

GOVERNMENT OF INDIA.
DEPARTMENT OF INDUSTRIES AND LABOUR.



Note on the Functions,
Organisation and Present
Developments of the Indian
Meteorological Department

DELHI: PRINTED BY THE MANAGER,
GOVERNMENT OF INDIA PRESS: 1930.

CONTENTS.

	PAGES.
SECTION I.—Functions of the Department	1—2
SECTION II.—Definitions of different types and classes of Observatories	2—3
SECTION III.—Organisation prior to the demands of aviation .	3—5
SECTION IV.—Special organisation to meet the needs of avia- tion	5—8
SECTION V.—Possible Future Developments	8

APPENDIX.

Annexe G. to Convention relating to the Regulation of Aerial Navigation, dated the 13th October 1919	9—12
---	------

INDIAN METEOROLOGICAL DEPARTMENT.

I.—Functions of the Department.

1. The Indian Meteorological Department was instituted in 1875 to combine and extend the work of various provincial meteorological services which had sprung up before that date. The various duties which were imposed on the Department at the time of its formation were from time to time supplemented by new duties. The main existing functions, more or less in the historical order in which they were assumed, may be briefly summarised as follows:—

- (a) The issue of warnings to ports and coastal districts of the approach of disastrous storms. Since the introduction of wireless telegraphy this has been extended to include the issue of storm warnings to ships in Indian seas.
- (b) The maintenance of systematic records of meteorological data and the publication of climatological statistics. These were originally undertaken in order to furnish data for the investigation of the relation between weather and disease.
- (c) The issue to the public of up-to-date weather reports and of rainfall forecasts. These duties were originally recommended by a Committee of Enquiry into the causes of famine in India.
- (d) Meteorological researches of a general character, but particularly regarding tropical storms and the forecasting of monsoon and winter rainfall.
- (e) The issue of seasonal rainfall forecasts.
- (f) The issue of telegraphic warnings of heavy rainfall by special telegrams to district officers on Departmental warning lists (*e.g.*, canal and railway engineers), and by means of the ordinary daily weather telegram to the public in general.
- (g) Supply of meteorological, astronomical and geophysical information in response to enquiries from officials, commercial firms or private individuals.
- (h) Technical supervision of rainfall registration carried out under the control of Provincial Government authorities.
- (i) The study of temperature and moisture conditions in the upper air by means of instrument-carrying balloons and of upper winds by pilot balloons.
- (j) The issue of weather reports and warnings to aircraft.
- (k) Special investigations at the Airship Base, Karachi.

In addition to these meteorological duties the India Meteorological Department was from time to time made responsible for various other important duties, such as—

- (l) Determination of time in India and the issue of time-signals; also the determination of errors of chronometers for the Royal Indian Marine and the Royal Navy.

- (m) Observations and researches on terrestrial magnetism at Bombay.
- (n) Regular study (mainly by spectroscopic examination) of the sun at the Solar Physics Observatory at Kodaikanal.
- (o) Maintenance of seismological instruments at various centres.

II.—Definitions of different types and classes of Observatories.

2. Before proceeding to indicate the organisation of the Meteorological Department, it may be helpful to introduce here the following definitions:—

F = Forecast Centre at which weather observations are collected by telegrams from a number of stations in order to form the basis of weather reports and forecasts issued therefrom. These may be (a) Main Centres, serving a large area for general purposes, or (b) Regional Centres, serving more limited areas for special purposes.

U = Upper Air Observatory undertaking observations of upper winds, and of upper air temperatures, humidities and pressures up to heights of about 15 miles by means of sounding balloons (*i.e.*, with instruments attached).

A = Observatory to which R. A. F. supply aeroplane data of temperatures and humidities up to heights of 2 or 3 miles.

P = Pilot Balloon Observatory at which pilot balloons (*i.e.*, balloons without instruments attached) are released and observed through special theodolites for the determination of wind directions and velocities at various heights in the free atmosphere. The minimum staff is two full-time observers for one balloon flight per day and 3 full-time observers and a balloon-maker for two balloon flights per day.

W = A meteorological or weather observatory for the observations of such elements as can be recorded by an observer with the help of instruments on the ground (as distinct from upper air observations obtained by means of balloons, etc.). Observatories where the staff is provided and paid for by other agencies, *e.g.*, Indian States, are called non-departmental, although instruments are supplied by the Meteorological Department. These surface observatories are classified according to the number of observations per day and the number and kind of instruments to be read. Thus:

W₁ = First class weather observatory which is furnished with autographic instruments for continuously recording pressure, temperature, humidity, wind direction and velocity, and rainfall, in addition to instruments read by eye. It may also undertake special observations (*e.g.*, on atmospheric electricity). The staff required varies from two part-time observers to about four full-time observers according to the amount of special work and of computation and tabulation of data.

W₂ = Second class weather observatory at which observations are taken two or three times daily and telegraphed to one or

more forecast centres. The existing standard times of observation in India are 8 hrs. and 17 hrs., the observations being made by a part-time observer on Rs. 25 p. m.

W_3 = Third class weather observatory where (a) readings are taken daily at 8 hrs. and sent by telegram to one or more forecast centres, or (b) readings are recorded twice daily at 10 hrs. and 16 hrs., but not telegraphed. At each (a)-type observatory there is one part-time observer on Rs. 15 a month. Practically all (b)-type observatories are non-departmental.

W_4 = Fourth class weather observatory at which observations (a) of temperature, wind and rainfall only or (b) of temperature and rainfall only are recorded. The staff at a 4th class observatory is one part-time observer on pay not exceeding Rs. 12 a month.

W_5 = Fifth class weather observatory at which a part-time observer on Rs. 5 p. m. records and telegraphs rainfall only.

M = Observatory equipped with instruments for continuously recording the principal magnetic elements.

S = Seismological station equipped with one or more continuously recording seismographs.

T = Observatory equipped with instruments for the determination of time from observations of sun, stars and European wireless time signals.

Sp. = Solar Physics Observatory equipped with photo-heliograph, spectro-heliograph, etc.

III.—Organisation prior to the demands of aviation.

3. It is necessary to note that practical meteorology implies a meteorological organisation, not merely individual meteorologists relying upon their own personal and purely local observations. The making of a single forecast in any of the larger meteorological offices of the world requires the organised co-operation of some hundreds of persons. In India some 250 observers co-operate daily to take simultaneous observations at about 200 separate places and hand in their reports to telegraphists, who transmit them to centres, where for rapid assimilation clerks decode them and chart them on maps; meteorological experts then draw therefrom the conclusions on which their forecasts are based. There are other observatories, which take observations for climatological purposes, but do not telegraph them.

4. As aviation has been and still is making rapidly increasing demands on meteorologists in India, it is easier to understand the constitution and needs of the Department, if we first consider the organisation prior to the demands of aviation. In order to carry out the functions imposed upon it, the Department had a central office, five principal sub-offices and 26 pilot balloon observatories and supervised 270* weather observatories principally of the third class distributed over a region stretching from Persia, Aden and Zanzibar on the west to Burma on the east. A brief

*The actual numbers were 10 first class, 2 second class, 200 third class, 29 each fourth and fifth class.

summary is given below of the work at each of the principal observatories and offices:—

Headquarters Office, Poona (F. U. W.).—The general administration of the Department is carried on by the headquarters office in Poona. It receives the telegraphic reports of morning observations collected at practically all pilot balloon and 1st, 2nd, 3rd and 5th class observatories and issues daily a telegraphic summary of general weather conditions with forecasts of probable changes in weather during the next twenty-four hours. It serves as the main forecasting centre for the Indian area and prepares and publishes the Daily, Weekly and Monthly Weather Reports and an Annual volume entitled the "India Weather Review". It undertakes the issue of heavy rain warnings for practically the whole country, excepting northeast India, and the issue of warnings for storms in the Arabian Sea. It is responsible for practically all climatological work in India including checking and computation of data of most weather observatories and the preparation of normals of rainfall, temperature, humidity, etc., for all observatories. It collects and analyses weather logs from ships in the Arabian Sea. It is responsible for the design, specification, test and supply of special meteorological instruments. On its transfer from Simla to Poona the headquarters office was equipped as an upper air observatory and a first class weather observatory and has also been designed to provide facilities for research in theoretical and practical meteorology.

Meteorological Office and Observatory, Alipore, Calcutta (F. P. W., S. T.).—The Alipore Office serves as a regional forecast centre and is responsible for the publication of the Calcutta Daily Weather Report for northeast India, for storm-warning in the Bay of Bengal and heavy rainfall warning in northeast India. It has complete charge of all 2nd, 3rd, 4th and 5th class observatories in northeast India (from Assam to Orissa), while its other duties consist in supplying all weather observatories with ordinary instruments and stores, keeping a stock of such instruments, and supplying time-signals by time-ball to the Port of Calcutta and by wireless to shipping at sea. It is also a first class weather observatory, pilot balloon observatory and seismological station.

Upper Air Observatory, Agra (U. W., S.).—Agra Observatory is the headquarters of upper air work in India. It is responsible for maintaining all the pilot balloon observatories in India and neighbouring countries and supplying them with necessary equipment for carrying on daily pilot balloon observations and supervising their work; these duties have necessitated the provision of a hydrogen factory to make hydrogen gas and compress it into tubes as well as the provision of a workshop for the repair of instruments and hydrogen tubes and the manufacture of upper air instruments. All data from pilot balloon observation are collected, checked and statistically summarised at Agra. This observatory is also the principal centre of upper air research work in India. The sounding balloon work there (in the course of which balloons have provided information of conditions up to as great a height as 85,000 feet) has been responsible for most of our present knowledge regarding the free atmosphere over India. There is a seismological station attached to this observatory.

Colaba and Alibag Observatories (W., S. T. M.).—These observatories specialise in the study of geophysics, particularly terrestrial magnetism

and seismology, and in addition carry on the duties of a first class weather observatory. They take star or sun observations for the determination of time and are responsible for the time-ball service at the Bombay Harbour and the rating of chronometers belonging to the Royal Indian Marine and Royal Navy.

Kodaikanal (Sp. W₁.S.).—The observatory at Kodaikanal specialises in the study of the physics of the sun, and is specially equipped for spectroscopic observations and research. The routine work is decided in accordance with recommendations of the International Astronomical Union which prevent any serious overlapping of work in the comparatively few solar physics observatories in the world. This observatory also undertakes the duties of a first class weather observatory and a seismological station.

Madras (W₁.P. T.).—The most important duty of the Observatory is the supply of time by time-ball signal to local shipping and to the whole civil population of India by telegraphic signal throughout the Indian telegraph system. The observatory issues the Madras Daily Weather Report throughout the year and in addition carries out the duties of a first class surface observatory and of a pilot balloon station.

IV.—Special organisation to meet the needs of aviation.

5. The above represented the activities of the Department prior to the introduction of aviation in India. With the development of civil and military aviation and rather rapid expansion of their activities in recent years fresh duties of a different character devolved upon the Department and necessitated a more or less complete overhaul of the pre-existing arrangements. Aviators require detailed information about the weather; they wish to know winds at different levels, have information about clouds, visibility, fogs, duststorms, thunderstorms, etc., along with forecasts of changes in these elements. Many of these are local, short-lived and rapidly changing phenomena.

6. Definite recommendations regarding the nature of information to be supplied to aircraft, the exhibition of current weather information at aerodromes and the meteorological organisation of international airways have been embodied in Annexe G. of the International Convention of Air Navigation (*vide* Appendix). In accordance with these recommendations, expert meteorologists should be stationed at aerodromes at reasonable intervals along the airway to supply *en clair* to the aviation personnel current information and forecasts of weather conditions along the routes up to the next aerodrome of the same class. Forecast centres should be established at least at each main aerodrome along aerial routes and forecasts prepared at such centres should be transmitted to the other aerodromes for the information of pilots. These recommendations involve the opening up of new forecast centres in India. Other recommendations refer to hours and kind of observations and manner of codifying them.

7. In Europe practically all observatories record and telegraph readings at least thrice daily, while stations along air routes do so every three hours. In U. S. A. readings are made at least twice daily at all observatories and every three hours along air routes; proposals are being considered for changing the number of regular observations per day from two to four. The network of observatories in Europe and America is closer than the existing network in India.

8. A comparison of these practices and International recommendations with the past Indian programme of telegraphing observations once daily, shows that at each observatory in India fuller and more frequent observations should be taken and be made available to aviators in internationally approved codes, and that the number of observatories should be increased.

9. It has therefore become necessary to arrange for the preparation of two weather charts per day at such regional forecast centres in India as are specially concerned with aviation, to raise to 2nd class status most of the existing weather observatories reporting to these centre and to create some new observatories.* Further, on account of the fuller observations required, new instructions for observers have been drawn up, new registers for the recording of observations and new telegraphic codes more in conformity with international agreement and suited to the changed method of recording of observations have been prepared. These have been introduced at observatories from the Persian Gulf to N.W. India and will be introduced elsewhere as air routes extend.

10. The forecast centres already started or proposed to meet the needs of aviators are Quetta, Peshawar, Karachi, Delhi and Rangoon, while work at the existing offices at Calcutta and Poona will require to be extended.

Quetta and Peshawar (F. W₁. P. A.).—Aviation on a regular basis was first started in this country by the Royal Air Force in northwest India, and the necessity for opening local forecast centres was first experienced there. Two forecast centres were accordingly started four years ago at Quetta and Peshawar, each under an R. A. F. Meteorologist who was entrusted with the charge of issuing forecasts of weather over the Lahore-Peshawar-Quetta-Karachi air routes for R. A. F. aeroplanes and detailed local forecasts and warnings each for his own immediate neighbourhood. The Meteorological Department supplies instruments for the use of the R. A. F. Meteorologists, meets the cost of the staff of clerks and observers at each centre and supplies data by telegram from its observatories. The technical work done at these stations is supervised by the Director-General of Observatories.

Karachi (F. W₁. P. A.).—For civil aviation preparations had to be made for the first time by the Department in aid of the Cairo-Karachi aeroplane service. A new forecast centre was established at Karachi, its initial function being the issue of weather reports and forecasts for the flying sector Karachi to Charbar. In connection with the larger Imperial Airship-Scheme which has its own distinctive demands on meteorological services, India was asked to undertake responsibility for supplying information for the section extending from Basra to Karachi. Necessary schemes were drawn up and Government decided that action should be taken in three distinct and separate stages. As a result of the preliminary scheme, additional surface observatories were established along the flying route and pilot balloon observations to determine the upper air currents were started at Bahrein, Muscat and Gwadar, thus enabling the Karachi Office to gather

* In connection with the Bushire to Rangoon aviation schemes 10 new pilot balloon observatories and 36 new weather observatories have been started or proposed, while a change in the status of more than half the existing 3rd class observatories has been proposed. If these schemes are sanctioned the numbers of observatories will be 13 first, 175 second, 67 third, 29 fourth and 22 fifth class observatories.

and study an increased supply of weather information from the Arabia and Mekran coasts. Arrangements were made for the preparation of two charts daily at Karachi, based on 4 and 14 hrs. G. M. T.* observation telegraphed from stations in the Persian area and parts of northwest India.

In order to meet the requirements of the London-Karachi Air Mail Service, arrangements were completed for issuing through the Karachi Civil Wireless Station synoptic weather broadcasts on short wave at regular intervals, also for supplying weather reports by wireless to aeroplanes in flight and for receiving synoptic broadcasts from Baghdad and Egypt.

At Karachi itself arrangements had to be made for the study of special meteorological problems in connection with airships. The two most important problems for the safe landing and mooring of airships relate to experiments on wind structure and the thermal structure of the air in the first 200 to 300 ft. above ground at the air base. There are two aspects to be considered in connection with the thermal structure, firstly, rapid changes of temperature with time, and secondly, the variation of temperature with height above the ground; the latter is generally referred to as the vertical temperature gradient. Each change of air temperature gives rise to a change of buoyancy of the moored airship which must be corrected, while the knowledge of vertical gradient of temperature is important in connection with the stability of the airship when landing or approaching the mooring mast; when the gradient is low an airship is stable and manageable; when it exceeds a certain value an airship is unstable and tends during descent to fall at an ever increasing rate. For the purposes of studying temperature conditions at the airship base, a mast 260' high has been erected at Drigh Road and special instruments are being installed at suitable heights on the mast. The information provided by such apparatus is of great importance and its installation at all existing or prospective airship bases is desired by airship authorities. Similar installations have been completed at Cardington in England and at Ismailia in Egypt.

The forecast office is temporarily located in Karachi Cantonment and will be transferred to Drigh Road civil aerodrome, when buildings are provided there. Meanwhile a first class weather observatory and pilot balloon station have been started at Drigh Road. The weather observatories in Persia and Arabia and along the Mekran coast are under the charge of the Meteorologist at Karachi.

On the newly-opened Karachi-Delhi air route, the Karachi forecast centre is responsible for weather reports and forecasts between Karachi and Jodhpur.

Delhi (F. P. W.).—A forecast centre has recently been opened at Delhi and will be specially responsible for the supply of weather reports and forecasts to aviators between Jodhpur and Allahabad or Gaya. A pilot balloon and first class weather observatory is attached to this office.

Calcutta.—In connection with the Delhi-Calcutta and Calcutta-Rangoon air routes, proposals have been made to extend the existing duties of this centre (see previous section of this pamphlet). It will become responsible for weather reports and forecasts to aviators between Allahabad or Gaya and Akyab.

* Greenwich Mean Time. Add $5\frac{1}{2}$ hours to convert to Indian Standard Time.

Rangoon.—The establishment of a new forecast centre and first class observatory at Rangoon under a trained Meteorologist has been proposed. If sanctioned, it will become responsible for weather reports and forecasts to aviators between Akyab and Victoria Point.

Poona.—The new forecast centres, the increased status of most weather observatories and generally increased activities add greatly to the administrative and executive responsibilities of the headquarters office at Poona and the need for additional staff has already been experienced. Further, headquarters office is at present responsible for weather reports and forecasts to aviators on routes outside northern India.

V.—Possible Future Developments.

11. When air mail services are extended to central and southern India, forecast centres will be required at various points along the route in accordance with the International Convention on Air Navigation. Third class observatories in these areas will be raised to second class, and new pilot balloon and weather observatories may have to be opened.

12. The arrangements so far made or proposed for meteorological services along the air routes between Bushire and Rangoon are not as elaborate or detailed as the meteorological arrangements on air routes in Europe or America. Experience will perhaps show the need of (a) frequent reports of current weather from observatories in the immediate neighbourhood of air routes, (b) establishment of special stations at critical points on air routes which are specially dangerous, for example, the tops of ranges of hills on which cloud may settle, and (c) forecasts in such detail that weather charts must be prepared more frequently than twice daily; this would involve more frequent observations at, and more frequent telegrams from all 2nd class observatories.

13. When night flying begins along air routes, additional observations will be required from stations along air routes and arrangements may have to be made to keep forecast centres open by night as well as by day.

APPENDIX.

ANNEXE G: TO CONVENTION RELATING TO THE REGULATION
OF AÉRIAL NAVIGATION, DATED 13TH OCTOBER 1919.

SECTION I.

Classification of Information.

The meteorological information necessary to aerial navigation referred to in Article 35 (a) of the Convention, may be divided, in a general way, into three categories, *viz.*:—

- (a) Climatological information (1) which is based upon past meteorological records analysed and summarised to show the weather which is experienced in the long run at a given place or in a given area.
- (b) Current information (2) which is based upon reports of observations transmitted to a central station by wireless, or ordinary telegraphy or telephony, and upon observations made at the centre itself. Such information gives a survey of the existing conditions at the observing stations. Current information may be divided into two categories, *viz.*:—
 - 1. Information necessary for the preparation of synoptic charts.
 - 2. Information necessary for the working of airways.
- (c) Forecasts (3) which are statements of the meteorological conditions anticipated during a period of time or for an epoch of time subsequent to the time of their issue. There are two kinds of forecasts of importance for air navigation, *viz.*:—
 - 1. General forecasts relating to an extensive area and usually for a period of 24 to 36 hours.
 - 2. Detailed short period forecasts relating to airways.

SECTION II.

Exchange of Information.

A. **Climatological information.*—1. The fundamental information as regards pressure, temperature, wind and weather, is furnished by the published monthly and annual summaries issued by the various meteorological services as far as possible in the form recommended by the International Meteorological Committee.

* 1. Climatological information is required:—

- (a) In connection with the selection of airways,
- (b) for indicating the variation of the meteorological conditions affecting flight during the day and the year and with the place and altitude,
- (c) for indicating the places at which stations should be established or furnishing current information.

2. Current information is required:—

- (a) for the guidance of aviation companies and for the pilots or navigators.
- (b) for the meteorologists responsible for the preparation of forecasts.

3. Forecasts are required for the guidance of aviation companies and for the pilots and navigators.

2. The following summaries, of great importance for aerial navigation, should be prepared for each month of the year by each Contracting State, from the observations made at a selection of meteorological stations. These summaries will show:—

- (a) The frequency of occurrence at each station of the different degrees of horizontal visibility for at least three different times a day, one in the morning, one near mid-day, and one in the late afternoon.
- (b) The frequency of occurrence at each station of the different heights of base of cloud for the same times as those selected for visibility.
- (c) The frequency of occurrence at each station of winds of different directions and speeds at the surface and at heights of 500, 1,000, 2,000 and 3,000 metres.

These summaries should be prepared in the forms and for the heights and limits shown in Appendix G-1 and should be exchanged through the International Commission for Air Navigation.

It is particularly important that these summaries should be prepared in those countries where no airway has yet been established, in order that concise climatological information may be available for the establishment of airways over these countries as the need for them arises.

3. Further, each Contracting State is recommended to publish a "guide" conceived on lines which are essentially practical for use by airmen, presenting in a very convenient form a synthesis of climatological information useful for air navigation. The guide should also contain a table giving a list of meteorological information at the disposal of airmen at different times in the different countries.

B. **Current information.*—1. The observations should be made at hours fixed by international agreement and should be collected at regional or national centres. The reports to be exchanged in connection with the preparation of synoptic charts should be issued by wireless telegraphy at times fixed by international agreement. The reports for use on airways should be issued by wireless telegraphy at times fixed mutually by the States concerned. The issues should be made in such a way that the reports may be available to the personnel of the aviation and meteorological services with the least possible delay, duplication or interference.

2. The reports should be drawn up, as far as possible, in the form and according to the codes specified by the International Meteorological Committee. The Codes recommended at present are given in Appendix G-2. The symbolic form of the reports and the codes indicate the nature of the information required.

* 1. Climatological information is required:—

- (a) in connection with the selection of airways,
- (b) for indicating the variation of the meteorological conditions affecting flight during the day and the year and with the place and altitude,
- (c) for indicating the places at which stations should be established or furnishing current information.

2. Current information is required:—

- (a) for the guidance of aviation companies and for the pilots or navigators,
- (b) for the meteorologists responsible for the preparation of forecasts,

3. Forecasts are required for the guidance of aviation companies and for the pilots and navigators,

3. Current information specially supplied to aircraft in flight should be either in clear or in the abbreviated code given in Appendix G-3. If coded information is required by a meteorologist or a navigator on board an aircraft it should be furnished, as far as possible, in one of the codes of Appendix G-2.

4. The exhibition of current information at aerodromes is dealt with in Section III below.

C. Forecasts.—The code for international exchange of short period forecasts on an airway, and the arrangements for their utilisation, will be determined hereafter. The period covered by such forecasts will depend upon the length of the flights to be made and upon the precision with which the meteorological services can foretell the weather.

SECTION III.

Exhibition of Current Information at Aerodromes.

The exhibition of current information will be effected in three ways:—

1. A synoptic chart showing the general meteorological distribution over a wide area for the last epoch of general reports (Appendix G-4).

2. One or more skeleton maps covering the area to the aerodromes to which flights are made without landing. The maps should give the visibility, clouds, weather, wind on the ground and upper wind. The information should be shown by suitable symbols (Appendix G-5).

3. Current reports in clear and in tabular form according to the scheme shown in Appendix G-6. (A knowledge of the wind at different heights is of great importance to airmen).

SECTION IV.

Meteorological Organisation on International Airways.

1. In order to give adequate information of existing weather, meteorological reporting stations should be established along and in proximity to an airway and particularly at places having special conditions of visibility and low cloud.

When an airway over a Contracting State passes close to another Contracting State without crossing it, the latter State shall co-operate, as far as possible, in the protection of such airway by furnishing special meteorological information relating to the region extending in principle to a distance from the airway equal to three quarters of the distance normally flown without landing, on the portion in question of the airway.

2. Exchange of information should be made promptly and as frequently as necessary having regard to the climate of the airway concerned and, as far as possible, in the codes indicated in the Appendices. International exchange will normally be effected by wireless telegraphy, though the national centralisation of reports may be made by wireless, or ordinary telegraphy or telephony or by a combination of these methods.

3. Meteorologists should be stationed at aerodromes at reasonable intervals along an airway to supply in clear to the aviation personnel current

information and forecasts of conditions along the airway to the next aerodromes of the same class.

4. To assist the aviation personnel in the ready interpretation of the reports, provision should be made for the exhibition of the information in clear in a uniform manner in accordance with the provisions of Appendices G-4, G-5, G-6.

5. The most important current information for aviation on an international airway is information relative to the state of the weather (past and present) the visibility, the cloud and its height, and the wind at the surface and at different heights.

6. Reports of violent and sudden phenomena which threaten the safety of air navigation, such as thunderstorms, squalls, fogs, and reports of improvements of weather when the conditions have been such as to threaten the safety of air navigation, should be transmitted immediately to the aerodromes concerned and to aircraft in flight; these reports should be made not only from stations situated along an airway, but also from stations covering it at a distance equal in principle to three quarters of the distance normally flown without landing. The transmission to aerodromes will be effected as far as possible in the Code which appears in Appendix G-7. The transmission to aircraft will be made in clear.

7. Arrangements should also be made for the exhibition, where necessary, of ground signals to indicate the meteorological conditions existing at other places along the airway. The code of Appendix G-8 and as far as possible, the system of panels referred to in that Appendix, should be used.

8. Stations situated on or in proximity to mountains should make special observations of cloud and visibility. These observations should be transmitted immediately after the groups of Appendix G-2 in a group of figures preceded by a code word "Mont". They should contain information about the cloud on or near the summits of the mountains and of the cloud or fog below the station of observation. They should also indicate the changes in the cloud which have been observed during the period immediately preceding the hour of observation.

9. Arrangements should also be made for the issue to the aviation personnel at the principal aerodromes of information regarding the corrections to be applied, in consequence of the variations of barometric pressure, to the altimeter readings at various points along the airway as far as the next aerodrome to which flights are made without landing. Such information shall be issued in accordance with the provisions of Appendix G-9.

Note.—The meteorological information furnished under the provisions of this Annex should be given in units of the C. G. S. system or derived units.