millibars per three hours. "BB" the barometer in whole millibars.* Thus the normal message would consist of 6 five-figure groups, but at 7h. and 18h. an additional group would be inserted.

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* This would be obtained simply by omitting the last figure of the barometer readings hitherto telegraphed; *e.g.*, 953·6 mb. now telegraphed as 63·6 would be reported as 63. This is simpler for the observer than rounding off; it is more convenient also for use at national headquarters and it gives the same degree of accuracy as rounding off; the only difference is that the average value of results telegraphed as 63 will be 63·5 and not 63·0.

If the barometric tendency exceeds 9 but not 19, then the *second* figure is telegraphed as " b " and 33 added to the wind direction. If the tendency exceeds 19, the second figure is again telegraphed and 66 added to the wind direction. Tendencies above 29 to be reported as 29.

The following table would then serve for coding wind direction :—

Code for Reports of Wind Directions to indicate the " tens " figure in the Barometric Tendency.

Direction.	Barometer Tendencies of 9 or less.	Barometer Tendencies of 10–19.	Barometer Tendencies of 20–29.
	Code Numbers for Wind Direction.		
Calm	00	33	66
N. by E.	01	34	67
N.N.E.	02	35	68
N.E. by N.	03	36	69
N.E.	04	37	70
N.E. by E.	05	38	71
E.N.E....	06	39	72
E. by N.	07	40	73
E.	08	41	74
E. by S.	09	42	75
E.S.E.	10	43	76
S.E. by E.	11	44	77
S.E.	12	45	78
S.E. by S.	13	46	79
S.S.E.	14	47	80
S. by E.	15	48	81
S.	16	49	82
S. by W.	17	50	83
S.S.W....	18	51	84
S.W. by S.	19	52	85
S.W.	20	53	86
S.W. by W.	21	54	87
W.S.W.	22	55	88
W. by S.	23	56	89
W.	24	57	90
W. by N.	25	58	91
W.N.W.	26	59	92
N.W. by W.	27	60	93
N.W.	28	61	94
N.W. by N.	29	62	95
N.N.W.	30	63	96
N. by W.	31	64	97
N.	32	65	98

[At 13h. a group might be inserted daily giving the form (c), direction and relative speed of high cloud as determined by nephoscope.

Symbolically this group would be :—

CDDvX

(" v "—velocity height ratio in conventional units so that if cloud is at 10 km. (Ci.) and " v "=4, the actual speed is 40 m./s.)]

The " International " form of message would also be used for national reports, but it could be amplified very readily as follows by adding a group :—

b_1R_1BMx

where " BM " refers to the second type of cloud and its amount.

" b_1 " = decimal figure in barometer reading.
" R_1 " = decimal figure in rainfall measurement before rounding off.

This group would not be included in making up the figure " y."

In some national reports, too, a further group would be necessary in the 7h. report, giving duration of sunshine for the preceding day and the grass minimum.

SSggx

Sunshine would be in hours and tenths. If sunshine exceeds 8 hours, round it off to whole numbers and add 80 to this number to obtain the figure for telegraphy, e.g., sunshine 11 hours, telegraph 91.

An additional group would also be required in some countries, giving the form, direction of motion, and approximate speed of low cloud. This would take the form

" ADDvx "

where A = form of cloud.

London.
17th November, 1920.

APPENDIX VI.

MEMORANDUM ON METEOROLOGICAL CODES.

By Dr. Hesselberg, Director of the Meteorological Institute, Kristiania. Capt. C. Ryder, Director of the Meteorological Institute, Denmark. Mr. A. Wallen, Director of the Hydrographic and Meteorological Bureau, Sweden.

(October, 1920.)

At a meeting in Kristiania on the 21st-23rd October, 1920, the undersigned have discussed the different proposals on the international code for weather telegrams and for their distribution by means of wireless telegraphy.

I. We agree in recommending that the groups ought to be arranged according to their importance for the general weather-service and the possibility of getting them from all countries and stations.

We recommend the following code :—

Alt. I.—If it is resolved to give the temperature with two figures—

BBBβb DDFww TTRRW rsHVS ALB*NC

Alt. II.—If it is resolved to give the temperature with three figures—

BBBβb DDFww TTTRR WrsHV ALB*NS (or C)

The letters have the same significance as in Gold's code with the following alterations :—

B* = form of higher clouds.
N = Total amount of clouds.
C = Drift of Ci according to the common code.

The amount b of barometric tendency should be given after the code:—

0=0–0·2 mm.
1=0·3–0·7 mm.
2=0·8–1·2 ,,
3=1·3–1·7 ,,
4=1·8–2·2 ,,
5=2·3–2·7 ,,
6=2·8–3·2 ,,
7=3·3–4·7 ,,
8=4·8–7·2 ,,
9>7·2 mm.

or a similar code with pressure given in mbar.

Past weather W might be given after the code:—

0=Clear sky.
1=Only higher clouds.
2=Slightly clouded } lower clouds
3=Clouded } lower clouds
4=Overcast } lower clouds
5=Changing cloudiness with precipitation.
6=Overcast with precipitation.
7=Occasional fog.
8=Continuous fog.
9=Thunderstorm.

For the wind direction DD we recommend the scale 00–32 and propose to add 50 for variable wind force. This will make it necessary to use the Norwegian scale for the characteristic of barometric tendency.

The stations that can give the drift of clouds might give

$$N^*N^*N^1N^1h$$

instead of the above given fifth group.

The proposed code might be used for weather telegrams from ships, when RR is replaced by the temperature of the surface water or xx.

II. If it should be resolved to give the amount of barometric tendency with two figures, we recommend to use only one figure for present weather.

III. As to the transmission of the reports by wireless we have drawn up the following statement indicating the times at which the morning transmission could be made by the countries included in a group for north western Europe:—

Iceland	0720
Switzerland	0730
Denmark	0740
Finland, Estonia	0750
Sweden	0800
Norway	0810
Poland, Bohemia	0820
England	0830
France, Belgium	0845
Germany, Austria, Holland	0900

We consider Nauen as a well situated and good station for the issuing of the collective report, and we have therefore placed the transmission of telegrams from Germany, Austria and Holland at last. The collective report from the other countries should follow immediately after the issuing of the telegrams from Germany, Austria and Holland.

If a station in another country should be chosen for the transmission of collective reports, this country should be placed last in the list.

We propose that countries that give reports from several stations, give the stations in such an order that even a part of the telegram gives the weather conditions from the whole country.

Kristiania, 23/10/1920.

(Signed) Carl Ryder.
A. Wallen.
M. Hesselberg.

APPENDIX VII (a).

LETTER FROM DIRECTOR OF METEOROLOGICAL OFFICE, LONDON, WITH REFERENCE TO THE DRAFT CODE FOR WEATHER REPORTS FROM SHIPS AT SEA BY RADIO-TELEGRAPHY.

Meteorological Office,
Air Ministry, Kingsway,
London, W.C.2.
1st November, 1920.

Dear Colonel Gold,

I should be glad if you would kindly place the accompanying draft code for the "Weather Messages by Wireless Telegraphy from Ships at Sea" before the International Committee for Meteorological Telegraphy which meets in London on the 22nd November.

The code is essentially different from other weather codes and I realise that this should not be unless there are imperative reasons to justify the change. It is the opinion of the Meteorological Committee that these reasons do exist and I have been instructed to place them before the Commission.

1. It is necessary to realise that an observer at sea has not the same relationship to an official meteorological service as an observer on land. The latter is usually a paid servant of the service, and depends in part at least on his meteorological work for his livelihood. Thus he will carry out any instructions given to him, and will make any observation even if he finds it difficult. On the other hand, the observers at sea are voluntary observers and do the meteorological work in addition to their work as seamen. For this reason it is necessary not to ask them to supply information with which they are unfamiliar and which can only be done as the result of considerable study and application. For this reason the observations asked for should be as few and simple as possible. It will be seen that where the observations asked for in the code depart from those used on land, *e.g.*, in cloud, visibility, past and present weather, etc., the change is one of simplification or a modification of the land code to make it more appropriate to seamen.

2. The actual coding of the message should be simpler on sea than on land. When an observer codes a message several times a day and every day for months on end, he has little difficulty with a complicated code. The seamen, however, codes his message only for short periods of the time he is at sea, and has relatively long periods during which his meteorological work lapses. Each time therefore that he recommences his meteorological work he will have to refresh his memory as to the method of coding; for this reason alone a simpler code and one arranged so that the preparation of the message is almost automatic is greatly to be desired. It is felt that the proposed code and the arrangement of the observation book achieves this end.

3. The desirability of using the tables and phrases of Annex G (or suitable modification of them), has been carefully considered. It was decided, however, that in many cases the specifications used in Annex G were unsuitable for use at sea and that in others, notably in the case of past and present weather, they were much too complicated. It was considered that a complete break from Annex G would be better than an unsatisfactory compromise. It was also considered highly desirable that the tables for past and present weather should be so arranged that the observer could consider each phrase in the order in which it is set down in the table, and use the first phrase which is applicable to the actual conditions. This removes from the observer the necessity of deciding which of two or more possible phrases should be used. It may be noted that the phrase he would choose might not be the one most useful to the Forecaster.

4. It has been contended that certain groups of figures should mean the same in all meteorological codes. It is not considered that this contention has any real weight as the messages from the sea must be different from those from land stations. This uniformity can only be attained by asking the seaman for observations which are considered unsuitable and it is not considered that the end justifies the means.

5. Code messages in figures sent from ships at sea are frequently mutilated in transmission. For this reason it has been thought desirable to introduce into these messages a method of checking the figures, which has been found of the utmost utility in India where weather messages are frequently mutilated in transmission over their long land lines. The method is shortly explained at the end of the code, from which it will be seen that errors can not only be detected, but can be rectified also. A little experience in correcting erroneous messages soon shows the power of this check system, and it is considered that it should be tried.

The Meteorological Committee feel very strongly that the question of observations from ships should not be considered from the meteorological point of view alone. Sailors are not meteorologists and although it is to be hoped that some day they will be, at present we must consider the position as we find it. For this reason the Committee would be glad if the Commission would invite Admiral Learmonth, the Hydrographer to the Navy, to explain to them the point of view of the sailor.

Yours faithfully,

(Signed) G. C. SIMPSON.

Colonel E. Gold, F.R.S., D.S.O., President,
International Commission for Weather Telegraphy.

APPENDIX VII (b).

DRAFT CODE FOR WEATHER MESSAGES BY WIRELESS TELEGRAPHY FROM SHIPS.

MEMORANDUM BY DIRECTOR OF METEOROLOGICAL OFFICE, LONDON.

(November, 1920.)

Observations.

The meteorological observations to be reported in a message consist of:—

(1) The reading of the barometer in millibars, corrected for temperature, latitude and height above mean sea level.
(2) The direction and force of the wind.
(3) The state of the weather.
(4) The temperature of the air and of the sea.
(5) The visibility.
(6) The form and amount of cloud.
(7) The "characteristic" of the swell.
(8) The direction of the swell.

The Code.

The text of the message consists of eight groups, each of five figures. Symbolically the text may be represented as follows:—

QLLLX	1111X	BBBVX	DDFFX
TTttX	HAKSX	wWGGX	YYYYZ

in which

Q = Quarter of the globe.
LLL = Latitude.
1111 = Longitude.

BBB = Barometer reduced to sea level, expressed in millibars and tenths.
V = Visibility.
DD = True wind direction on a scale 1 to 32.
FF = Wind force on Beaufort Scale.
TT = Air temperature in degrees Fahrenheit.
tt = Sea temperature in degrees Fahrenheit.
H = Cloud height, whether high, medium or low.
A = Cloud amount.
K = Swell characteristic.
S = True swell direction.
w = Present weather.
W = Past weather.
GG = Greenwich time.
X = Check figure.
Y = Check figure.
Z = Key figure.

Address.

The word "weather" suffices for the address.*

First Group. QLLLX.

Q Quarter of the globe in which the ship is.

Code Number.	*Latitude.*	*Longitude.*
1	N.	W.
2	N.	E.
3	S.	W.
4	S.	E.

(Examples see page 10.)

A	Latitude N.	Longitude E.	Code figure 2.
B	,, S.	,, E.	,, 3.

LLL Latitude in degrees and minutes. Code the degree figures as observed by 00 to 90. Code the minute figures by dividing by six, neglecting any remainder; for example, 59′ is coded as 9, and 05′ is coded as 0.

Examples:

	Observation.	*Code Figures.*
A	23° 04′	230
B	25° 58′	259

X Check Figure. Add the first four figures in the group, neglect the tens figure, and enter the units figure.

Examples:

	First four Figures.	*Fifth Figure.*
A	2230	7
B	3259	9

Second Group. 1111X.

1111 Longitude in degrees and minutes. Code the degrees as observed, by 000 to 180. Code the minute figures by dividing by six, neglecting any remainder.

Examples:

	Observation.	*Code.*
A	130° 49′	1308
B	72° 34′	0725

X Check figure as described under first group.

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* Application has been made to Berne to allot an International three-letter abbreviation to mean "Here follows weather data," which will replace the word "Weather"

Third Group. BBBVX.

BBB Barometer reduced to sea level in millibars and tenths, omitting the initial 10 or 9.

Examples:

	Observation.	*Code Figures.*
A	1026·4 mb.	264
B	993·6 mb.	936

V Visibility.

0	Dense fog.	Objects not visible at 50 yards.
1	Thick fog.	,, ,, ,, ,, a cable.
2	Moderate fog.	,, ,, ,, ,, ½ mile.
3	Thin fog or mist.	,, ,, ,, ,, 1 mile.
4	Horizon not visible but can see more than one mile.	
5	Horizon just visible (height of eye approx. 40 feet).	
6	Horizon well defined, *i.e.*, visibility very good.	
7	Visibility exceptional. (V on Beaufort Scale.)	
8	Fog in patches.	
9	Not possible to estimate visibility, but no mist or fog. (To be used only at night.)	

X Check figure as described under first group.

Fourth Group. DDFFX.

DD True wind direction.

00	Calm.	17	S. by W.
01	N. by E.	18	S.S.W.
02	N.N.E.	19	S.W. by S.
03	N.E. by N.	20	S.W.
04	N.E.	21	S.W. by W.
05	N.E. by E.	22	W.S.W.
06	E.N.E.	23	W. by S.
07	E. by N.	24	W.
08	E.	25	W. by N.
09	E. by S.	26	W.N.W.
10	E.S.E.	27	N.W. by W.
11	S.E. by E.	28	N.W.
12	S.E.	29	N.W. by N.
13	S.E. by S.	30	N.N.W.
14	S.S.E.	31	N. by W.
15	S. by E.	32	N.
16	S.		

FF Wind force on Beaufort Scale 00 to 12.

X Check figure as described under first group.

Fifth Group. TTttX.

TT Air temperature in whole degrees Fahrenheit.

When temperature is 100° F. or over, omit the first figure.*

Examples:

	Observation.	*Code Figures.*
A	107° F	07
B	29° F	29

tt Sea temperature, to be telegraphed as for air temperature.

X Check figure, as described under first group.

* If Centigrade degrees are used, add 100 to negative values ; *i.e.*, telegraph −1°C. as 99; −5°C. as 95, etc.

Sixth Group. HAKSX.

H Cloud height: the observer should telegraph whether the greater quantity of visible cloud is high, medium, or low.

0 No cloud.
1 High (Ci, Ci-st, Ci-Cu).
2 Medium (Al-st, Al-Cu).
3 Low (Cu, Ni, St).

A Cloud amount: The number of tenths of sky covered by cloud, to be telegraphed. Note, 0 will be used for no cloud, and for completely overcast. The figure for cloud height will differentiate between 0 cloud and 10 cloud.

Examples:

	Height of Cloud.	*Amount of Cloud.*	*Code.*
A	No cloud	0	00
B	Medium	3	23

K Characteristic of swell.

0	No swell	Waves not breaking.
1	Slight swell	
2	Moderate swell	
3	Long low swell	
4	No swell	Waves breaking.
5	Slight swell	
6	Moderate swell	
7	Long low swell	
8	Heavy swell	
9	No observation.	

S True direction from which most pronounced swell is coming.

0	No swell.	5	S.W.
1	N.E.	6	W.
2	E.	7	N.W.
3	S.E.	8	N.
4	S.		

Examples:

A	Moderate swell from N.W. Waves not breaking.	27
B	Long low swell from E. Waves breaking.	72

X Check figure as described under first grpup.

Seventh Group. wWGGX.

w Weather at time of observation. The first phrase as arranged below, which describes conditions to be used.

Code Figure:

1 Thunderstorm with precipitation.
2 Hail without thunderstorm.
3 Heavy rain without thunderstorm.
4 Light rain without thunderstorm.
5 Snow or sleet without thunderstorm.
6 Thunderstorm without precipitation at ship (includes distant lightning).
7 Ugly, threatening.
8 Squally.
9 Weather clearing.
0 None of above phrases apply.

W Weather during last six hours.

1	Precipitation commenced or ceased			0 to 1	hour ago
2	,,	,,	,,	1 to 2	,, ,,
3	,,	,,	,,	2 to 4	,, ,,
4	,,	,,	,,	4 to 6	,, ,,

5 Continuous precipitation.
6 Thunderstorm.
7 Passing showers (rain or snow).
8 Misty or foggy.
9 Chiefly cloudy or overcast.
0 Little or no cloud.

Examples:

	Observation.		*Code Figures.*
	Present Weather.	*Past Weather.*	
A	Blue sky	Rain ceased 4½ hours ago	04
B	Squally	Misty or foggy	88

GG Greenwich time to the nearest hour, 01 to 24.

X Check figure, as described under first group.

Eighth Group. YYYYZ.

YYYY Column check.

Each Y is the sum of the seven figures in the column above it (*see* example on page 10), the units figure only being written. In working these sums always start with the left hand column, to prevent the accidental "carrying" of figures as in ordinary arithmetic.

Z *Key Figure.*—This is the units figure in the sum of the fifth column which contains the X's. If the summing has been done correctly this figure should also be the units figure in the sum of the Y's. Therefore, after having obtained Z as the sum of the X-column, check that it is correct by finding the sum of the Y-row.

(*See* attached specimen page of Observation Book.)

Note on the Check System.

The system of checks given by the fifth figure in each of the first seven groups, and the whole of the last group, makes it possible to trace *and correct* any reasonable number of errors in transmission, provided the checks have been correctly made in the first place. Suppose for example a message is received as shown on next page. First verify whether the check figure in each group is correct, marking those which are correct with a tick. When the check figure is not correct, write down after it the number which must be added to bring the sum up to the check figure transmitted. Thus in the second group of the sum of the first four figures is 21, giving a check figure 1. The number which must be added to this to give the correct check 2, is 1. So +1 is written after the check figure, indicating that 1 must be added to one of the figures in the group in order to make the check work. Again in the fifth group, the check sum of the first four figures transmitted is 9. It is necessary to add 4 to this to give the transmitted check 3. When all the rows have been verified in this way, the columns are verified in a similar manner, the numbers which must be added to bring the sum of the first seven figures in the columns up to the transmitted check being shown. It is important to remember that the new sum is to be subtracted from the transmitted check figure, and not *vice versa*. For example, in the fifth group the sum of the first four figures gives 9. This is subtracted from 3, *i.e.* from 13. It will not do to subtract the original check 3 from the new sum 9.

In the case considered the error of +1 in the second group and in the third column shows that the third figure in the second group is to be corrected by adding 1. The corrected group is then 13082. The correction +4 shown by the fifth group and the fourth column shows that the fourth figure in the fifth group is to be corrected by +4. The corrected group reads 07423.

Slightly more complicated rules are necessary when a check figure is transmitted wrongly, but the observer will have little difficulty in evolving these rules for himself.

2	2	3	0	7√
1	3	9	8	2+1
2	6	4	7	9√
2	0	0	3	5√
0	7	4	8	3+4
0	0	2	7	9√
0	4	0	7	1√
7	2	3	4	6√
√	√	+1	+4	√

NOTE: The dashes in the code figure column will be printed in the note books so that the places for the code figures will be clearly indicated to the Observer.

SPECIMEN PAGE OF NOTEBOOK.

—	Example A.							Example B.							Example C.					
	Observation.	Code Figures.						Observation.	Code Figures.						Observation.	Code Figures.				
Q=Quarter of Globe...	Lat. N. Long. E.	2	—	—	—	—		Lat. S. Long. W.	3	—	—	—	—				—	—	—	—
LLL=Latitude { Degrees	23°	—	2	3	—	—		25°	—	2	5	—	—			—				
{ Minutes	04″÷6 ...	—	—	—	0	—		58″÷6 ...	—	—	—	9	—		÷6	—	—	—	—	—
X=Check	—	—	—	—	—	7		—	—	—	—	—	9			—	—	—	—	—
1111=Longitude { Degrees	130° ...	1	3	0	—	—		72°	0	7	2	—	—						—	—
{ Minutes	49″÷6 ...	—	—	—	8	—		34″÷6 ...	—	—	—	5	—		÷6	—	—	—		—
X=Check	—	—	—	—	—	2		—	—	—	—	—	4			—	—	—	—	—
BBB=Barometer ...	1026.4 mb ...	2	6	4	—	—		993.6 mb ...	9	3	6	—	—						—	—
V=Visibility	Abnormally clear air	—	—	—	7	—		Horizon just visible	—	—	—	5	—			—	—	—		—
X=Check	—	—	—	—	—	9		—	—	—	—	—	3			—	—	—	—	
DD=Wind direction ...	S.W. ...	2	0	—	—	—		N.	3	2	—	—	—						—	—
FF=Wind force ...	3	—	—	0	3	—		10	—	—	1	0	—			—	—			—
X=Check	—	—	—	—	—	5		—	—	—	—	—	6			—	—	—	—	—
TT=Air temperature ...	107° ...	0	7	—	—	—		29°	2	9	—	—	—						—	—
tt=Sea temperature ...	42°	—	—	4	2	—		37°	—	—	3	7	—			—	—			—
X=Check	—	—	—	—	—	3		—	—	—	—	—	1			—	—	—	—	
H=Cloud height ...	No cloud ...	0	—	—	—	—		Medium ...	2	—	—	—	—				—	—	—	—
A=Cloud amount ...	0	—	0	—	—	—		3	—	3	—	—	—			—		—	—	—
K=Swell characteristic	Moderate Waves not breaking.	—	—	2	—	—		Long low waves breaking.	—	—	7	—	—			—	—		—	—
S=Swell direction ...	N.W. ...	—	—	—	7	—		East... ...	—	—	—	2	—			—	—	—		—
X=Check	—	—	—	—	—	9		—	—	—	—	—	4			—	—	—	—	
w=Present weather ...	Blue sky ...	0	—	—	—	—		Squally ...	8	—	—	—	—				—	—	—	—
W=Past weather ...	Rain ceased 2.30 a.m.	—	4	—	—	—		Misty or foggy	—	8	—	—	—			—		—	—	—
GG=Greenwich Time ...	7 a.m. ...	—	—	0	7	—		1 p.m. ...	—	—	1	3	—			—	—			—
X=Check	—	—	—	—	—	1		—	—	—	—	—	0			—	—	—	—	
YYYY=Column Check ...	—	7	2	3	4	—		—	7	4	5	1	—							—
Z=Key Figure ...	—	—	—	—	—	6		—	—	—	—	—	7			—	—	—	—	

Coded Telegrams for above observations :—

A.—22307 13082 26479 20035 07423 00279 04071 72346
B.—32599 07254 93653 32106 29371 23724 88130 74517
C.—

APPENDIX VIII.

LETTER TO THE PRESIDENT FROM CAPTAIN C. RYDER.

(November 9th, 1920.)

DEAR MR. PRESIDENT,

At a meeting in Christiania in October Director Hesselberg, Director Wallen and I discussed the international telegraphy code, and sent you the result of our deliberations in a letter from Christiania of 23rd October. The code proposed in this letter is to be considered as a compromise between us under the supposition, that on the the meeting of the Commission in London there should be a majority for introducing rs, time rain begins and time rain ends, into the international code.

I, however, reserved my rght to place before the members of the Commission the following remarks:—

I, myself, am very much against introducing rs into the international code, and I will vote against it, for I do not see that they are of sufficient value to compensate neither for the place they will take up in the code, nor for the difficulties and troubles they will cause the observers.

May be that some of the Institutes may wish to get, and may have advantage by getting, r and s from the stations in their own country, but it is an internal matter for such Institutes to arrange that, and it does not concern the international code. I do not, however, see that, for instance, we here in Denmark should gain by knowing more exactly at what time rain began and ended at stations in Iceland, Ireland or France, and we certainly do not wish to charge our observers and weather service with this information.

If it is decided that the amount of the precipitation shall be given not only once, but twice a day, I find that this information, together with the information about the precipitation given in ww (present weather), and in W or WW (post weather), will be quite sufficient concerning the distribution of the precipitation during the day. I do not think that there is more need for getting r and s than there is for getting corresponding minute information regarding most of the other meteorological elements: clouds, temperature, wind-direction and force, etc.

I wish to point upon the fact that the importance of rs from distant countries is not yet proved in practice, and is not generally acknowledged. The advantage of includings rs in the international code, therefore, can only be considered as a hypothetical one.

It is of predominant importance that the international code gives the necessary information to draw up the weather maps and make the forecasts, but it is from different reasons, also of great importance, that the telegrams are as short as possible, only including what is of acknowledged international importance, and not encumbered with information about things, the value of which for the international weather service is not at all proved.

As to the observers, I fear that all the most scrupulous and reliable of them will not like to be charged with the duty of observing r and s the whole day, and during the night it will most frequently be almost impossible for them to do their duty in a satisfactory manner. Even if all the stations are equipped with self-registering rain gauges I will not like to charge them with rs, as it is of importance to make the duties of the observers as easy as possible, only asking from them what I consider as necessary and useful.

If rs is not introduced in the code, it will be possible to put together the two last groups, 4 and 5 in alternative I in our letter from Christiania, into one group, and still give all information which is of essential importance to international weather-servce.

The code would then be the following:—

BBBBb—DDFww—TTRRW—AB^{x}HVS (C)

where in the last group

A=form of lower clouds.
B^x= ,, ,, higher ,,

This would mean saving one group, that is time, labour and expenses, and still after my opinion give all that is necessary and can be desired.

The omittance of L and N I think is justified, because L is rather shifting and local (when not 0 or 10), and, as well as N (the total amount of clouds), is partially given in ww.

I therefore prefer the four-group code proposed above, as I find it quite sufficient.

I am, dear Mr. President,

Yours sincerely,

(Signed) C. RYDER.

Meteorological Institute,
Copenhagen, 9th November, 1920.

APPENDIX IX.

SPECIFICATION OF TELEGRAPHIC SCALES.

PROPOSALS BY DR. G. T. WALKER, DIRECTOR-GENERAL OF OBSERVATORIES, SIMLA, INDIA.

Agenda IV. 2 (a).

"I think it desirable to substitute for the Beaufort Scale one in which the numbers are directly proportional to the speed of the wind."

Agenda IV. 2 (b).

"I think it desirable that the scale for the state of the sea should be based primarily on the height of the waves, and not on a series of descriptive words."

(Signed) G. T. WALKER.

Simla,
8th September, 1920.

APPENDIX X.

QUELQUES CONSIDERATIONS RELATIVES AUX DIVERS THEMES A DISCUTER PAR LA COMMISSION INTERNATIONALE DE TELEGRAPHIE METEOROLOGIQUE.

PAR J. GALBIS.

(November, 1920.)

Je prie tout d'abord mes collegues de vouloir bien me pardonner le retard apporté á la presentation de ces notes, en egard á mon absense de Madrid pendant les mois de septembre et d'octobre au cours desquels j'ai eté absorbé par le service meteorologique des Canaries et de l'Afrique, n'ayant pu par consequent me rendre compte dans tous ses details du developpement de l'organisation de notre assemblée.

A moins de raisons d'une haute portée, je crois que nous ne devons point alterer d'une facon essentielle, la forme générale des groupes de chiffres des télégrammes météorologiques approuvée par la Conference des Directeurs de Meteorologie (Paris, 1919), la plus grande autorité dans notre organisation internationale.

Forme des Telegrammes Meteorologiques.

Si l'on conserve la forme adoptée par la Conference de Paris, je suis d'avis que l'on pourrait satisfaire les desirs de l'aviation en ajoutant aux quatre groupes.

BBBDD—FwwTT—βbbPP (7h. et 18h.)
βbbWW (1h. et 19h.) } ALBNS

le cinquième groupe proposée par Mr. Everdingen

VhHrs.

Dans le cas on l'on jugerait necessaire d'introduire une modification generale, j'estime que l'on devrait grouper les données relatives aux divers elements météorologiques suivant l'ordre de plus grande à plus petite utilité generale.

Pour moi, je considere que BBB—DD—Fβ—bb—WW—W—TT et C (directions dans laquelle viennent les cirrus) sont des elements dont l'information offre un interet pour la prediction generale de toutes les nations en etat de recevoir les telegrammes proches ou lointains.

AL—BN—S=r—s=PP—V ne sauraient interesser les nations un peu eloignées du point d'observation.

H—D_1—F_1—h—S_1 n'interessant que l'aviation nationale et celle entre nations limitrophes.

D'accord avec ce criterium je propose le groupement suivant:—

1°—BBBDD
2°—FC bb
3°—WWW TT } Groups generaux pour tous telegrammes internationaux rapports (B) C.EU.F. GBI. } Groupes pour les telegrammes entre nations voisines rapports (A) C.EU.F.GBI.

4°—ALBNS
5°—rsPPV

6°—HD$_1$F$_1$hS$_1$ special pour l'avaiation.

Entre ces groupes, chaque nation pourra adopter ceux qu'elle estimera opportuns pour exprimer les temperatures extrêmes, etc.

Detail des Codes.

BBB — En millibares et dixiemes.

DD — Echelle de 0-32 complete, bien qu'il me semble illusoire que dans la pratique les observateurs puissent apprecier dans les girouettes qui d'habitude ne sont point registreuses, plus de 16 directions.

F — Echelle proportionelle à la vitesse.

C — Direction dans laquelle viennent les cirrus, conformement au Code en vigueur avant la guerre.

β — Code norvegien.

bb — En millibares et dixiemes.

WW — Code proposé par Mr. Everdingen et qui contienne la donne interessant de variations dans la nebulosité.

W — Je ne crois pas qu'il soit necessaire de connaitre le temps passé avec autant de details que le temps present, et en tenant compte, d'autre part, que les telegrammes anterieurs en nous rendant compte du temps present nous donnent une idée du temps passé, je considere que pour exprimer celui-ci il n'est besoin que d'un seul chiffre, en adoptant à cet effet le Code norvegien CR (Conference de Paris, pag. 44).

TT — Comme actuellement.

H — De conformité avec la proposition de notre President.

rs — Je trouve qu'il est preferable d'en venir a exprimer le nombre entier d'heures anterieures á l'observation plutot que celui des heures ou commence et finit la pluie.

PP — La quantité de pluie comme actuellement.

ALBN — On pourra adopter dans certaines stations de premier ordre elues par le service international, le Code proposé par Mr. Everdingen. Pour la plupart des stations, j'opine avec Mr. Quervain, que les observations de nuages seraient defectueuses, et il me semble par consequent plus facile d'adopter pour AB le Code suisse et de donner dans LN la quantité de nuages.

V — Le Code 8V de M—0—2622 me parait bien.

D_1 — Direction des nuages bas, 0 à 32 mesuré au nephoscope.

F_1 — Vitesse angulaire mesuré au nephoscope.

s — Echelle approuvée à la Conference de Paris.

S_1 — Etat de la vague (Code du Service Meteorologique Militaire Francais).

h — Hauteur a laquelle se trouve la base des nuages bas (Code du Service Meteorologique Francais).

Radiogrammes depuis les Vaisseaux.

Dans le cas où l'on ne s'entend pas aux resolution de la Conference de Paris, le Code pourrait etre:

Nom du vaisseau—GGLLL—lllV—BBBDD—FFβbb—WttTT—ALSS—K.

G — Heure de Greenwich.

LLL
llll } Longitude et latitude. Proposition de Mr. Simpson.

V — Visibilité.

bb — Temperature de l'eau de la mer en degrés centigrades.

K — Direction dans laquelle viennent les vagues.

Observations au Moyen des Ballons Pilotes.

D'acord avec la proposition M.O.F. 2622=HDDVV.

Heures de l'Observation.

A partir du premier janvier on adoptera en Espagne dans les observatoires disposant d'un personel professionel celles de 1h.—7h.—13h. et 18h.

Les autres stations feront leurs observations à 8h.—13h. et 18h.

Chiffres "Check."

Etant données la rapidité avec laquelle il faut traduire les telegrammes et tracer la carte synoptique du temps, l'implatation des chiffres " check " ne fournirait pas toute l'utilité qu'on attend et en autre, elle augmente la longueur des telegrammes déjà considerables aujourd'hui.

Dans le cas où l'on songerait à adopter cette importante reforme je suis d'avis qu'il vaudrait mieux disposer les chiffres " check " en deux groupes à la fin de ceux destinés à exprimer les elements meteorologiques et on peut répéter ces deux derniers groupes.

Organisation Radiotelegraphique Internationale.

Je me range de l'opinion de Mr. Quervain qu'il est necessaire de sortir du chaos de radiotelegrammes meteorologiques actuelles, et notre Commission doit etudier les lignes generales pour l'organisation du service international.

Or nous ne pouvons resoudre cette question d'une facon definitive et detaillée sans un accord prealable avec les organisations radiotelegraphiques officielles et particulieres de chaque nation, et nous devrons

par consequent nous borner à tracer des lignes generales et à donner un vote de confiance à notre President pour qu'il resoudre les difficultés pratiques que puissent presenter la realisation de nos resolutions.

La proposition de Mr. Quervain peut servir de base pour la discussion de cette question.

APPENDIX XI.

LETTER FROM Dr. C. F. MARVIN.

United States Department of Agriculture,
Weather Bureau, Washington.
November 10th, 1920.

Office of the Chief.
Major E. Gold,
President, Commission for Weather Telegraphy,
Meteorological Office, Air Ministry,
Kingsway, London, W.

My dear Major,

I am in receipt of your letter of October 15th, 1920, inclosing the following papers, which will be brought before the Commission for Weather Telegraphy at a meeting to be held November 22nd, 1920:—

(*a*) Agenda.
(*b*) M.O. Form 2622—Abbreviated reports for London and S.E. England.
(*c*)-(*d*) Memorandum on meteorological codes by M. Hesselberg, Christiania, and M. Van Everdingen de Bilt.

These memoranda, as well as the one by yourself, forwarded with your letter of July 30th, 1920, have been given my earnest consideration. In connection therewith I beg to submit the following observations:—

The United States Weather Bureau is concerned in the matters discussed in the inclosures to a relatively minor degree, and no serious objection is interposed to any of the suggestions, nor is it necessary to make any specific comments thereon, as none of them appear to affect the service of this country. For the most part they relate to details that concern the individual domestic needs of the meteorological service of continental Europe. Any general criticism that I might make would be confined to the fact that, viewed from the standpoint of experiences in this country, the application of the codes to anywhere near the extent of their entirety will be found far too complex and detailed for expeditious transmission, charting and assimilation in forecast work.

It is appreciated that the situation with which the European services are confronted is materially different from our own. The territory within the control of each is relatively small, and it is quite necessary that an agreement be reached for a uniform method of exchange. The United States is not desirous of opposing, but on the contrary will heartily indorse, the adoption of codes and units which the European meteorologists may agree among themselves as being best suited to their convenience and use.

From our point of view a numerical code is subject to a number of objections, but it is appreciated that the European meteorologists will wish to adhere to a system which has been used by them for many years. However, this country will not oppose the use of numeral codes for long distance continental exchanges. The first two groups of the code under consideration, as represented by BBBDD and FwwTT, will give all the information desired at this time by the United States Weather Bureau in radiographed reports from Europe or other distant continental areas. However, one of the figures representing "present weather" should be made to indicate that unit in the customary terms that have been used on weather charts for many years.

Some provision should be made in the code for identifying observations with the time at which they are taken. Otherwise, confusion and uncertainty is bound to occur in distinguishing between belated and current reports.

The United States would oppose any adoptions which will prejudice or interfere with the continued use of word codes within its own borders and in securing and transmitting meteorological reports and information from and to vessels in contiguous waters, including the Caribbean Sea, a word code being best adapted to these domestic purposes. It would not feel called upon to agree to any restrictions upon its making arrangements with neighbouring and Pan-American countries for exchanges of meteorological information in any manner which might be mutually satisfactory to them.

The United States will undertake to accommodate itself to the usage of any international code that may be finally adopted for the transmission of reports from its stations to Europe and other continents that will not be inconsistent with its own hours and systems of observations, which are fixed to meet its own domestic needs and relationship to daylight hours.

Although not specifically involved in the memoranda submitted by you, I trust that the important question relating to observations from ships at sea may not be neglected. With this object in view I have very recently arranged to bring before the International Commission which recently met in Washington a recommendation which in effect is as follows:—

> In order to extend the area over which meteorological data are being collected, it will be necessary to increase the number of reports received from ships at sea. In view of the great benefit of meteorological information to navigators as well as the value of such reports to meteorological practice and service, mobile stations (especially ships) should be required to take daily observations at two or more of the hours designated in Annex G, and to transmit or relay them, *free of charge*, to the nearest fixed land station assigned as a receiving station for meteorological reports; these reports to be transmitted to the meteorological service of the country in which the fixed station is located.

The foregoing is respectfully submitted as representing in a somewhat general way my views on the codes and related subjects. I am regretful that circumstances will not permit me the pleasure of attending the conference, meeting its members personally, and discussing more intimately the many meteorological subjects in which all of us have a deep interest.

With assurances of my high regard, which I beg that you extend to the other members of the Committee,

I am,
Sincerely yours,
C. F. MARVIN,
Chief of Bureau.

APPENDIX XII.

ANNEX G OF THE CONVENTION FOR THE REGULATION OF AERIAL NAVIGATION.

(13th October, 1919.)

(Command Paper 670, published by H.M. Stationery Office, London, 1920. Price 1*s*. Net.)

(Not reprinted here.)

APPENDIX XIII.

VISIBILITY AND FOG.

I.—Land Stations.

1. At each station a number of definite objects should be selected at the following distances from the observation post:—

Distances.	*Object.*
25 metres.	A
50 ,,	B
100 ,,	C
200 ,,	D
500 ,,	E
1,000 ,,	F
2,000 ,,	G
4,000 ,,	H
7,000 ,,	I
12,000 ,,	J
20,000 ,,	K
30,000 ,,	L

As it is not usually possible to select suitable objects at the exact distances, a variation of 10 per cent. is permissible.

E.g.—An object at 1,100 metres will serve for the 1,000 metres distance, but an object at 1,200 metres will not.
An object at 18,000 metres will serve for the 20,000 metres distance, but an object at 17,000 metres will not.

A list of the objects selected and their bearing from the station must be posted up at each station and a copy forwarded to headquarters.

2. The ideal object is one which stands above the horizon so that it is seen against the sky and subtends an angle 10 feet high and 2½ feet broad; *e.g.*, at a distance of 1,000 metres an object 3 metres (10 feet) high and 80 centimetres (3 feet) broad would do.

3. As it is impossible to define precisely what "seeing clearly" means, an object is regarded as being *visible* if it can be distinguished by eye, *e.g.*, if the object is a tree and it can be distinguished as a tree, it is to be counted as visible.

4. The visibility is to be determined by taking the most distant of the objects A, B, C, D, which is visible; *e.g.*, suppose D is visible and E is not visible, then the visibility figure corresponding with D is to be telegraphed. If none of the objects are visible, denote the fact by the letter X.

5. Having determined the last object of the series which is visible, the figure for telegraphing is obtained from the following table:—

Object.	*Telegraphic Figure.**
X	0
A	0
B	1
C	1
D	2
E	3
F	4
G	5
H	6
I	7
J	8
K	8
L	9
L and exceptional clearness of air (*see* below)	9

* Modified according to Minute 6, p. 26.

If the fog is so thick that *no object* is visible, the figure 0 is to be telegraphed. If L is visible and the air has that peculiar clearness which is associated with the Beaufort "v" (exceptional visibility), the figure 9 is to be telegraphed.

Note.—If the station is so situated that no objects are visible at the greatest distances, it is clear that it would be misleading to report the visibility simply by the number corresponding with the last object on all occasions when that object is visible. In such cases the observer must use his judgment in allocating the higher numbers. For example, if "H" is the last object of the series and there are no objects available for "I," "J," "K," "L," the visibility must *not always* be reported by the code figure "6" when "H" is visible. Figures 7, 8, 9, must be allocated by the observer according to his judgment of the relative clearness with which the objects can be seen.

6. For entries *in the register* the following scales are to be used, and reports in the weather code of Annex G are to be based on these scales too.

Fog or f scale (for entries of "weather").

Object visible.	*Entry in Register.*
X	8f
A	7f
B	6f
C	5f
D	4f
E	3f
F	2m or 2z
G	2m or 2z
H	1m or 1z
I	1m or 1z
J, K, L	No entry of f or z

The letter z is to be used only when the air is dry (humidity less than 80 per cent.).

Visibility (or V) Scale (for entries in Visibility column).

Object visible.	*Entry in V column.*
X	0V
A	0V
B	0V
C	0V
D	1V
E	2V
F	3V
G	4V
H	5V
I	6V
J	7V
K	8V
L	9V
L and exceptional clearness of air	

For convenience of reference all the above scales may be collected into one table as below*:—

Code number for telegram.	*Description.*	*Specification.*
0	8f	Objects visible at 0 but not at 25 metres.
	7f	,, ,, ,, 25 ,, ,, ,, 50 ,,
1	6f	,, ,, ,, 50 ,, ,, ,, 100 ,,
	5f	,, ,, ,, 100 ,, ,, ,, 200 ,,
2	4f	,, ,, ,, 200 ,, ,, ,, 500 ,,
3	3f or 1V	,, ,, ,, 500 ,, ,, ,, 1000 ,,
4	2m ,, 2V	,, ,, ,, 1000 ,, ,, ,, 2000 ,,
5	2m ,, 3V	,, ,, ,, 2000 ,, ,, ,, 4000 ,,
6	1m ,, 4V	,, ,, ,, 4000 ,, ,, ,, 7000 ,,
7	1m ,, 5V	,, ,, ,, 7000 ,, ,, ,, 12000 ,,
8	6V	,, ,, ,, 12000 ,, ,, ,, 20000 ,,
8	7V	,, ,, ,, 20000 ,, ,, ,, 30000 ,,
9	8V	,, ,, ,, 30000
9	9V	,, ,, above 30000 and clear air.

8. At coast stations the visibility towards the sea is often very different from that towards the land.

In such cases double entries should be made and the visibility towards the sea should be separately reported, as provided in the telegraphic code.

At inland stations, when there is low-lying fog which does not obscure distant objects, this should be specially noted and specially reported.

9. For observations at night lights should be used, if they are available, at suitable distances. If lights are not available the visibility must be estimated to the best of the observer's ability. A *very good* estimate can always be made when there is fog enough to make the range of vision less than 500 metres.

II.—Ships at Sea.

1. When ships are near the coast with marks at known distances, the visibility can usually be determined with reasonable accuracy by using the following modification of the land scale:—

Range of Vision.	*Letter.*
Less than 25 metres	X.
25 to 50 ,,	A.
50 ,, 100 ,,	B.
100 ,, 200 ,,	C.
200 ,, 500 ,,	D.
500 ,, 1,000 ,,	E.
1,000 ,, 2,000 ,,	F.
2,000 ,, 4,000 ,,	G.
4,000 ,, 7,000 ,,	H.
7,000 ,, 12,000 ,,	I.
12,000 ,, 20,000 ,,	J.
20,000 ,, 30,000 ,,	K.
above 30,000 ,,	L.

* Modified according to Minute 6, p. 26.

Having determined the range of vision and the corresponding letter, the figures for telegraphed reports and the entries to be made in the register are then as follows*:—

Letter.	Telegraphic figure.	Entry in Register (in weather column).	Entry in Register (in V Column).
X	0	8f	0V
A	0	7f	0V
B	1	6f	0V
C	1	5f	0V
D	2	4f	0V
E	3	3f	1V
F	4	2m or 2z	2V
G	5	2m or 2z	3V
H	6	1m or 1z	4V
I	7	1m or 1z	5V
J	8	No entry of f or z	6V
K	8		7V
L	9		8V
and exceptional clearness of air.	9		9V

If L is visible and the air has that peculiar clearness which is associated with the Beaufort letter V, the figure 9 is used for telegraphic reports and the entry 9V for the register.

2. When ships are in the open ocean the visibility can only be estimated by estimating the range of vision; although for distances up to 100 metres the ship itself will normally enable the range of vision to be observed with reasonable accuracy.

Having estimated the range of vision with the assistance of any means available, the procedure is the same as shown in II 1 above.

Meteorological Office,
London.

21st January, 1920.

APPENDIX XIV.

AIR MINISTRY, METEOROLOGICAL OFFICE, LONDON.

COLLECTIVE WEATHER REPORTS (CLASS 3) FOR LONDON AND SOUTH-EAST ENGLAND.

1. On and after 2nd August, 1920, the hourly reports of meteorological information, prepared by the Forecast Service of the Meteorological Office and issued by W/T from the Air Ministry, will be sent in a modified code, of which particulars are given below. The essential features of the code are the same as those for Collective Station reports of Class 3 of Annex G of the Convention for International Air Navigation (Paris, 1919), but the following modifications are noted:—

(i) The figures for fitness for flying (F_1F_2) are replaced by figures reporting direction and approximate speed of the low cloud.

(ii) The separate codes for high or medium and low cloud have been replaced by a single code in which clouds are grouped, but no change is made in the number of figures allocated to cloud reports.

* Modified according to Minute 6, p. 26.

(iii) An additional group has been added to provide for the inclusion of information available only occasionally or at sea coast stations. This group includes more precise specification of the height of the base of the low cloud when it is below 1,000 feet. It includes also the character of the swell and sea disturbance and the visibility towards the sea as distinguished from the visibility landwards.

(iv) The direction of the surface wind is reported on the scale 0—32, and not as hitherto on the scale 0—72.

2. Reports are issued daily, Sundays included, according to the following schedule:—

Wave length	1,680 metres.
Nature of transmission	Continuous wave.
Call sign	G.F.A.

Times of issue 0735 G.M.T. giving observations for 0700 G.M.T.

,,	,,	0835	,,	,,	,,	0800	,,
,,	,,	0935	,,	,,	,,	0900	,,
,,	,,	1035	,,	,,	,,	1000	,,
,,	,,	1135	,,	,,	,,	1100	,,
,,	,,	1235	,,	,,	,,	1200	,,
,,	,,	1335	,,	,,	,,	1300	,,
,,	,,	1435	,,	,,	,,	1400	,,
,,	,,	1535	,,	,,	,,	1500	,,
,,	,,	1635	,,	,,	,,	1600	,,

3. After the call sign G.F.A. comes the word "*METEOR*" indicating that a meteorological message is being transmitted. This is followed by one 4 figure group giving the hour (G.M.T.) at which the observations were made; this time group is in turn followed by station index letters and figure groups giving the conditions at the following stations:—

Index Letters.	*Station.*
FXT	Felixstowe.
CDN	Croydon.
BGL	Biggin Hill.
LMP	Lympne.
BCD	Beachy Head.
DNS	Dungeness.
BOTLEY	Botley Hill (North Downs).

4. The letters DNS, when included, will be followed by a figure giving the channel visibility at Dungeness. The channel visibility at *Hythe* is given as the last figure of the 4th group of the report for LMP (Lympne), and the channel visibility at Beachy Head is given as the last figure of the 4th group of the report for BCD (Beachy Head).

5. The word "BOTLEY" is followed by a statement in plain language of the conditions on the North Downs as viewed from Biggin Hill, when such a statement adds material information to that contained in the rest of the message.

6. At the end of the message a short forecast is given in plain language of the changes in the weather conditions anticipated in the period of daylight following the time of issue.

This begins with the word "FORECAST."

If there is no reason to modify the forecast sent in the preceding message the words "Forecast unaltered" are sent.

7. The complete results of a pilot balloon ascent at Croydon or Lympne, when available, are inserted in the message at 0835 immediately before the forecast referred to in paragraph 6.

This part of the message is preceded by the index letters of the station and by the five figure index group 49860.

The groups following the index group are in the form HDDVV, where H is the height according to the scale of the International Convention for Aerial Navigation, viz.:—

1	refers to a height of		200	metres or	500	feet.
2	,,	,,	500	,,	1,500	,,
3	,,	,,	1,000	,,	3,000	,,
4	,,	,,	1,500	,,	5,000	,,
5	,,	,,	2,000	,,	7,000	,,
6	,,	,,	3,000	,,	10,000	,,
7	,,	,,	4,000	,,	13,000	,,
8	,,	,,	5,000	,,	16,000	,,

DD is the direction of the wind on the scale 0—72 at the height H.

VV is the speed of the wind in miles per hour.

7. (*a*) Three groups of five figures will be inserted in the message sent at 07·35 G.M.T. immediately before the forecast, giving the barometer readings at 07·00 at FELIXSTOWE, CROYDON and LYMPNE, and the barometric changes in the preceding three hours. These groups will be introduced by the word "BAR," thus:—

BAR BBBbb BBBbb BBBbb

where BBB = Barometer in millibars (initial 9 or 10 omitted)

and bb = Change in the three hours preceding 07·00 in half-millibars (50 added for a negative tendency).

The three groups will be sent invariably in the order of the stations given above. If a particular group is missing, five hyphens will be sent in its place.

8. *CODES.*

Symbolically the code for the individual stations is as follows:—

$DDFD_1F_1$ ALBMh wwWWV $h_1S_1SV_1$ $2D_2D_2VV$

where DD = Direction of wind (see code 1).
F = Force of wind (see code 1).
D_1 = Direction of lowest clouds (see code 2).
F_1 = Speed of lowest clouds (see code 3).
A = Form of cloud (see code 4).
L = Amount of cloud of type A (10 telegraphed as 0; the value of "A" enables differentiation between 0 and 10 to be made).
B = Form of cloud (see code 4).
M = Amount of cloud of type B (see code 4).
h = Height of the base of low cloud (see code 5).
ww = Weather 15—25 minutes before the time of issue of the report (see code 6).
WW = Weather in the period of 2 hours preceding the time to which "ww" refers (see code 7).
V = Visibility (see code 8).
h_1 = Height of base of low cloud below 1,000 feet (see code 5a).
S_1 = State of swell (see code 9).
S = Sea disturbance (see code 10).
V_1 = Visibility towards the sea (see code 8).
2 = 2,000 feet (height to which upper wind refers).
D_2D_2 = Direction of wind at 2,000 feet (see code 1a).
VV = Speed of wind at 2,000 feet in miles per hour.

9. The following is a specimen message:—

GFA	Meteor	0900	G.M.T.	
CDN	20354	60003	05656	24728
BGL	21454	00001	77624	6 - - -
LMP	21555	79512	05655	24940
BCD	22655	70001	43815	5754

BOTLEY in clouds.

FORECAST.—Wind changing to West after noon, cloud lifting and visibility improving afterwards

10. The information contained in the messages should be entered after decoding in a form similar to the following, which gives the information from the specimen message above:—

Note I.—If any figures are missing a hyphen or dash is transmitted in place of each missing figure.

II.—When the upper wind at 2,000 feet is not available at any station, the group for upper wind at that station is omitted from the message. Similarly, for inland stations the group $h_1S_1SV_1$ is omitted altogether when there is no cloud below 1,000 feet.

Time of Observation. G.M.T.	Place.	Wind (speed in m.p.h.).		General Weather.	Cloud.			Visibility.	Weather in preceding two hours and state of the sea.
		Surface.	2,000 feet (direction in degrees from North).		Amount.		Height of lowest.	Dir. and speed of lowest (m.p.h.).	
					Low.	High or Medium.			
0900 ...	Croydon ...	S.W. 10	235° 28	Overcast ...	St. Cu. 10	—	2,000	S.W. 30	4 miles	Occasional slight rain.
0900 ...	Biggin Hill...	S.W. by W. 15	—	Slight drizzle	St. 10 ...	—	900	S.W. 30	2,000 yards	Occasional slight drizzle.
0900 ...	Lympne ...	S.W. by W. 21	245°40	Overcast ...	Nb. 9 ...	ASt. 1	1,200	S.W. 40	4,000 yards	Occasional slight rain.
0900 ...	Beachy Head	W.S.W. 27	—	Squally ...	Nb. 10 ...	—	700	S.W. 40	4,200 yards	Continuous moderate rain.
0900 ...	Channel (from Beachy Hd.).	—	—	—	—	—	—	—	2,000 yards	Waves breaking and moderate swell. Sea rather rough.
0900 ...	Botley Hill	In clouds.		—	—	—	—	—	—	—

Forecast.—Wind changing to West after noon; cloud lifting and visibility improving afterwards.

In the following codes the numbers of the Annex G code are given in brackets:—

CODE 1 (X).—DIRECTION AND FORCE OF THE WIND NEAR THE GROUND (DD F).

Direction is given on scale (1-32) and force on the Beaufort Scale. Calm is reported by the figures 00 for wind direction and 0 for wind force.

CODE 1A.

For upper wind the direction (D_2D_2) is reported on the scale 0-72. The actual direction measured in degrees from North is obtained by multiplying the code figures by five, *e.g.*:—

Code number 28—Wind direction 140°.
,, ,, 03— ,, ,, 15°

The speed of the upper wind is expressed in miles per hour.

CODE 2.—DIRECTION OF LOW CLOUD (D_1).

1—Clouds moving *from* NE.
2— ,, ,, ,, E.
3— ,, ,, ,, SE.
4— ,, ,, ,, S.
5— ,, ,, ,, SW.
6— ,, ,, ,, W.
7— ,, ,, ,, NW.
8— ,, ,, ,, N.

CODE 3.—SPEED OF LOW CLOUD (F_1).

	Approximate values of speed.	
Code figure.	*Metres per second.*	*Miles per hour.*
0—	0	0
1—	2	5
2—	6	15
3—	10	25
4—	14	30
5—	18	40
6—	22	50
7—	26	60
8—	30	70
9—	32 or above	75 or above

The table above is for decoding. The reports are *encoded* according to the following scheme:—

Speed limits.		
Metres per second.	*Miles per hour.*	*Code figure.*
0	0	0
Between 0 and 4	Between 1 and 9	1
,, 4 ,, 8	,, 10 ,, 18	2
,, 8 ,, 12	,, 19 ,, 27	3
,, 12 ,, 16	,, 28 ,, 36	4
,, 16 ,, 20	,, 37 ,, 45	5
,, 20 ,, 24	,, 46 ,, 54	6
,, 24 ,, 28	,, 55 ,, 63	7
,, 28 ,, 32	,, 64 ,, 72	8
Above 32	Above 72	9

CODE 4 (III).—FORM AND AMOUNT OF CLOUD (ALBMh).

The form of cloud is reported according to the following specification, and provision is made for reports of two different types of cloud at each station:—

Name of cloud.	*Code figure.*
Cirrus	1
Cirro-stratus	2
Cirro-cumulus	3
Alto-cumulus	4
Alto-stratus	5
Strato-cumulus or Mammato-cumulus	6
Nimbus	7
Cumulus or Fracto-cumulus	8
Cumulo-nimbus	9
Stratus or Fracto-stratus	0 (10)

If only one type exists, the figures for form and amount of that type are repeated in the message. (Example, 68685 means Strato-cumulus amount 8/10ths, height between 3,500 and 5,000 feet.)

If more than two types of cloud are present, then the amount of cloud reported as L is the total amount of all the cloud of a type more nearly approaching the type of A than the type of B. For example, if the sky is covered by the following clouds:—

Cirrus	Amount 1
Cirro-cumulus	,, 2
Alto-cumulus	,, 2
Strato-cumulus	,, 5

then the cloud group would be 6535, the amounts of Cirrus, Cirro-cumulus and Alto-cumulus all being grouped together under M. If, on the other hand, the sky was covered with the following clouds:—

Alto-cumulus	Amount 2
Fracto-cumulus	,, 3
Nimbus	,, 5

the cloud report would be 7842, the Fracto-cumulus being grouped, for purposes of report, with Nimbus.

It should be noted that if the figures for L and M are "0," the interpretation may be either cloud amount 0 or cloud amount 10. The figure for the form of the cloud A and B will indicate sufficiently definitely to the recipient of the message the correct interpretation of the figures. In a special case of a report 0000, which may stand for no cloud of any type or for a sky completely covered with Stratus, the value of the height of cloud (h) and the report of present weather (ww) will indicate the correct interpretation of the figures.

CODE 5 (IVa).—HEIGHT OF BASE OF LOW CLOUD (h).

(*See* Annex G or MO 237.)

CODE 5a.—MORE DETAILED CODE FOR HEIGHT OF LOW CLOUD WHEN BELOW 1,000 FEET (h_1).

1.	Cloud below	50 metres	or 150 feet (nearly).
2.	Cloud between	50 metres and 100 metres	or 150 and 350 feet.
3.	,,	100 ,, 150 ,,	,, 350 ,, 500 ,,
4.	,,	150 ,, 200 ,,	,, 500 ,, 650 ,,
5.	,,	200 ,, 250 ,,	,, 650 ,, 800 ,,
6.	,,	250 ,, 300 ,,	,, 800 ,, 1000 ,,

CODE 6 &7 (I) & (II)—PRESENT WEATHER (WW) AND PAST WEATHER (WW).

(*See* Annex G or MO 237 Minutes of meeting held at Meteorological Office, London, July, 1919.)

CODE 8 (V) AND CODE 8 (*a*). VISIBILITY (V) AND FOG.

(*See* Appendix XIII, MO 2630.)

CODE 9.—THE CHARACTERISTIC OF THE SWELL (S_1).

0—Waves not breaking and no swell.
1— ,, ,, slight swell.
2— ,, ,, moderate swell.
3— ,, ,, heavy swell.
4— ,, ,, very heavy swell.
5—Waves breaking and no swell.
6— ,, ,, slight swell.
7— ,, ,, moderate swell.
8— ,, ,, heavy swell.
9— ,, ,, very heavy swell.

CODE 10 (VII).—THE STATE OF THE SEA (S).

Description.	Height of waves from crest to trough.
0—Calm—glassy	0
1—Very smooth—slightly rippled	Less than 1
2—Smooth—rippled	1 to 2
3—Slight—rools buoy	2 to 3
4—Moderate—furrowed	3 to 5
5—Rather rough—much furrowed	5 to 8
6—Rough—deeply furrowed	8 to 12
7—High—rollers: steep fronts	12 to 20
8—Very high—rollers: steel fronts	20 to 40
9—Phenomenal—precipitous	40 and above

APPENDIX XV.

EXTRACT FROM MEMORANDUM SUBMITTED BY LIEUT.-COLONEL DELCAMBRE.

(November, 1920.)

Memoire du Service Meteorologique Militaire Francais.

Au sujet des propositions du Lieut.-Colonel Gold, concernant les radiogrammes météorologiques internationaux européens.

Avant—Propos.

La question de remaniement des radiogrammes météorologiques internationaux comprend 3 parties bien distinctes:

1° La détermination et la justification météorologique des renseignements devant être contenus dans la dépêche.

2°. La manière de les chiffres, le code.

3°. L'organisation des émissions.

Le seul point de contact entre les 3 parties est le suivant.

La répartition des émissions dans le temps limité la longueur de la dépêche ce qui amène à réduire les renseignements au strict nécessaire et à compliquer le code pour la raccourcir(1).

(1) Le degré de complication du code ne semble pas limité par la longueur et la difficulté de déchiffrement (le personnel des stations centrales est en effet un personnel relativement d'élite et, en tous cas, très entrainé). Au Centre de Prévision de Paris, il suffit d'une heure pour reporter sur les cartes (six cartes) tous les renseignements de 7 h. et rédiger l'avertissement. Encore, pourrait-on augmenter, si c'etait nécessaire le personnel. C'est au contraire les erreurs possibles dans le chiffrement par les simples observateurs qui qui oblige à adopter un code assez simple.

1° Partie.

DETERMINATION ET JUSTIFICATION DES RENSEIGNEMENTS A FOURNIR DANS LES RADIOGRAMMES METEOROLIQUES.

Nous partirons de deux idees fondamentales:

1°. Comme l'ont dit si justement M. Gold and M. Angot, il faut distinguer nettement les renseignements necessaires a la prevision générale des renseignements particuliers pour l'Aeronautique.

2°. Les seuls renseignements à fournir dans la dépêche internationale sont ceux qui doivent être utilisés immédiatement pour la prévision, ce qui élimine beaucoup d'elements très généralement observés, mais qui ne servent, au moins à l'heure actuelle, qu'à des etudes le climatologie ou de statistique.

Le texte de la dépêche est donc commandé par les besoins de la prévision générale, et par eux seuls.

Pour justifier nos propositions, il est donc indispensable de resumer d'abord très brièvement les principes de la prévision du Service Météorologique Militaire, et d'énumérer les cartes qu'elle nécessite.

I.—PRINCIPES DE LA PREVISION DU SERVICE METEOROLOGIQUE MILITAIRE.

A.—*Prévision de l'état du ciel.*

Elle comporte, naturellement, la considération de la situation générale, mais l'avertissement précis est fondé sur deux methodes.

1°. Le deplacement et l'évolution des noyaux de variations barométriques (Etude dans des intervalles convenables), differents suivant la période et la vitesse des ondes de variations barométriques auxquels les états du ciel sont liés beaucoup plus étroitement qu'à la situation isobarique.

2°. Le deplacement et l'évolution des successions nuageuses elles-mémes, une prévision barométrique n'étant jamais suffisante pour faire une prévision précise d'état du ciel.

B.—*Prévision de température.*

Cette prévision est fondée sur l'explication des variations de température par 3 causes:

1°. La rotation du vent.

2°. La différence des nébulosités aux extrémites de l'intervalle considéré.

3°. L'influence des états intermédiaires de température

II.—CARTES NECESSAIRES.

Prévision de l'état du ciel et des hydrometéores.

A.—Pour la situation générale, une carte d'isobares.

Pour l'étude des noyaux de variations barométriques, dés cartes de tendances et de variations en 6 h.—12 h.—24 h.

Pour l'étude des successions nuageuses des cartes de nébulosité totale, des cartes de nébulosité partielle, suivant les différentes espèces de nuages et des cartes de vent aux differentes altitudes.

B.—*Pour la prévision de température.*

Des cartes d'amplitude de la variation diurne.
Des cartes d'isothermes moyennes de la journée.
Des cartes de variation de température en 24 heures.

III.—DETAIL ET JUSTIFICATION DES RENSEIGNEMENTS DEMANDES.

1° Baromètre.

a. *Pression barométrique.*—Tout le monde est d'accord pour donner cet élément (et avec 3 chiffres) qui est nécessaire à l'établissement des cartes d'isobares. Nous n'attachons qu'une importance très relative à

l'unité employée néanmoins nos préférences vont au m/m de mercure, car il vaut mieux que la transformation d'unité soit faite à la station centrale, que par un observateur quelconque en poste.*

b. *Tendance.*—Autant la tendance elle-même en valeur absolue et avec son signe, est un élément précieux pour la prévision, autant la caracteristique de la tendance (qui ne peut d'ailleurs figurer sur les cartes) nous semble inutile. Elle n'a jamais servi à *rien* au Service Météorologique Militaire. Nous demandons donc *instamment* que cet élément soit supprimé dans la dépêche.

Le trace des cartes de tendance au Service Meteorologique Militaire comporte les lignes de tendances nulles, d'iso-tendance de 0,5 puis d'iso-tendances espacées de millimètre en millimètre (l'experience ayant montré que la variation diurne et les erreurs d'observation masqueraient la variation réelle dans un trace plus rapproché). Il nous parait donc inutile de donner la tendance avec une précision supérieure à 0,2 m/m au bas de l'échelle qui serait progressive.

2° Température.

a. *Température à l'heure d'observation.*

La température à chaque heure d'observation, nécessaire dans les dépêches pour la construction des cartes de variations de température en 24 heures qui se fait aux quatre heures d'observations internationales.

b. *Remarques*:

1°. Il est absolument inutile de donner la température avec une précision supérieure au degré centigrade: 1°/étant donné les différences de température au même instant d'un point à un point très voisin dues à des causes tout à fait locales; 2°/étant donnée qu'une très petite différence dans l'heure de l'observation peut donner une différence très sensible de température, et enfin; 3°/que d'une extremité à l'autre de l'Europe à un même instant absolu, l'heure solaire étant différente, la variation diurne de la température joue d'une façon très notable. Pratiquement on a été amené au Service Météorologique Militaire, dans les cartes de variation de température, à laisser en blanc une marge de + ou — 2 degrés.

2°. Il a été proposé dans certains mémoires de réduire le nombre des stations envoyant la température à 3 par pays de surface moyenne (France, Angleterre). Cette mesure équivaudrait à n'envoyer aucun renseignement sur la température, car les noyaux de variations de température en 24 h. même quand il s'agit de mouvements profonds (+ 10°) dépassent rarement les dimensions de la France, et très souvent n'en couvrent que la moitié.

3°. L'unité employée devra être empruntée à un systéme d'unité cohérent, c'est à dire qu'on devra utiliser le degré centigrade ou le degré absolu.

Maximum et minimum de température.—Ces données sont à conserver dans les dépêches car elles ne servent pas seulement à établir des moyennes de la journée, mais aussi à construire. 1°/Les cartes d'isothermes moyennes de la journée. 2°/les cartes d'amplitude de la variation diurne, nécessaires à la prévision de température.

3° Vent au sol.

a. *Direction.*—Tout le monde est d'accord sur la nécessité de conserver cet élément; il y a lieu de remarquer qu'il faut se limiter à 16 directions.

1°. Parce que le report rapide sur les cartes ne dépasse pas cette précision.

* Pour la realisation de ces desiderata tant à cet element metéorologique qu'aux autres, voir la 2° partie (form des radiogrammes).

2°. Parce qu'il y a (même en altitude) une variation instantanée de la direction du vent de l'ordre correspondant à cette précision.

b. *Force.*—Etant donnée la variation de la vitesse instantanée et le degré de précision des appareils employés, il n'y a pas lieu d'employer plus d'un seul signe à cet élément, peu importe l'échelle.

4° Vent en altitude.

Il est de la plus haute importance que des renseïgnements suffisants sur les vents en altitude soient donnés à toutes les heures d'observation car ils donnent le moyen d'étudier directement des successions nuageuses.

Néanmoins, étant donné:

1°. Que la masse nuageuse dont la déplacement est capital à étudier parce que c'est elle qui détermine vraiment le beau et le mauvais temps, est le vélum du corps de succession (Ast ou A Cu);

2°. Que ces renseignements tiennent une place considérable dans une dépêche, il est nécessaire de limiter, comme cela est d'ailleurs généralement proposé, en altitude la transmission du sondage. (Echelle progressive plus détaillée pour les faibles altitudes à cause de l'Aéronautique).

C'est également pour cette 2° raison et aussi, à cause de la dépense relativement élevée que représentent les sondages, qu'il faut limiter le nombre des stations envoyant ces renseignements (par example à 1/4 du nombre total des stations internationales).

5° Nebulosité.

Il est indispensable de distinguer nettement l'indication de la surface du ciel couvert de nuages (élément qui sert à la construction des cartes spéciales de nébulosité) de la description generale du temps; orages, averses, grêle, etc., qui représentent trop de données pour pouvoir être reportées sur des cartes ce qui n'a pas lieu dans le code actuel.

On devra remarquer que:

a. Même si on indique les nébulosités partielles suivant les espèces de nuages, il faudra donner la nébulosité totale, car elle n'est pas nécessairement la somme des nébulosités partielles.

b. Il est *indispensable* d'avoir pour la nébulosité totale, un signe de plus qu'actuellement afin d'introduire le ciel couvert avec trous qu'il est très important de distinguer du velum continu.

6° Formes, altitudes, vitesse des nuages.

a. *Renseignements sur les nuages.*—Il faut donner à ces renseignements tout le développement nécessaire (presque tout le monde est d'ailleurs d'accord à ce sujet) car l'étude directe du développement des successions nuageuses dans l'espace prend une place de plus en plus grande dans la météorologie.

Certains directeurs de services météorologiques ont objecté qu'un petit nombre de stations seulement serait à même de donner des renseignements de bonne qualité sur les nuages. Il semble pourtant qu'il suffirait de doter tous les postes de horses nephoscopiques Besson, instrument simple et robuste.

b. *Nature et quantité de différentes espèces de nuages.*—Il semble qu'il y ait lieu de conserver la classification internationale actuelle quelqu'insuffisante qu'elle soit devenue maintenant car on ne saurait la modifier *incidemment* à propos d'un code, c'est une question de la plus haute importance, à traiter ultérieurement en elle même avec tout le développement qu'elle comporte. Il sera toujours temps de modifier le code en fonction de ce perfectionnement.

Nous proposons donc de s'en tenir à la classification internationale en y apportant simplement 2 simplifications pour réduire le nombre des espèces.

1°. Conformément aux suggestions de M. Gold et M. de Quervain, on confondrait sous un même signe les ACu et les Ci Cu, si souvent difficiles à distinguer l'un de l'autre, le cirrocumulus étant d'ailleurs fréquemment une forme de transition très éphemère.

2°. Nous demandons instamment que l'on classe également sous le même signe Cumulus et strato-cumulus, l'experience a démontré en effet que les observateurs distinguent très mal le véritable Strato Cu des Cu denses, et abusent de la dénomination Strato Cu.

D'ailleurs ces deux espèces de nuages n'ont pas de significations météorologiques très différentes car ils correspondent soit à des beaux temps d'hiver, soit à des queues de successions.

Nota.—Pour l'observation d'une heure, l'espèce des nuages étant rarement discernable, sauf par beau clair de lune, on pourra réduire la classification à 3 catégories suivant l'altitude.

c. *Direction et vitesse des nuages les plus élevés existant dans le ciel au moment de l'observation.*—Nous disons " les plus élevés " pour ne pas gâcher la place réservée à cet élément lorsqu'il n'y a pas de cirrus dans le ciel.

Pour ces éléments, il semble inutile de chercher une précision illusoire (rose de 8 suffisante) étant donnés les procédés d'observation.

La vitesse des cirrus est un élément intéressant pour la prévision, l'arrivée d'une depression étant souvent précédée de cirrus à vitesse très rapide. D'autre part la direction et la vitesse des nuages les plus élevés observables suppléant éventuellement en partie les sondages, donneront des renseignements sur le vent en altitude donc sur le déplacement des " velum " et aussi sur l'étendue en altitude du relief isobarique au sol qui parait être une indication sur le degré de solidité des anticyclones.

7° Visibilité.

Cet élément est intéressant non seulement pour l'aéronautique mais aussi pour la prévision générale, car il précise la densité du brouillard. donc fournit un élément d'appréciation de sa durée et de l'importance du stratus qu'il peut former en s'élevant.

Une échelle progressive plus détaillée pour les faibles visibilités semble indiquée, car pour l'aéronautique la précision dans le bas de l'échelle seule est intéressante.

8° Caractères du temps.

Ces renseignements trop divers pour être reportés sur les cartes, sont néanmoins extrêmement utiles pour faciliter leur interpretation.

Après la Conférence de la Paix (Annexe G de la Convention de la Navigation Aérienne) l'emploi d'une suite de caractères du temps a été essayé, cette suite est beaucoup compliquée, pratiquement les observateurs sont embarassés et font des erreurs ou des simplifications d'office, choisissant arbitrairement un certain nombre de signes qui reviennent arbitrairement dans les dépêches. L'Espagne qui a adopté ce code après l'Angleterre, a d'ailleurs été amenée de bonne heure à le simplifier.*

D'autre part il ne parait pas judicieux de consacrer autant de signes aux caractères du temps présent qu'aux caractères du temps passé.

Dans le 1° cas, en effet, il ne s'agit que de décrire l'état présént du temps, c'est à dire un seul instant de la durée, dans le 2° cas au contraire, il s'agit de décrire la succession du temps dans les 3 heures (ou mieux dans les 6 heures précédentes.

* Il semble en particulier que la serie si longue des signes reservés au brouillard double emploi avec le signe de l'indication de la visibilité.

Il est donc logique de n'attribuer qu'un signe à la première description et une suite de plusieurs signes à la deuxième d'autant plus qu'il y aurait grand intérêt à donner des renseignements sur l'intervalle complet entre deux observations, soit six heures.

On pourrait employer les lettres de Beaufort, légèrement modifiées, s· des considérations de chiffrement l'imposent.*

En effet on ne peut employer des chiffres, neuf signes étant météorologiquement insuffisants pour répondre à toutes les situations possibles, tandis que le code en lettre donne près de 24 signes.

Le procédé actuel consistant à décrire la succession des états du temps par plusieurs signes consécutifs, présente en outre l'avantage de donner une idée suffisante des époques et des durées des pluies, renseignements réclamés dans plusieurs mémoires.

2° Partie.

Formes Proposees pour les Radiogrammes Meteorologiques—Codes.

I.—Disposition des Renseignements dans les Radiogrammes.

1°.—*Subdivision des renseignements à transmettre.*—Les renseignements transmis peuvent se classer en 3 catégories;

Renseignements I

fournis par toutes les stations dans les radiogrammes internationaux, comme dans les radiogrammes abrégés de l'Aéronautique;

Renseignements II

fournis par toutes les stations dans les radiogrammes internationaux, mais supprimés des radiogrammes abrégés destinés spécialement à l'Aéronautique;

Renseignements III

fournis par un certain groupe de stations seulement· (Ex.: Renseignements fournis par les stations maritimes, sondages, etc.)

Il est indispensable que ces 3 sortes de renseignements soient classés séparément dans les radiogrammes, c'est-à-dire que chacun forme un ou plusieurs groupes entiers.

La solution suivante peut être adoptée:

I ... ... II III

2°—*Emploi des lettres.*—Dans le cas de radiogrammes comportant des groupes de lettres et des groupes de chiffres, il importe de ne pas mélanger des groupes de lettres et des groupes de chiffres. La solution à adopter sera alors la suivante:

I II III A B C

ou I II III représentent tous les groupes de chiffres compris dans le radiogramme, A B C représentent tous les groupes de lettres.

A donnant les renseignements supprimés dans les radiogrammes spéciaux à l'Aeronautique; B ceux fournis par toutes les stations dans tous les radiogrammes; C ceux spéciaux à certaines stations.

Dans l'étude qui suit, les groupes I II B C figurent seuls. Il n'est pas proposé de codification relative aux renseignements maritimes; ces renseignements s'ils sont exprimés en chiffres devront figurer comme groupes III à la suite des groupes II ou, s'ils sont exprimés en lettres, être adjoints aux groupes.

* Il est indispensable d'introduire une nouvelle lettre indiquant " couvert avec trous " voir paragraphe sur la nébulosité totale.

II.—Projet de Code.

Si les groupes de chiffres et les groupes de lettres qui forment le code sont représentés par des groupes de lettres symboliques, les codes correspondant aux 4 heures d'observation sont :—

Obs. de.	Gr. I.	Groupes II.	Gr. B.	Groupes C.
1 h.	BBBTT	DDFbv $n_1n_2n_3$	wwwww	$D_1V_1D_2V_2D_3V_3D_4V_4$ $D_5V_5D_6V_6$
7 h.	BBBTTm	DDFbv $Nvn_1n_2n_3n_4n_5$ $n_6n_7n_8$	wwwww	$D_1V_1D_2V_2D_3V_3D_4V_4$ $D_5V_5D_6V_6$
13 h.	BBBTT	DDFbv $NVn_1n_2n_3n_4n_5$ $n_6n_7n_8$	wwwww	$D_1V_1D_2V_2D_3V_3D_4V_4$ $D_5V_5D_6V_6$
18 h.	BBBTTM	DDFbv $NFn_1n_2n_3n_4n_5$ $n_6n_7n_8$	wwwww	$D_1V_1D_2V_2D_3V_3D_4V_4$ $D_5V_5D_6V_6$

Premier Groupe : *BBBTT* pour les observations de 1 et 13h.

Déchiffrement.

BBB—*Pression barometrique* en m/m et 1/10 de m/m, le premier chiffre 7 étant supprimé.

TT—*Température* en degrés entiers, 50 étant ajoutés pour les températures negatives.

Remarques.

PREMIER.....

Premiers Groupes : *BBBTm* / *BBBTTM* pour les observations de 7 et 18 h.

Déchiffrement.

Les 5 premiers chiffres représentés par BBBTT sont les mêmes que pour les observations de 1 h. et de 13 h.

Le 6° chiffre m à 7 h. et M à 18 h. donne le minimum et le maximum de la température dans les consitions suivantes. 1°/à 7 h. *m* donne en degrés entiers la différence entre la température au moment de l'observation et la température minima dans les 13 heures précédentes.

Remarques et Justification.

L'introduction d'un groupe de 6 figures n'est pas une nouveauté (sondage de la tour Eiffel, de Prague, Varsovie, radiogrammes Italiens, etc.). L'avantage les serait de rassembler dans le même groupe tous les renseignements relatifs à la température reseignements qui ne seront pas fournis dans les radiogrammes abregés destinés spécialement à l'Aeronautique.

Ce procédé qui donne la même notation, si on emploie les degrés centigrades ou les degrés absolus, offre l'avantage de designer le maximum ou le minimum par un seul chiffre au lieu de 2.

Déchiffrement.

2°. A 18 h. *M* donne en degrés entiers la différence entre la température maxima dans les 11 heures précédentes et la température au moment de l'observation.

Remarques et Justification.

Il est de plus avantageux de fournir le maximum et le minimum dans 2 radiogrammes separés.

1°. Pour faire parvenir plus rapidement ces 2 renseignements.

2°. Pour repartir les renseignements sur 2 radiogrammes et n'en pas charger un seul.

La température de 18 h. sera toujours inférieure au maximum de la journée.

Par contre, le minimum ne sera pas toujours atteint à 7 h. Dans ce cas *m* sera désigne par le chiffre 0. La difference entre la température à 7 h. et le minimum postérieur à 7 h. sera alors donnée dans l'obs. de 13 h. par un 6° chiffre ajouté au groupe BBBTT.

Deuxièmes Groupes : *DD F bv* pour les 4 h. d'observation.

Dechiffrement.

DD—*Direction du vent* au sol cotée de 1 à 16 (échelle obtenue en divisant par 2 l'échelle actuelle de 0 à 32).

DD indique également la *nébulosité* grâce au procédé suivant. On ajoute un multiple de 20 à la direction du vent :

00 pour ciel 1/4 couvert.
20 ,, 1/2 ,,
40 ,, 3/4 ,,
60 ,, couvert avec trous.
80 ,, complètement couv.

F—*Force du vent.*
Chiffre de 0 à 9.

b—*Tendance barométrique.*
Chiffre de 0 à 9 suivant l'échelle :

1 tendance de 0 m/m à 0 m/m 2
2 ,, 0 ,, 2 à 0 ,, 5
3 ,, 0 ,, 5 à 1 ,,
4 ,, 1 ,, à 2 ,,
5 ,, 2 ,, à 3 ,,
6 ,, 3 ,, à 4 ,,
7 ,, 4 ,, à 5 ,,
8 ,, 5 ,, à 6 ,,
9 ,, 6 ,, et au-dessus.

v—*Vitesse du nuage le plus élevé.*
1 et 2 = vitesse faible ou nulle.
3 et 4 = ,, moyenne.
5 et 6 = grande vitesse.
7 et 8 = pas d'observation de vitesse de nuages supérieurs.

Les chiffres impairs employés quand la tendance barométrique est positive et les chiffres pairs quand elle est négative.

Remarques et Justification.

Il est reconnu généralement que 16 facons de désigner la direction suffisent. Le remplacement de l'échelle 0 à 32 par l'échelle 0 à 16 permet de fournir des renseignements supplémentaires.

Le déchiffrement est moins compliqué qu'il ne paraît à première vue.

Pour avoir la nébulosité totale, il suffit en effet de considérer le premier chiffre pair inférieur ou égal ou premier chiffre de DD.

Par soustraction, on a immédiatement la direction du vent. Ex :

1°. DD = 35 — le 1° chiffre est 3 ; le chiffre pair inférieur est 2 (ciel 1/2ct) le vent est 15, c.à.d. NNW.

2°. DD = 63 — 60 indique la nébulosite ; couvert avec trous ; le vent est 03, c.à.d. ENE.

Cette échelle permet d'exprimer la tendance par un chiffre au lieu de deux.

Troisième Groupe : $n_1'n_2'n_3'$ pour les observations de 1 heure.

Déchiffrement.

$n_1'n_2'n_3'$. *Nature et quantité de nuages.*

n_1', quantité et 1/10 de ciel couvert par les nuages élevés.

n_2', quantité en 1/10 de ciel couvert par des nuages moyens.

n_3', quantité en 1/10 de ciel couvert par des nuages bas.

Remarques et Justification.

Ce groupe de 3 chiffres n'est pas une nouveauté dans les radiogrammes. Rien ne serait d'ailleurs plus simple que de les compléter par deux chiffres conventionnels toujours les mêmes.

Troisième et Quatrième Groupes : $NVn_1n_2n_3n_4n_5n_6n_7n_8$ pour les observations de 7, 13 et 18 heures.

Déchiffrement.

N—Direction du nuage le plus élevé parmi les nuages désignés ci-aprés.—Même code actuellement employé pour la direction des nuages supérieurs.

V—Visibilité designée par un de 0 à 9.

$n_1n_2n_3$ $n_4n_5n_6n_7n_8$.—*Nature et quantité des nuages.*

n_1—quantité en 1/1ϕ du ciel couvert par des Cirrus.

n_2 ..... par des Cirro-st.

n_3 ..... ou des Strato-cu. ou Altro-cumulus.

n_4 ..... par des Alto-strat.

n_5 ..... par des nimbus.

n_6 ..... par des Cumulus ou des Strato-Cu.

n_7 ..... par des Cumulo-nimbus.

n_8 ..... par des Stratus.

Remarques et Justification.

Comme le nuage le plus élevé observé est le premier qui ne soit pas désigné par le chiffre " zéro " (voir ci-dessous) il n'y a pas d'ambiguïté possible sur le nuage dont la direction est donnée.

Ces chiffres devraient former une échelle progressive notant avec précision les visibilités faibles particulièrement importantes pour l'aéronautique.

Ce procedé permet d'exprimer 2 renseignements à l'aide d'un seul chiffre : le renseignement sur la *nature* du nuage donné par l'emplacement même du chiffre dans le groupe, et le renseignement sur la *quantité* de ce nuage donné par la valeur du chiffre.

A l'objection que, dans tous les cas il faudra 8 figures pour désigner les nuages, on peut répondre que lorsqu'un nuage ne peut être observe, la figure qui lui correspond est un " zéro " qui sera toujours désigné par un trait (—).

Donc, même si aucun des nuages $n_4n_5n_6n_7n_8$ n'est observé, le groupe de nuages $n_4n_5n_6n_7n_8$ se présentera sous la forme de 5 traits — — — — — qui seront rapidement transmis.

Cinquième Groupe : *wwwww* pour les obs. de 7, 13, 18 heures

et Quatrième Groupe : wwwww ,, ,, 1 heure.

Déchiffrement.

wwwww—*Caractères successifs du temps* dans les 6 heures qui précèdent l'heure d'observation.

Ce groupe est un groupe de 5 lettres.

Chacune des lettres désigne suivant un code unique un caractère particulier du temps.

La répétition d'une même lettre indique que le même caractère du temps s'est maintenu.

La dernière lettre a toujours trait au caractère du temps au moment même de l'observation.

Le code employé peut être le code de Beaufort legèrement modifié par la suppression des lettres doubles ou triples.

Les modifications au code de Beaufort peuvent être les suivantes :

Beau temps (ciel 1/2 couvert *n* au lieu de *bc*.

Orage ..... *j* au lieu de *tlr*.

Une seule lettre *f* pour brouillard épais, brouillard très humide et brouillard au sol.

Une nouvelle lettre *k* pour couvert avec trous.

Remarques et Justification.

Ce procédé évite le système actuellement proposé de 2 codes différents pour le temps présent et le temps passé.

De plus, il présente une très grande souplesse pour désigner toutes les modifications du temps survenues entre deux observations.

La notation en lettres des caractères du temps permet de donner 5 caractères successifs à l'aide de 5 figures seulement.

Cette notation n'est d'ailleurs pas nouvelle (Beaufort).

Ce groupe de 5 lettres est toujours placé à la fin des groupes de chiffres pour ne pas introduire un mélange de lettres et de chiffres.

Des groupes de lettres sont d'ailleurs employés depuis le 1 juin 1919 dans les sondages émis par la Tour Eiffel et plusieurs pays (Tchéco-Slovaquie, Hollande, Pologne, etc.) ont adopté ce code de sondage dans leurs émissions météorologiques.

Le Service Météorologique Militaire français a adopté depuis 18 mois ce mode de désignation des caractères du temps dans ses transmissions radiotélégraphiques; il en a obtenu d'excellents résultats.

Sixième et Septième Groupes : $D_1V_1D_2V_2D_3V_3D_4V_4D_5V_5D_6V_6$.

Cinquième et Sixième Groupes : $D_1V_1D_2V_2D_3V_3D_4V_4D_5V_5D_6V_6$.

(6° et 7° : des observations de 7, 13, 18 heures; 5° et 6° des observations de 1 heure).

Déchiffrement.

$D_1V_1D_2V_2D_3V_3D_4V_4D_5V_5D_6V_6$
2 groupes de 6 lettres chacun.

D_1 = direction du vent à 500m.
D_2 = ,, ,, 1,000m.
D_3 = ,, ,, 1,500m.
D_4 = ,, ,, 2,000m.
D_5 = ,, ,, 3,000m.
V_1 = vitesse du vent à 500m.
V_2 = ,, ,, 1,000m.
V_3 = ,, ,, 1,500m.
V_4 = ,, ,, 2,000m.
V_5 = ,, ,, 3,000m.
V_6 = ,, ,, 4,000m.

Remarques et Justification.

Ce code est utilisé depuis le 15 juin 1919, dans les sondages émis par la Tour Eiffel.

Il semble avoir donné de bons résultats puisque, successivement il a été introduit dans diverses émissions européennes (Tchéco-Slovaquie, Pologne, Suède, Hollande).

M. Van Everdingen dans son mémoire considéré que le principle de le code est excellent et qu'il y aurait simplement lieu d'y introduire des améliorations de détail.

Ce procédé a l'avantage de donner en deux groups de six figures seulement des renseignements sur les sondages jusqu'à 4,000 metres.

LETTRES DU TEMPS. CHIFFRES DE CONTROLE.

(Omitted.)

3° Partie.—Organisation des Emissions.

HISTORIQUE.

(Omitted.)

PROJETS FRANCAIS. PRESENTATION DES PROJETS.

Chaque projet comporte.

1°—Une carte* indiquant la répartition territoriale des observations comprises dans les émissions. Les couleurs bleu ou rouge correspondent à 2 longueurs d'onde spéciales.

2°—Un graphique indiquant les heures, la durée et la simultanéité des émissions.

3°—Une note brève sur chacun de ces projets.

Tous les graphiques ont trait aux observations de 7 h. seules. Les trois autres émissions seraient réglées de façon tout à fait analogue: les espaces de temps qui séparent l'heure d'observation des heures d'émission devant rester les mêmes pour la transmission des 4 observations.

* The charts of the original have been replaced by tables.

PROJETS FRANCAIS. PROJET N° 1.

Avantages—

(*a*) Il supprime presque complètement les émissions simultanées.

(*b*) Les quelques émissions simultanées concernant des regions très éloignées et ne concernant aucune des régions de la bordure W de l'Europe.

(*c*) Il donne en moins de 2 heures tous les renseignements concernant le NW de l'Europe (Islands, Pays scandinaves, France, Grande-Bretagne.)

Inconvenients—

(*a*) Il donne assez tard (2 h. 40 après l'observation) les renseignements de l'Espagne.

(*b*) Il donne tard les renseignements maritimes.

(*c*) Il ne donne aucune latitude pour allonger la durée de chaque émission en cas d'augmentation du nombre de renseignements compris dans les radiogrammes.

Le Transmission commence.	Le Transmission fin.	Le Pays.	Le Pays.
0720	0725	Islande	—
0730	0735	Suisse	—
0740	0750	Danemark	—
0750	0800	Finlande	—
0800	0820	Suède et Norvège ...	—
0820	0840	France et Belgique ...	—
0840	0900	Grande Bretagne ...	—
0900	0920	Allemagne ... / Hollande ... / Autriche ...	—
0920—	0930	Afrique du Nord	Tchéco-Slovaquie.
0930	0940		Pologne.
0940	1000	Espagne...	Balkans.
1000	1020	Italie	—
1020	1030	Mer du N. 50 degré ...	—
1030	1040	Mer du S. 50 degré ...	—
1040	1045	Mediterranée Ocean ...	—

Projets Francais. Projet n° 2.

Avantages.

(*a*) Il fournit tous les reseignements européens dans un délai total de 2 h. 55 et les renseignements maritimes européens dans un délai total de 3 h. 25. Il offre donc une certaine latitude à l'allongement des radiogrammes.

(*b*) Les deux séries d'émissions concernent, l'une le NW de l'Europe, l'autre (excepté pour la Finlande) la région méditerraneenne. Les simultanéités concernent toujours des régions assez eloignées.

(*c*) Il est possible, avec un seul poste récepteur, de recevoir les renseignements de l'W et du SW de l'Europe (c'est-à-dire Islande, Grande-Bretagne, France, Espagne, Italie, Afrique du Nord).

Inconvenients.

(*a*) Il faut deux postes recepteurs pour recevoir en même temps l'Espagne, la Suède et la Norvège.

(*b*) L'heure d'émission de l'Espagne est peut-être fixée un peu tôt par rapport aux nuages actuels de ce pays.

Le Transmission commence.	Le Trans mission fin	Le Pays.	Le Pays.
0735	0740	Islande	—
0745	0755	Danemark	—
0755	0 05	Belgique et Hollande ...	—
0805	0815	Suisse...	Finlande. Esthonia.
0815	0835	France	—
0835	0855	Grande Bretagne ...	Balkans.
0855	0915	Suède et Norvège ...	Espagne.
0915	0935	Allemagne ... Autriche ...	Afrique N.
0935	0940	Tchéco-Slovaquie...	Italie.
0940	0945		
0945	0955	Pologne	
0955	1010	Mer N.... ... Ocean Angleterre	Açores.
1010	1025	Ocean France	—
1025	1030	Mediterranée Ocean ...	—

Projets Francais.—Projet n° 3.

Principe.

Alors que les 2 projets précédents supposent que toutes les observations sont faites à la même heure en Europe, le projet n° 3 suppose l'Europe divisée en fuseaux analogues aux fuseaux horaires, les heures d'observation étant décalées quand on passe d'un fuseau à l'autre. Il y a dans ce cas, pour chaque fuseau, une seule série d'émissions successives.

Il est supposé qu'on fait emploi de 2 fuseaux.

Avantages.

(*a*) Le décalage des heures d'observation permet de décaler la série d'émission d'un fuseau par rapport à la série d'émission de l'autre fuseau. D'où réduction presque complète de la simultanéité.

(*b*) La simultanéité est presque entièrement supprimée et ne subsiste que pour des pays éloignés.

(*c*) Une certaine extension de la durée des émissions reste possible.

Inconvénient.

L'obligation d'observations à heures différentes.

Le Transmission commence.	Le Transmission fin.	Le Pays.	Le Pays.
0640	0650	Danemark	—
0650	0700	Finlande	—
0700	0720	Suède-et-Norvège ...	—
0720	0725	Islande	—
0725	0730		Suisse.
0730	0735	Belgique et Hollande	
0735	0740		Pologne.
0740	0745	—	
0745	0755	Tchéco-Slovaquie ...	—
0755	0815	Allemagne et Autriche	—
0815	0835	France	—
0835	0855	Grande Bretagne ...	Italie.
0855	0900	Espagne	—
0900	0915		Balkans.
0915	0920	Afrique N.	
0920	0935		—
0935	0945	Açores	—
0945	1010	Mer du Nord	Ocean Mediterranée.

Le Probleme des Emissions Collectives.

Pour permettre à tous les pays de l'Europe Centrale et Occidentale de recevoir les émissions des projets ci-dessus, deux methodes se presentent :—

1°—Tous les pays écoutent directement ces émissions. Dans ce cas, une portee de 2,000 klm. est nécessaire.

2°—Il est organisé, comme dans le protocole EU-F-GB-I, une seconde serie d'émissions collectives donnant le résumé de series d'émissions nationales et d'une portée d'au moins 3,000 klm.

1° *cas.*—Les émissions devant toutes être assurées par des postes puissants, il y a lieu de ne pas trop les éparpiller. Example : les observations suèdoises, norvégiens et danoises seraient émises en un seul radiogramme par un poste TSF d'une portée l'au moins 2,000 klm.

2° *cas.*—Les émissions du type collectif ne peuvent être organisées qu'aprés la realisation parfaite des émissions nationales qu'elles doivent résumer. Il parait donc prématuré de les organiser tant que la première etape n'aura pas fait ses preuves.

En tous cas, elles doivent (comme dans le protocole EU-F-GB-I) être organisées de telle sorte qu'elles ne gênent nullement la première série d'émissions. Heures différentes et longuers d'ondes différentes.

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