



Maldives Civil Aviation Authority
Republic of Maldives

Maldivian Civil Aviation Regulations

MCAR-3 Meteorological Service for Air Navigation

Issue 1, Amendment 0, 1 September 2014

Foreword

Maldives Civil Aviation Authority, in exercise of the powers conferred on it under Articles 5 and 6 of the Maldives Civil Aviation Act 2/2012 has adopted this Regulation.

This Regulation shall be cited as MCAR-3 Meteorological Service for Air Navigation and shall come in to force on 1 September 2014.

The purpose of this MCAR is to provide specifications for physical characteristics, configuration, material, performance, personnel or procedure, the uniform application of which is recognized as necessary and/or desirable for the safety or regularity of air navigation and to which the Authorities providing meteorological and air traffic services in Maldives will, or endeavor to conform in accordance with the Convention on International Civil Aviation.

The standards and recommended practices contained in this MCAR together with Regional Supplementary Procedures (Doc 7030) shall be applicable to all aspects of air navigation in the Maldives.

Definitions of the terms and abbreviations used in this regulation, unless the context requires otherwise, are in MCAR-I Definitions and Abbreviations.



For the Civil Aviation Authority

Hussain Jaleel

Chief Executive

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CHAPTER I DEFINITIONS

Definitions of the terms and abbreviations used in this regulation, unless the context requires otherwise, are in MCAR-I Definitions and Abbreviations.

I.1 TERMS USED WITH A LIMITED MEANING

For the purpose of this MCAR, the following terms are used with a limited meaning as indicated below:

- a. to avoid confusion in respect of the term “service” between the meteorological service considered as an administrative entity and the service which is provided, “meteorological authority” is used for the former and “service” for the latter;
- b. “provide” is used solely in connection with the provision of service;
- c. “issue” is used solely in connection with cases where the obligation specifically extends to sending out the information to a user;
- d. “make available” is used solely in connection with cases where the obligation ends with making the information accessible to a user; and
- e. “supply” is used solely in connection with cases where either c) or d) applies.
- f. “ASHTAM” means a special series NOTAM notifying by means of a specific format change in activity of a volcano, a volcanic eruption and/or volcanic ash cloud that is of significance to aircraft operations.
- g. “PMD” means processed meteorological data in the form of grid point values expressed in binary forms (meteorological code).

CHAPTER 2 GENERAL PROVISIONS

Note: - It is recognized that the provisions of this MCAR with respect to meteorological information are subject to the understanding that the obligation of a Contracting State is for the supply, under Article 28 of the Convention, of meteorological information and that the responsibility for the use made of such information is that of the user.

2.1 OBJECTIVE, DETERMINATION AND PROVISION OF METEOROLOGICAL SERVICE:

- 2.1.1 The objective of meteorological service for air navigation shall be to contribute towards the safety, regularity and efficiency of air navigation.
- 2.1.2 This objective shall be achieved by supplying the following users: operators, flight crew members, air traffic services units, search and rescue services units, airport managements and others concerned with the conduct or development of international/national air navigation, with the meteorological information necessary for the performance of their respective functions.
- 2.1.3 Maldivian Civil Aviation Authority (CAA), in collaboration with Maldives Meteorological Services (MMS) shall determine the meteorological service which will be provided by the latter to meet the needs of air navigation. This determination shall be made in accordance with the provisions of this MCAR and with due regard to regional air navigation agreements. It shall also include the meteorological service to be provided for air navigation over international waters and other areas which lie outside the territory of Maldives, where the responsibility for the provision of ATS over such waters and areas has been delegated to Maldives under international/regional arrangements.
- 2.1.4 MMS is the designated Authority, to arrange for the provision of meteorological service for air navigation in such form and in such manner and at such places as the Director-General may consider necessary to ensure the safe, economic and regular operation of aircraft and to give effect to the Convention. Details of the Authority providing meteorological services for air navigation is included in the Aeronautical Information Publication of Maldives.
- 2.1.5 CAA shall ensure that the requirements of the World Meteorological Organization in respect of qualifications and training of meteorological personnel providing service for international/national air navigation are being complied with by the MET service Provider i.e. the organization providing meteorological service for air navigation.

Note:- Requirements concerning qualifications and training of meteorological personnel in aeronautical meteorology given in WMO Publication No. 49, Technical Regulations, Volume I — General Meteorological Standards and Recommended Practices, Chapter B.4 — Education and Training should be followed.

2.2 SUPPLY, USE AND QUALITY MANAGEMENT OF METEOROLOGICAL INFORMATION:

- 2.2.1 Close liaison shall be maintained between those concerned with the supply and those concerned with the use of meteorological information on matters, which affect the provision of meteorological service for air navigation.
- 2.2.2 In order to meet the objective of meteorological service for air navigation, the designated meteorological authority referred to in 2.1.4, should ensure that the MET service provider establishes and implements a properly organized quality system comprising procedures, processes and resources necessary to provide for the quality management of the meteorological information to be supplied to the users listed in 2.1.2.
- 2.2.3 CAA shall ensure that the designated meteorological authority referred to in 2.1.4 establishes and implements a properly organized quality system comprising procedures, processes and resources necessary to provide for the quality management of the meteorological information to be supplied to the users listed in 2.1.2.
- 2.2.4 The quality system established in accordance with 2.2.2 should be in conformity with the International Organization for Standardization (ISO) 9000 series of quality assurance standards and should be certified by an approved organization.

Note:- The International Organization for Standardization (ISO) 9000 series of quality assurance standards provide a basic framework for the development of a quality assurance programme. Guidance on the establishment and implementation of a quality system is given in the Manual on the Quality Management System for the Provision of Meteorological Service to International Air Navigation (Doc 9873).

- 2.2.5 The quality system should provide the users with assurance that the meteorological information supplied complies with the stated requirements in terms of the geographical and spatial coverage, format and content, time and frequency of issuance and period of validity, as well as the accuracy of measurements, observations and forecasts. When the quality system indicates that meteorological information to be supplied to the users does not comply with the stated requirements, and automatic error correction procedures are not appropriate, such information should not be supplied to the users unless it is validated with the originator.

Note:- Requirements concerning the geographical and spatial coverage, format and content, time and frequency of issuance and period of validity of meteorological information to be supplied to aeronautical users are given in Chapter 3, 4, 6, 7, 8, 9 and 10 and Appendices 2, 3, 5, 6, 7, 8 and 9 of this regulation and the relevant regional air navigation plans. Guidance concerning the accuracy of measurement and observation, and accuracy of forecasts is given in Attachments A and B, respectively.

- 2.2.6 In regard to the exchange of meteorological information for operational purposes, the quality system should include verification and validation procedures and resources for monitoring adherence to the prescribed transmission schedules for individual messages and/or bulletins required to be exchanged, and the times of their filing for transmission. The quality system should be capable of detecting excessive transit times of messages and bulletins received.

Note:- Requirements concerning the exchange of operational meteorological information are given in Chapter 11 and Appendix 10 of this MCAR.

2.2.7 Demonstration of compliance of the quality system applied should be by audit. If nonconformity of the system is identified, action should be initiated to determine and correct the cause. All audit observations should be evidenced and properly documented

2.2.8 The meteorological information supplied to the users listed in 2.1.2 shall be consistent with Human Factors principles and shall be in forms, which require a minimum of interpretation by these users.

Note:- Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (Doc 9683).

2.3 NOTIFICATIONS REQUIRED FROM OPERATORS:

2.3.1 An operator requiring meteorological service or changes in existing meteorological service shall notify, sufficiently in advance, MMS or the meteorological office(s) concerned. The minimum amount of advance notice required shall be as agreed between MMS or meteorological office(s) and the operator.

2.3.2 The MMS shall be notified by the operator requiring service when:

- a. new routes or new types of operations are planned;
- b. changes of a lasting character are to be made in scheduled operations; and
- c. other changes, affecting the provision of meteorological service, are planned.

Such information shall contain all details necessary for the planning of appropriate arrangements by MMS.

2.3.3 The aerodrome meteorological office, or the meteorological office concerned, shall be notified by the operator or a flight crew member:

- a. of flight schedules;
- b. when non-scheduled flights are to be operated; and
- c. when flights are delayed, advanced or cancelled.

2.3.4 The notification to the aerodrome meteorological office, or the meteorological office concerned, of individual flights should contain the following information except that, in the case of scheduled flights, the requirement for some or all of this information may be waived by agreement between the meteorological office and the operator:

- a. aerodrome of departure and estimated time of departure;
- b. destination and estimated time of arrival;
- c. route to be flown and estimated times of arrival at, and departure from, any intermediate aerodrome(s);
- d. alternate aerodromes needed to complete the operational flight plan and taken from the relevant list contained in the regional air navigation plan;
- e. cruising level;
- f. type of flight, whether under visual or instrument flight rules;
- g. type of meteorological information requested for a flight crew member, whether flight documentation and/or briefing or consultation; and
- h. time(s) at which briefing, consultation and/or flight documentation are required.

CHAPTER 3 WORLD AREA FORECAST SYSTEM AND METEOROLOGICAL OFFICES

Note:- Technical specifications and detailed criteria related to this chapter are prescribed in Appendix 2 .

3.1 OBJECTIVE OF THE WORLD AREA FORECAST SYSTEM:

3.1.1 The objective of the world area forecast system shall be to supply meteorological authorities and other users with global aeronautical meteorological en-route forecasts in digital form. This objective shall be achieved through a comprehensive, integrated, worldwide and, as far as practicable, uniform system, and in a cost-effective manner, taking full advantage of evolving technologies.

3.2 WORLD AREA FORECAST CENTRES:

3.2.1 CAA, having accepted the responsibility for providing a WAFC within the, framework of the world area forecast system in Maldives, delegates it to MMS which shall:

- a. prepare gridded global forecasts of:
 - i. upper wind;
 - ii. upper-air temperature and humidity;
 - iii. geopotential altitude of flight levels;
 - iv. flight level and temperature of tropopause; and
 - v. direction, speed and flight level of maximum wind;
 - vi. cumulonimbus clouds;
 - vii. icing; and
 - viii. turbulence;
- b. to prepare global forecasts of significant weather (SIGWX) phenomena;
- c. to issue the forecasts referred to in a) and b) in digital form to meteorological authorities and other users as approved by the CAA on advice from MMS.
- d. to receive information concerning the accidental release of radioactive materials into the atmosphere from its associated WMO regional specialized meteorological Centre (RSMC) for the provision of transport model products for radiological environmental emergency response, in order to include the information in SIGWX forecasts; and
- e. to establish and maintain contact with VAACs for the exchange of information on volcanic activity in order to coordinate the inclusion of information on volcanic eruptions in SIGWX forecasts.

3.2.2 In case of interruption of the operation of a WAFC, its functions shall be carried out by the other WAFC.

Note:- Back-up procedures to be used in case of interruption of the operation of a WAFC are updated by the World Area Forecast System Operations Group (WAFSOPSG) as necessary; the latest revision can be found at the WAFSOPSG website at www.icao.int/anb/wafsopsg.

3.3 METEOROLOGICAL OFFICES:

- 3.3.1 MMS shall establish one or more aerodrome and/or other meteorological offices, which shall be adequate for the provision of the meteorological service required to satisfy the needs air navigation.
- 3.3.2 An aerodrome meteorological office shall carry out all or some of the following functions as necessary to meet the needs of flight operations at the aerodrome:
- a. prepare and/or obtain forecasts and other relevant information for flights with which it is concerned; the extent of its responsibilities to prepare forecasts shall be related to the local availability and use of en-route and aerodrome forecast material received from other offices;
 - b. prepare and/or obtain forecasts of local meteorological conditions;
 - c. maintain a continuous survey of meteorological conditions over the aerodromes for which it is designated to prepare forecasts;
 - d. provide briefing, consultation and flight documentation to flight crew members and/or other flight operations personnel;
 - e. supply other meteorological information to aeronautical users;
 - f. display the available meteorological information;
 - g. exchange meteorological information with other meteorological offices.
- 3.3.3 The aerodromes for which landing forecasts are required shall be determined by regional air navigation agreement.
- 3.3.4 For aerodromes without meteorological offices:
- a. MMS shall designate one or more meteorological offices to supply meteorological information as required; and
 - b. the competent authorities shall establish means by which such information can be supplied to the aerodromes concerned.

3.4 METEOROLOGICAL WATCH OFFICES:

- 3.4.1 The Maldives Airports Company Limited (MACL), having assigned the responsibility for providing air traffic services within flight information regions or control areas, shall arrange, on the basis of regional navigation agreement, through the MET service provider (MMS), establishment of one or more meteorological watch offices.
- 3.4.2 A meteorological watch office shall:
- a. maintain continuous watch over meteorological conditions affecting flight operations within its area of responsibility;
 - b. prepare SIGMET and other information relating to its area of responsibility;
 - c. supply SIGMET information and, as required, other meteorological information to associated air traffic services units;
 - d. disseminate SIGMET information;
 - e. when required by regional air navigation agreement, in accordance with 7.2.1;

- i. prepare AIRMET information related to its area of responsibility;
 - ii. supply AIRMET information to associated air traffic services units; and
 - iii. disseminate AIRMET information;
- f. supply information received on pre-eruption volcanic activity, a volcanic eruption and volcanic ash cloud for which a SIGMET has not already been issued, to its associated ACC/FIC, as agreed between the meteorological and ATS authorities concerned, and to its associated VAAC as determined by regional air navigation agreement; and
- g. supply information received concerning the accidental release of radioactive materials into the atmosphere, in the area for which it maintains watch or adjacent areas, to its associated ACC/FIC, as agreed between the meteorological and ATS authorities concerned, and to aeronautical information service units. The information shall comprise location, date and time of the accident, and forecast trajectories of the radioactive materials.

Note:- The information is provided by WMO regional specialized meteorological centres (RSMC) for the provision of transport model products for radiological environmental emergency response, at the request of the delegated authority of the State in which the radioactive material was released into the atmosphere, or the International Atomic Energy Agency (IAEA). The information is sent by the RSMC to a single contact point of the national meteorological service in each State. In MMS has been assigned the responsibility of distributing the RSMC products within Maldives. Furthermore, the information is provided by IAEA to RSMC co-located with VAAC London (designated as the focal point) which in turn notifies the ACCs concerned about the release.

- 3.4.3 The boundaries of the area over which meteorological watch is to be maintained by a meteorological watch office should be coincident with the boundaries of a flight information region or a control area or a combination of flight information regions and/or control areas.

3.5 RESERVED

3.6 RESERVED

3.7 TROPICAL CYCLONE ADVISORY CENTRES:

- 3.7.1 CAA having accepted, by regional air navigation agreement, the responsibility for providing a TCAC, designates MMS, which shall arrange for:
- a. Monitoring of the development of tropical cyclones in the area of responsibility, using geostationary and polar-orbiting satellite data, radar data and other meteorological information;
 - b. Issuing of advisory information concerning the position of the cyclone centre, its direction and speed of movement, central pressure and maximum surface wind near the centre, in abbreviated plain language to:
 - i. meteorological watch offices in its area of responsibility;
 - ii. other TCACs whose areas of responsibility may be affected; and
 - iii. world area forecast centres, international OPMET databanks, and centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems; and

- c. issuing and updating of advisory information to meteorological watch offices for each tropical cyclone, as necessary, but at least every six hours.

CHAPTER 4 METEOROLOGICAL OBSERVATIONS AND REPORTS

Note:- Technical specifications and detailed criteria related to this chapter are prescribed in Appendix 3.

4.1 AERONAUTICAL METEOROLOGICAL STATIONS AND OBSERVATIONS:

- 4.1.1 The MMS shall establish, at aerodromes, such aeronautical meteorological stations as it determines to be necessary. An aeronautical meteorological station may be a separate station or may be combined with a synoptic station.

Note:- Aeronautical meteorological stations may include sensors installed outside the aerodrome, where considered justified, by MMS to ensure the compliance of meteorological service for international air navigation with the provisions of this regulation.

- 4.1.2 The MMS should establish, or arrange for the establishment of, aeronautical meteorological stations on offshore structures or at other points of significance in support of helicopter operations to offshore structures, if required by regional air navigation agreement.

- 4.1.3 Aeronautical meteorological stations shall make routine observations at fixed intervals. At aerodromes, the routine observations shall be supplemented by special observations whenever specified changes occur in respect of surface wind, visibility, runway visual range, present weather, clouds and/or air temperature.

- 4.1.4 The MMS shall arrange for its aeronautical meteorological stations to be inspected at sufficiently frequent intervals to ensure that a high standard of observation is maintained, that instruments and all their indicators are functioning correctly, and that the exposure of the instruments has not changed significantly.

Note:- Guidance on the inspection of aeronautical meteorological stations including the frequency of inspections is given in the manual on automatic meteorological observing systems at aerodromes (Doc 9837).

- 4.1.5 At aerodromes with runways intended for Category II and III instrument approach and landing operations, automated equipment for measuring or assessing, as appropriate, and for monitoring and remote indicating of surface wind, visibility, runway visual range, height of cloud base, air and dew-point temperatures and atmospheric pressure shall be installed to support approach and landing and take-off operations. These devices shall be integrated automatic systems for acquisition, processing, dissemination and display in real time of the meteorological parameters affecting landing and take-off operations. The design of integrated automatic systems shall observe Human Factors principles and include back-up procedures.

Note 1:- Categories of precision approach and landing operations are defined in MCAR OPS-I.

Note 2:- Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (Doc 9683).

- 4.1.6 At aerodromes with runways intended for Category I instrument approach and landing operations, automated equipment for measuring or assessing, as appropriate, and for monitoring and remote indicating of surface wind, visibility, runway visual range, height of cloud base, air and dew-point temperatures and atmospheric pressure should be installed to support approach and landing and take-off operations. These devices should be integrated automatic systems for acquisition, processing, dissemination and display in real time of the meteorological parameters affecting landing and take-off operations. The design of integrated automatic systems should observe Human Factors principles and include back-up procedures.
- 4.1.7 Where an integrated semi-automatic system is used for the dissemination/display of meteorological information, it should be capable of accepting the manual insertion of data covering those meteorological elements, which cannot be observed by automatic means.
- 4.1.8 The observations shall form the basis for the preparation of reports to be disseminated at the aerodrome of origin and of reports to be disseminated beyond the aerodrome of origin.
- 4.1.9 Owing to the variability of meteorological elements in space and time, to limitations of observing techniques and to limitations caused by the definitions of some of the elements, the specific value of any of the elements given in a report shall be understood by the recipient to be the best approximation to the actual conditions at the time of observation.

Note:- Guidance on the operationally desirable accuracy of measurement or observation is given in Attachment A.

4.2 AGREEMENT BETWEEN THE AUTHORITIES PROVIDING AIR TRAFFIC SERVICES AND METEOROLOGICAL SERVICES:

- 4.2.1 An agreement between the Authority providing air traffic services i.e. ANSP and the authority providing meteorological services i.e. MMS should be established to cover, amongst other things:
- the provision in air traffic services units of displays related to integrated automatic systems;
 - the calibration and maintenance of these displays/instruments;
 - the use to be made of these displays/instruments by air traffic services personnel;
 - as and where necessary, supplementary visual observations (for example, of meteorological phenomena of operational significance in the climb-out and approach areas) if and when made by air traffic services personnel to update or supplement the information supplied by the meteorological station;
 - meteorological information obtained from aircraft taking off or landing (for example, on wind shear); and
 - if available, meteorological information obtained from ground weather radar.

Note:- Guidance on the subject of coordination between ATS and aeronautical meteorological services is contained in the Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services (Doc 9377).

4.3 ROUTINE OBSERVATIONS AND REPORTS:

4.3.1 At aerodromes, routine observations shall be made throughout the 24 hours each day, except as otherwise agreed between MMS, ANS provider and the operator concerned. Such observations shall be made at intervals of one hour or, if so determined by regional air navigation agreement, at intervals of one half-hour. At other aeronautical meteorological stations, such observations shall be made as determined by the MMS taking into account the requirements of air traffic services units and aircraft operations.

4.3.2 Reports of routine observations shall be issued as:

- a. local routine reports, only for dissemination at the aerodrome of origin (intended for arriving and departing aircraft); and
- b. METAR for dissemination beyond the aerodrome of origin (mainly intended for flight planning, VOLMET broadcasts and D-VOLMET).

Note:- Meteorological information used in ATIS (voice-ATIS and D-ATIS) is to be extracted from the local routine report, in accordance with MCAR 11, 4.3.6.1 g).

4.3.3 At aerodromes that are not operational throughout 24 hours in accordance with Chapter 4.3.1, METAR shall be issued prior to the aerodrome resuming operations in accordance with regional air navigation agreement or as agreed between MMS, ANSP and the operator.

4.4 SPECIAL OBSERVATIONS AND REPORTS

4.4.1 List of criteria for special observations shall be established by the MMS, in consultation with the MACL, operators and others concerned.

4.4.2 Reports of special observations shall be issued as:

- a. local special reports, only for dissemination at the aerodrome of origin (intended for arriving and departing aircraft); and
- b. SPECI for dissemination beyond the aerodrome of origin (mainly intended for flight planning, VOLMET broadcasts and D-VOLMET) unless METAR are issued at half-hourly intervals.

Note:- Meteorological information used in ATIS (voice-ATIS and D-ATIS) is to be extracted from the local special report, in accordance with MCAR 11, 4.3.6.1 g).

4.4.3 At aerodromes that are not operational throughout 24 hours in accordance with Chapter 4.3.1, following the resumption of the issuance of METAR, SPECI shall be issued, as necessary.

4.5 CONTENTS OF REPORTS

4.5.1 Local routine and special reports and METAR and SPECI shall contain the following elements in the order indicated:

- a. identification of the type of report;
- b. location indicator;
- c. time of the observation;
- d. identification of an automated or missing report, when applicable;
- e. surface wind direction and speed;

- f. visibility;
- g. runway visual range, when applicable;
- h. present weather;
- i. cloud amount, cloud type (only for cumulonimbus and towering cumulus clouds) and height of cloud base or, where measured, vertical visibility;
- j. air temperature and dew-point temperature; and
- k. QNH and, when applicable, QFE (QFE included only in local routine and special reports).

Note:- The location indicators referred to under b) and their significations are published in Location Indicators (Doc 7910).

- 4.5.2 In addition to elements listed under Chapter 4.5.1 a) to k), local routine and special reports and METAR and SPECI should contain supplementary information to be placed after element k).
- 4.5.3 Optional elements included under supplementary information shall be included in METAR and SPECI in accordance with regional air navigation agreement.

4.6 OBSERVING AND REPORTING METEOROLOGICAL ELEMENTS

4.6.1 SURFACE WIND

- 4.6.1.1 The mean direction and the mean speed of the surface wind shall be measured, as well as significant variations of the wind direction and speed, and reported in degrees true and meters per second (or knots), respectively.
- 4.6.1.2 When local routine and special reports are used for departing aircraft, the surface wind observations for these reports should be representative of conditions along the runway; when local routine and special reports are used for arriving aircraft, the surface wind observations for these reports should be representative of the touchdown zone.
- 4.6.1.3 For METAR and SPECI, the surface wind observations should be representative of conditions above the whole runway where there is only one runway and the whole runway complex where there is more than one runway.

4.6.2 VISIBILITY

- 4.6.2.1 The visibility as defined in MCAR I shall be measured or observed, and reported in meters or kilometers.

Note:- Guidance on the conversion of instrument readings into visibility is given in Attachment D

- 4.6.2.2 When local routine and special reports are used for departing aircraft, the visibility observations for these reports should be representative of conditions along the runway; when local routine and special reports are used for arriving aircraft, the visibility observations for these reports should be representative of the touchdown zone of the runway.
- 4.6.2.3 For METAR and SPECI, the visibility observations should be representative of the aerodrome.

4.6.3 RUNWAY VISUAL RANGE

Note:- Guidance on the subject of runway visual range is contained in the Manual of Runway Visual Range Observing and Reporting Practices (Doc 9328).

- 4.6.3.1 Runway visual range as defined in MCAR I shall be assessed on all runways intended for Category II and III instrument approach and landing operations.
- 4.6.3.2 Runway visual range as defined in MCAR I should be assessed on all runways intended for use during periods of reduced visibility, including:
 - a. precision approach runways intended for Category I instrument approach and landing operations; and
 - b. runways used for take-off and having high-intensity edge lights and/or centre line lights

Note:- Precision approach runways are defined in MCAR I, under “Instrument runway”.

- 4.6.3.3 The runway visual range, assessed in accordance with 4.6.3.1 and 4.6.3.2, shall be reported in metres throughout periods when either the visibility or the runway visual range is less than 1 500m.
- 4.6.3.4 Runway visual range assessments shall be representative of:
 - a. the touchdown zone of the runway intended for non-precision or Category I instrument approach and landing operations;
 - b. the touchdown zone and the mid-point of the runway intended for Category II instrument approach and landing operations; and
 - c. the touchdown zone, the mid-point and stop-end of the runway intended for Category III instrument approach and landing operations.
- 4.6.3.5 The units providing air traffic service and aeronautical information service for an aerodrome shall be kept informed without delay of changes in the serviceability status of the automated equipment used for assessing runway visual range.

4.6.4 PRESENT WEATHER

- 4.6.4.1 The present weather occurring at the aerodrome and/or its vicinity shall be observed and reported as necessary. The following present weather phenomena shall be identified, as a minimum: precipitation and freezing precipitation (including intensity thereof), fog, freezing fog and thunderstorms (including thunderstorms in the vicinity).
- 4.6.4.2 For local routine and special reports, the present weather information should be representative of conditions at the aerodrome.
- 4.6.4.3 For METAR and SPECI, the present weather information should be representative of conditions at the aerodrome and, specified present weather phenomena, in its vicinity.

4.6.5 CLOUDS

- 4.6.5.1 Cloud amount, cloud type and height of cloud base shall be observed and reported as necessary to describe the clouds of operational significance. When the sky is obscured, vertical visibility shall be observed and reported, where measured, in lieu of cloud amount, cloud type and height of cloud base. The height of cloud base and vertical visibility shall be reported in metres (or feet).
- 4.6.5.2 Cloud observations for local routine and special reports should be representative of the approach area.

4.6.5.3 Cloud observations for METAR and SPECI should be representative of the aerodrome and its vicinity.

4.6.6 AIR TEMPERATURE AND DEW-POINT TEMPERATURE

4.6.6.1 The air temperature and the dew-point temperature shall be measured and reported in degrees Celsius.

4.6.6.2 Observations of air temperature and dew-point temperature for local routine and special reports, METAR and SPECI should be representative of the whole runway complex.

4.6.7 ATMOSPHERIC PRESSURE

4.6.7.1 The atmospheric pressure shall be measured, and QNH and QFE values shall be computed and reported in hectopascals.

4.6.8 SUPPLEMENTARY INFORMATION

4.6.8.1 Observations made at aerodromes should include the available supplementary information concerning significant meteorological conditions, particularly those in the approach and climb-out areas.

Where practicable, the information should identify the location of the meteorological condition.

4.7 REPORTING METEOROLOGICAL INFORMATION FROM AUTOMATIC OBSERVING SYSTEMS

4.7.1 METAR and SPECI from automatic observing systems should be used by the concerned authorities in a position to do so during non-operational hours of the aerodrome, and during operational hours of the aerodrome as determined by the MMS in consultation with users based on the availability and efficient use of personnel.

Note:- Guidance on the use of automatic meteorological observing systems is given in the Manual on Automatic Meteorological Observing Systems at Aerodromes (Doc 9837).

4.7.2 Local routine and special reports from automatic observing systems should be used if in a position to do so during operational hours of the aerodrome as determined by the MMS in consultation with users based on the availability and efficient use of personnel.

4.7.3 Local routine and special reports and METAR and SPECI from automatic observing systems shall be identified with the word "AUTO".

CHAPTER 5 AIRCRAFT OBSERVATIONS AND REPORTS

Note:- Technical specifications and detailed criteria related to this chapter are given in Appendix 4.

5.1 OBLIGATIONS:

5.1.1 The Maldives Civil Aviation Authority shall arrange, according to the following provisions, for observations to be made by aircraft of its registry operating on International/National air routes and for the recording and reporting of these observations.

5.2 TYPES OF AIRCRAFT OBSERVATIONS:

5.2.1 The following aircraft observations shall be made:

- a. routine aircraft observations during en-route and climb-out phases of the flight; and
- b. special and other non-routine aircraft observations during any phase of the flight.

5.3 ROUTINE AIRCRAFT OBSERVATIONS — DESIGNATION:

5.3.1 When air-ground data link is used and automatic dependent surveillance (ADS) or secondary surveillance radar (SSR) Mode S is being applied, automated routine observations should be made every 15 minutes during the en-route phase and every 30 seconds during the climb-out phase for the first 10 minutes of the flight.

5.3.2 For helicopter operations to and from aerodromes on offshore structures, routine observations should be made from helicopters at points and times as agreed between the Meteorological Authorities and the helicopter operators concerned.

5.3.3 In the case of air routes with high-density air traffic (e.g. organized tracks), an aircraft from among the aircraft operating at each flight level shall be designated, at approximately hourly intervals, to make routine observations in accordance with 5.3.1. The designation procedures shall be subject to regional air navigation agreement.

5.3.4 In the case of the requirement to report during the climb-out phase, an aircraft shall be designated, at approximately hourly intervals, at each aerodrome to make routine observations in accordance with 5.3.1.

5.4 ROUTINE AIRCRAFT OBSERVATIONS — EXEMPTIONS:

5.4.1 Aircraft not equipped with air-ground data link shall be exempted from making routine aircraft observations.

5.5 SPECIAL AIRCRAFT OBSERVATIONS:

5.5.1 Special observations shall be made by all aircraft whenever the following conditions are encountered or observed:

- a. moderate or severe turbulence; or
- b. moderate or severe icing; or
- c. severe mountain wave; or
- d. thunderstorms, without hail, that are obscured, embedded, widespread or in squall lines; or

- e. thunderstorms, with hail, that are obscured, embedded, widespread or in squall lines; or
- f. heavy duststorm or heavy sandstorm; or
- g. volcanic ash cloud; or
- h. pre-eruption volcanic activity or a volcanic eruption.

Note:- Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.

5.6 OTHER NON-ROUTINE AIRCRAFT OBSERVATIONS:

- 5.6.1 When other meteorological conditions not listed under 5.5, e.g. wind shear, are encountered and which, in the opinion of the pilot-in-command, may affect the safety or markedly affect the efficiency of other aircraft operations, the pilot-in-command shall advise the appropriate air traffic services unit as soon as practicable.

Note:- Icing, turbulence and, to a large extent, wind shear are elements which, for the time being, cannot be satisfactorily observed from the ground and for which in most cases aircraft observations represent the only available evidence.

5.7 REPORTING OF AIRCRAFT OBSERVATIONS DURING FLIGHT:

- 5.7.1 Aircraft observations shall be reported by air-ground data link. Where air-ground data link is not available or appropriate, special and other non-routine aircraft observations during flight shall be reported by voice communications.
- 5.7.2 Aircraft observations shall be reported during flight at the time the observation is made or as soon thereafter as is practicable.
- 5.7.3 Aircraft observations shall be reported as air-reports.

5.8 RELAY OF AIR-REPORTS BY ATS UNITS:

- 5.8.1 (MMS) shall make arrangements with the ANS authority to ensure that, on receipt by the ATS units of:
- a. special air-reports by voice communications, the ATS units relay them without delay to their associated meteorological watch office; and
 - b. routine and special air-reports by data link communications, the ATS units relay them without delay to their associated meteorological watch office and WAFCs.

CHAPTER 6 FORECASTS

Note:- Technical specifications and detailed criteria related to this chapter are given in Appendix 5.

6.1 INTERPRETATION AND USE OF FORECASTS:

6.1.1 Owing to the variability of meteorological elements in space and time, to limitations of forecasting techniques and to limitations caused by the definitions of some of the elements, the specific value of any of the elements given in a forecast shall be understood by the recipient to be the most probable value which the element is likely to assume during the period of the forecast. Similarly, when the time of occurrence or change of an element is given in a forecast, this time shall be understood to be the most probable time.

Note:- Guidance on the operationally desirable accuracy of forecasts is given in Attachment B.

6.1.2 The issue of a new forecast by a meteorological office, such as a routine aerodrome forecast, shall be understood to cancel automatically any forecast of the same type previously issued for the same place and for the same period of validity or part thereof.

6.2 AERODROME FORECASTS:

6.2.1 An aerodrome forecast shall be prepared on the basis of regional air navigation agreement by the meteorological office designated by the MMS.

Note:- The aerodromes for which aerodrome forecasts are to be prepared and the period of validity of these forecasts are listed in the relevant facilities and services implementation document FASID.

6.2.2 An aerodrome forecast shall be issued at a specified time and consist of a concise statement of the expected meteorological conditions at an aerodrome for a specified period.

6.2.3 Aerodrome forecasts and amendments thereto shall be issued as TAF and include the following information in the order indicated:

- a. identification of the type of forecast;
- b. location indicator;
- c. time of issue of forecast;
- d. identification of a missing forecast, when applicable;
- e. date and period of validity of forecast;
- f. identification of a cancelled forecast, when applicable;
- g. surface wind;
- h. visibility;
- i. weather;
- j. cloud; and
- k. expected significant changes to one or more of these elements during the period of validity.

Optional elements shall be included in TAF in accordance with regional air navigation agreement.

Note:- The visibility included in TAF refers to the forecast prevailing visibility.

- 6.2.4 Meteorological offices preparing TAF shall keep the forecasts under continuous review and, when necessary, shall issue amendments promptly. The length of the forecast messages and the number of changes indicated in the forecast shall be kept to a minimum.

Note:- Guidance on methods to keep TAF under continuous review is given in Chapter 3 of the Manual of Aeronautical Meteorological Practice (Doc 8896).

- 6.2.5 TAF that cannot be kept under continuous review shall be cancelled.
- 6.2.6 The period of validity of a routine TAF should be not less than 6 hours nor more than 30 hours; the period of validity should be determined by regional air navigation agreement. Routine TAF valid for less than 12 hours should be issued every 3 hours and those valid for 12 to 30 hours should be issued every 6 hours.
- 6.2.7 When issuing TAF, meteorological offices shall ensure that not more than one TAF is valid at an aerodrome at any given time.

6.3 LANDING FORECASTS:

- 6.3.1 A landing forecast shall be prepared by the meteorological office designated by the MMS as determined by regional air navigation agreement; such forecasts are intended to meet the requirements of local users and of aircraft within about one hour's flying time from the aerodrome.
- 6.3.2 Landing forecasts shall be prepared in the form of a trend forecast.
- 6.3.3 A trend forecast shall consist of a concise statement of the expected significant changes in the meteorological conditions at that aerodrome to be appended to a local routine or local special report, or a METAR or SPECI. The period of validity of a trend forecast shall be 2 hours from the time of the report which forms part of the landing forecast.

6.4 FORECASTS FOR TAKE-OFF:

- 6.4.1 A forecast for take-off shall be prepared by the meteorological office designated by the MMS.
- 6.4.2 A forecast for take-off should refer to a specified period of time and should contain information on expected conditions over the runway complex in regard to surface wind direction and speed and any variations thereof, temperature, pressure (QNH), and any other elements as agreed locally.
- 6.4.3 A forecast for take-off should be supplied to operators and flight crewmembers on request within the 3 hours before the expected time of departure.
- 6.4.4 Meteorological offices preparing forecasts for take-off should keep the forecasts under continuous review and, when necessary, should issue amendments promptly.

6.5 AREA FORECASTS FOR LOW-LEVEL FLIGHTS:

- 6.5.1 When the density of traffic operating below flight level 100 (or up to flight level 150 in mountainous areas, or higher, where necessary) warrants the routine issue and dissemination of area forecasts for such operations, the frequency of issue, the form and the fixed time or period of validity of those

forecasts and the criteria for amendments thereto shall be determined by the MMS in consultation with the users.

- 6.5.2 When the density of traffic operating below flight level 100 warrants the issuance of AIRMET information in accordance with 7.2.1, area forecasts for such operations shall be prepared in a format agreed upon between the meteorological authorities concerned. When abbreviated plain language is used, the forecast shall be prepared as a GAMET area forecast, employing approved ICAO abbreviations and numerical values; when chart form is used, the forecast shall be prepared as a combination of forecasts of upper wind and upper-air temperature, and of SIGWX phenomena. The area forecasts shall be issued to cover the layer between the ground and flight level 100 (or up to flight level 150 in mountainous areas, or higher, where necessary) and shall contain information on en-route weather phenomena hazardous to low level flights, in support of the issuance of AIRMET information, and additional information required by low level flights.
- 6.5.3 Area forecasts for low-level flights prepared in support of the issuance of AIRMET information shall be issued every 6 hours for a period of validity of 6 hours and transmitted to meteorological offices concerned not later than one hour prior to the beginning of their validity period.

CHAPTER 7 SIGMET AND AIRMET INFORMATION, AERODROME WARNINGS AND WIND SHEAR WARNINGS AND ALERTS

Note:- Technical specifications and detailed criteria related to this chapter are given in Appendix 6.

7.1 SIGMET INFORMATION

- 7.1.1 SIGMET information shall be issued by a meteorological watch office and shall give a concise description in abbreviated plain language concerning the occurrence and/or expected occurrence of specified en-route weather phenomena, which may affect the safety of aircraft operations, and of the development of those phenomena in time and space.
- 7.1.2 SIGMET information shall be cancelled when the phenomena are no longer occurring or are no longer expected to occur in the area.
- 7.1.3 The period of validity of a SIGMET message shall be not more than 4 hours. In the special case of SIGMET messages for volcanic ash cloud and tropical cyclones, the period of validity shall be extended up to 6 hours.
- 7.1.4 SIGMET messages concerning volcanic ash cloud and tropical cyclones should be based on advisory information provided by VAACs and TCACs, respectively, designated by regional air navigation agreement.
- 7.1.5 Close coordination shall be maintained between the meteorological watch office and the associated area control centre/flight information centre to ensure that information on volcanic ash included in SIGMET and NOTAM messages is consistent.
- 7.1.6 SIGMET messages shall be issued not more than 4 hours before the commencement of the period of validity. In the special case of SIGMET messages for volcanic ash cloud and tropical cyclones, these messages shall be issued as soon as practicable but not more than 12 hours before the commencement of the period of validity. SIGMET messages for volcanic ash and tropical cyclones shall be updated at least every 6 hours.

7.2 AIRMET INFORMATION

- 7.2.1 AIRMET information shall be issued by a meteorological watch office in accordance with regional air navigation agreement, taking into account the density of air traffic operating below flight level 100. AIRMET information shall give a concise description in abbreviated plain language concerning the occurrence and/or expected occurrence of specified en-route weather phenomena, which have not been included in Section I of the area forecast for low-level flights issued in accordance with Chapter 6, Section 6.5 and which may affect the safety of low-level flights, and of the development of those phenomena in time and space.
- 7.2.2 AIRMET information shall be cancelled when the phenomena are no longer occurring or are no longer expected to occur in the area.
- 7.2.3 The period of validity of an AIRMET message shall be not more than 4 hours.

7.3 AERODROME WARNINGS:

- 7.3.1 Aerodrome warnings shall be issued by the meteorological office designated by the MMS and shall give concise information of meteorological conditions which could adversely affect aircraft on the ground, including parked aircraft, and the aerodrome facilities and services.
- 7.3.2 Aerodrome warnings should be cancelled when the conditions are no longer occurring and/or no longer expected to occur at the aerodrome.

7.4 WIND SHEAR WARNINGS AND ALERTS:

Note:- Guidance on the subject is contained in the Manual on Low-level Wind Shear (Doc 9817). Wind shear alerts are expected to complement wind shear warnings and together are intended to enhance situational awareness of wind shear.

- 7.4.1 Wind shear warnings shall be prepared by the meteorological office designated by the MMS for aerodromes where wind shear is considered a factor, in accordance with local arrangements with the appropriate ATS unit and operators concerned. Wind shear warnings shall give concise information on the observed or expected existence of wind shear which could adversely affect aircraft on the approach path or take-off path or during circling approach between runway level and 500 m (1 600 ft) above that level and aircraft on the runway during the landing roll or take-off run. Where local topography has been shown to produce significant wind shears at heights in excess of 500 m (1 600 ft) above runway level, then 500 m (1 600 ft) shall not be considered restrictive.
- 7.4.2 Wind shear warnings for arriving aircraft and/or departing aircraft should be cancelled when aircraft reports indicate that wind shear no longer exists or, alternatively, after an agreed elapsed time. The criteria for the cancellation of a wind shear warning should be defined locally for each aerodrome, as agreed between the MMS, ANS provider and the operators concerned.
- 7.4.3 At aerodromes where wind shear is detected by automated, ground-based, wind shear remote sensing or detection equipment, wind shear alerts generated by these systems shall be issued. Wind shear alerts shall give concise, up-to-date information related to the observed existence of wind shear involving a headwind/tailwind change of 7.5 m/s (15 kt) or more, which could adversely affect aircraft on the final approach path or initial take-off path and aircraft on the runway during the landing roll or take-off run.
- 7.4.4 Wind shear alerts should be updated at least every minute. The wind shear alert should be cancelled as soon as the headwind/tailwind change falls below 7.5 m/s (15 kt).

CHAPTER 8 AERONAUTICAL CLIMATOLOGICAL INFORMATION

Note:- Technical specifications and detailed criteria related to this chapter are given in Appendix 7

8.1 GENERAL PROVISIONS:

Note:- In cases where it is impracticable to meet the requirements for aeronautical climatological information on a national basis, the collection, processing and storage of observational data may be effected through computer facilities available for international use, and the responsibility for the preparation of the required aeronautical climatological information may be delegated by agreement between the meteorological authorities concerned.

8.1.1 Aeronautical climatological information required for the planning of flight operations shall be prepared in the form of aerodrome climatological tables and aerodrome climatological summaries. Such information shall be supplied to aeronautical users as agreed between MMS and those users.

Note:- Climatological data required for aerodrome planning purposes are set out in Annex 14, Volume 1, 3.1.4 and Attachment A of this MCAR.

8.1.2 Aeronautical climatological information should normally be based on observations made over a period of at least five years and the period should be indicated in the information supplied.

8.1.3 Climatological data related to sites for new aerodromes and to additional runways at existing aerodromes should be collected starting as early as possible before the commissioning of those aerodromes or runways.

8.2 AERODROME CLIMATOLOGICAL TABLES:

8.2.1 The MMS should make arrangements for collecting and retaining the necessary observational data and have the capability:

- a. to prepare aerodrome climatological tables for each regular and alternate international aerodrome within its territory; and
- b. to make available such climatological tables to an aeronautical user within a time period as agreed between the MMS and that user.

8.3 AERODROME CLIMATOLOGICAL SUMMARIES:

8.3.1 Aerodrome climatological summaries should follow the procedures prescribed by the World Meteorological Organization. Where computer facilities are available to store, process and retrieve the information, the summaries should be published or otherwise made available to aeronautical users on request. Where such computer facilities are not available, the summaries should be prepared using the models specified by the World Meteorological Organization and should be published and kept up to date as necessary.

8.4 COPIES OF METEOROLOGICAL OBSERVATIONAL DATA:

8.4.1 Each meteorological authority, on request and to the extent practicable, shall make available to any other meteorological authority, to operators and to others concerned with the application of

meteorology to international air navigation, meteorological observational data required for research, investigation or operational analysis

CHAPTER 9 SERVICE FOR OPERATORS AND FLIGHT CREW MEMBERS

Note:- Technical specifications and detailed criteria related to this chapter are given in Appendix 8

9.1 GENERAL PROVISIONS:

9.1.1 Meteorological information shall be supplied to operators and flight crew members for:

- a. pre-flight planning by operators;
- b. in-flight re-planning by operators using centralized operational control of flight operations;
- c. use by flight crew members before departure; and
- d. aircraft in flight.

9.1.2 Meteorological information supplied to operators and flight crew members shall cover the flight in respect of time, altitude and geographical extent. Accordingly, the information shall relate to appropriate fixed times, or periods of time, and shall extend to the aerodrome of intended landing, also covering the meteorological conditions expected between the aerodrome of intended landing and alternate aerodromes designated by the operator.

9.1.3 Meteorological information supplied to operators and flight crew members shall be up to date and include the following information, as established by MMS in consultation with operators concerned:

- a. forecasts of:
 - i. upper wind and upper-air temperature;
 - ii. upper-air humidity;
 - iii. geopotential altitude of flight levels;
 - iv. flight level and temperature of tropopause;
 - v. direction, speed and flight level of maximum wind; and
 - vi. SIGWX phenomena;

Note:- Forecasts of upper-air humidity and geopotential altitude of flight levels are used only in automatic flight planning and need not be displayed.

- b. METAR or SPECI (including trend forecasts as issued in accordance with regional air navigation agreement) for the aerodromes of departure and intended landing, and for takeoff, en-route and destination alternate aerodromes;
- c. TAF or amended TAF for the aerodromes of departure and intended landing, and for takeoff, en-route and destination alternate aerodromes;
- d. forecasts for take-off;
- e. SIGMET information and appropriate special air-reports relevant to the whole route;

Note:- Appropriate special air-reports will be those not already used in the preparation of SIGMET.

- f. volcanic ash and tropical cyclone advisory information relevant to the whole route;

- g. subject to regional air navigation agreement, GAMET area forecast and/or area forecasts for low-level flights in chart form prepared in support of the issuance of AIRMET information, and AIRMET information for low-level flights relevant to the whole route;
 - h. aerodrome warnings for the local aerodrome;
 - i. meteorological satellite images; and
 - j. ground-based weather radar information.
- 9.1.4 Forecasts listed under 9.1.3 a) shall be generated from the digital forecasts provided by the WAFCs whenever these forecasts cover the intended flight path in respect of time, altitude and geographical extent, unless otherwise agreed between MMS and the operator concerned.
- 9.1.5 When forecasts are identified as being originated by the WAFCs, no modifications shall be made to their meteorological content.
- 9.1.6 Charts generated from the digital forecasts provided by the WAFCs shall be made available, as required by operators, for fixed areas of coverage as shown in Appendix 8 Figures A8-1, A8-2 and A8-3.
- 9.1.7 When forecasts of upper wind and upper-air temperature listed under D9.1.3 a) i.) are supplied in chart form, they shall be fixed time prognostic charts for flight levels as specified in Appendix 2, 1.2.2 a). When forecasts of SIGWX phenomena listed under D9.1.3 a) vi.) are supplied in chart form, they shall be fixed time prognostic charts for an atmospheric layer limited by flight levels as specified in Appendix 2, 1.3.2 and Appendix 5, 4.3.2.
- 9.1.8 The forecasts of upper wind and upper-air temperature and of SIGWX phenomena above flight level 100 requested for pre-flight planning and in-flight re-planning by the operator shall be supplied as soon as they become available, but not later than 3 hours before departure. Other meteorological information requested for pre-flight planning and in-flight re-planning by the operator shall be supplied as soon as is practicable.
- 9.1.9 When necessary, the MMS providing service for operators and flight crew members shall initiate coordinating action with the Meteorological Authorities of other States with a view to obtaining from them the reports and/or forecasts required.
- 9.1.10 Meteorological information shall be supplied to operators and flight crew members at the location to be determined by the MMS, after consultation with the operators and at the time to be agreed upon between the meteorological office and the operator concerned. The service for pre-flight planning shall be confined to flights originating within Maldives. At an aerodrome without a meteorological office, arrangements for the supply of meteorological information shall be as agreed upon between the MMS and the operator concerned.

9.2 BRIEFING, CONSULTATION AND DISPLAY:

Note:- The requirements for the use of automated pre-flight information systems in providing briefing, consultation and display are given in 9.4.

- 9.2.1 Briefing and/or consultation shall be provided, on request, to flight crew members and/or other flight operations personnel. Its purpose shall be to supply the latest available information on existing and expected meteorological conditions along the route to be flown, at the aerodrome of intended landing, alternate aerodromes and other aerodromes as relevant, either to explain and amplify the information contained in the flight documentation or, if so agreed between the MMS and the operator, in lieu of flight documentation.
- 9.2.2 Meteorological information used for briefing, consultation and display shall include any or all of the information listed in 9.1.3.
- 9.2.3 If the meteorological office expresses an opinion on the development of the meteorological conditions at an aerodrome, which differs appreciably from the aerodrome forecast included in the flight documentation, the attention of flight crewmembers shall be drawn to the divergence. The portion of the briefing dealing with the divergence shall be recorded at the time of briefing and this record shall be made available to the operator.
- 9.2.4 The required briefing, consultation, display and/or flight documentation shall normally be provided by the meteorological office associated with the aerodrome of departure. At an aerodrome where these services are not available, arrangements to meet the requirements of flight crew members shall be as agreed upon between MMS and the operator concerned. In exceptional circumstances, such as an undue delay, the meteorological office associated with the aerodrome shall provide or, if that is not practicable, arrange for the provision of a new briefing, consultation and/or flight documentation as necessary.
- 9.2.5 The flight crewmember or other flight operations personnel for whom briefing, consultation and/or flight documentation has been requested should visit the meteorological office at the time agreed upon between the meteorological office and the operator concerned. Where local circumstances at an aerodrome make personal briefing or consultation impracticable, the meteorological office should provide those services by telephone or other suitable telecommunications facilities.

9.3 FLIGHT DOCUMENTATION:

Note:- The requirements for the use of automated pre-flight information systems in providing flight documentation are given in 9.4.

- 9.3.1 Flight documentation to be made available shall comprise information listed under 9.1.3 a) i) and vi.), b), c), e), f) and, if appropriate, g). However, when agreed between MMS and operator concerned, flight documentation for flights of two hours' duration or less, after a short stop or turn around, shall be limited to the information operationally needed, but in all cases the flight documentation shall at least comprise information on 9.1.3 b), c), e), f) and, if appropriate, g).
- 9.3.2 Whenever it becomes apparent that the meteorological information to be included in the flight documentation will differ materially from that made available for pre-flight planning and in-flight re-planning, the operator shall be advised immediately and, if practicable, be supplied with the revised information as agreed between the operator and the meteorological office concerned.
- 9.3.3 In cases where a need for amendment arises after the flight documentation has been supplied, and before take-off of the aircraft, the meteorological office should, as agreed locally, issue the necessary

amendment or updated information to the operator or to the local air traffic services unit, for transmission to the aircraft.

- 9.3.4 The MMS shall retain information supplied to flight crew members, either as printed copies or in computer files, for a period of at least 30 days from the date of issue. This information shall be made available, on request, for inquiries or investigations and, for these purposes, shall be retained until the inquiry or investigation is completed.

9.4 AUTOMATED PRE-FLIGHT INFORMATION SYSTEMS FOR BRIEFING, CONSULTATION, FLIGHT PLANNING AND FLIGHT DOCUMENTATION:

- 9.4.1 Where the MMS uses automated pre-flight information systems to supply and display meteorological information to operators and flight crew members for self-briefing, flight planning and flight documentation purposes, the information supplied and displayed shall comply with the relevant provisions in 9.1 to 9.3 inclusive.

- 9.4.2 Automated pre-flight information systems providing for a harmonized, common point of access to meteorological information and aeronautical information services information by operators, flight crew members and other aeronautical personnel concerned should be established by an agreement between the MMS and the civil aviation authority or the agency to which the authority to provide service has been delegated in accordance with MCAR 15, 3.1.1 c).

Note:- The meteorological and aeronautical information services information concerned is specified in 9.1 to 9.3 and Appendix 8 and in MCAR 15, 8.1 and 8.2, respectively.

- 9.4.3 Where automated pre-flight information systems are used to provide for a harmonized, common point of access to meteorological information and aeronautical information services information by operators, flight crew members and other aeronautical personnel concerned, the MMS shall remain responsible for the quality control and quality management of meteorological information provided by means of such systems in accordance with Chapter 2, 2.2.2.

Note:- The responsibilities relating to aeronautical information services information and the quality assurance of the information are given in MCAR 15, chapter 3.

9.5 INFORMATION FOR AIRCRAFT IN FLIGHT:

- 9.5.1 Meteorological information for use by aircraft in flight shall be supplied by a meteorological office to its associated air traffic services unit and through D-VOLMET or VOLMET broadcasts as determined by regional air navigation agreement. Meteorological information for planning by the operator for aircraft in flight shall be supplied on request, as agreed between the MMS or authorities and the operator concerned.

- 9.5.2 Meteorological information for use by aircraft in flight shall be supplied to air traffic services units in accordance with the specifications prescribed in Chapter 10.

- 9.5.3 Meteorological information shall be supplied through D-VOLMET or VOLMET broadcasts in accordance with the specifications prescribed in Chapter 11.

CHAPTER 10 INFORMATION FOR AIR TRAFFIC SERVICES, SEARCH AND RESCUE SERVICES AND AERONAUTICAL INFORMATION SERVICES

Note:- Technical specifications and detailed criteria related to this chapter are given in Appendix 9.

10.1 INFORMATION FOR AIR TRAFFIC SERVICES UNITS

- 10.1.1 MMS shall designate a meteorological office to be associated with each air traffic services unit. The associated meteorological office shall, after coordination with the air traffic services unit, supply, or arrange for the supply of, up-to-date meteorological information to the unit as necessary for the conduct of its functions.
- 10.1.2 The associated meteorological office for an aerodrome control tower or approach control unit should be an aerodrome meteorological office.
- 10.1.3 The associated meteorological office for a flight information centre or an area control centre shall be a meteorological watch office.
- 10.1.4 Where, owing to local circumstances, it is convenient for the duties of an associated meteorological office to be shared between two or more meteorological offices, the division of responsibility should be determined by the MMS in consultation with the ANS provider.
- 10.1.5 Any meteorological information requested by an air traffic services unit in connection with an aircraft emergency shall be supplied as rapidly as possible.

10.2 INFORMATION FOR SEARCH AND RESCUE SERVICES UNITS:

- 10.2.1 Meteorological offices designated by MMS in accordance with regional air navigation agreement shall supply search and rescue services units with the meteorological information they require in a form established by mutual agreement. For that purpose, the designated meteorological office shall maintain liaison with the search and rescue services unit throughout a search and rescue operation.

10.3 INFORMATION FOR AERONAUTICAL INFORMATION SERVICES UNITS:

- 10.3.1 The Meteorological Authority i.e. MMS, in coordination with the Maldives Civil Aviation Authority, shall arrange for the supply of upto-date meteorological information to relevant aeronautical information services units, as necessary, for the conduct of their functions.

CHAPTER 11 REQUIREMENTS FOR AND USE OF COMMUNICATIONS

Note 1:- Technical specifications and detailed criteria related to this chapter are given in Appendix 10

11.1 REQUIREMENTS FOR COMMUNICATIONS

- 11.1.1 Suitable telecommunications facilities shall be made available to permit aerodrome meteorological offices and, as necessary, aeronautical meteorological stations to supply the required meteorological information to air traffic services units on the aerodromes for which those offices and stations are responsible, and in particular to aerodrome control towers, approach control units and the aeronautical telecommunications stations serving these aerodromes.
- 11.1.2 Suitable telecommunications facilities shall be made available to permit meteorological watch offices to supply the required meteorological information to air traffic services and search and rescue services units in respect of the flight information regions, control areas and search and rescue regions for which those offices are responsible, and in particular to flight information centres, area control centres and rescue coordination centres and the associated aeronautical telecommunications stations.
- 11.1.3 Suitable telecommunications facilities shall be made available to permit world area forecast centres to supply the required world area forecast system products to meteorological offices, meteorological authorities and other users.
- 11.1.4 Telecommunications facilities between meteorological offices and, as necessary, aeronautical meteorological stations and aerodrome control towers or approach control units shall permit communications by direct speech, the speed with which the communications can be established being such that the required points may normally be contacted within approximately 15 seconds.
- 11.1.5 Telecommunications facilities between meteorological offices and flight information centres, area control centres, rescue coordination centres and aeronautical telecommunications stations should permit:
- a. communications by direct speech, the speed with which the communications can be established being such that the required points may normally be contacted within approximately 15 seconds; and
 - b. printed communications, when a record is required by the recipients; the message transit time should not exceed 5 minutes.

Note:- In 11.1.4 and 11.1.5, “approximately 15 seconds” refers to telephony communications involving switchboard operation and “5 minutes” refers to printed communications involving retransmission.

- 11.1.6 The telecommunications facilities required in accordance with 11.1.4 and 11.1.5 should be supplemented, as and where necessary, by other forms of visual or audio communications, for example, closed-circuit television or separate information processing systems.

- 11.1.7 As agreed between the MMS and operators, provision should be made to enable operators to establish suitable telecommunications facilities for obtaining meteorological information from aerodrome meteorological offices or other appropriate sources.
- 11.1.8 Suitable telecommunications facilities shall be made available to permit meteorological offices to exchange operational meteorological information with other meteorological offices.
- 11.1.9 The telecommunications facilities used for the exchange of operational meteorological information should be the aeronautical fixed service or, for the exchange of non-time critical operational meteorological information, the public Internet, subject to availability, satisfactory operation and bilateral/multilateral and/or regional air navigation agreements.

Note 1:-Three aeronautical fixed service satellite distribution systems providing for global coverage are used to support the global exchanges of operational meteorological information. Provisions relating to the satellite distribution systems are given in ICAO Annex 10, Volume III, Part 1, 10.1 and 10.2.

Note 2:-Guidance material on non-time-critical operational meteorological information and relevant aspects of the public Internet is provided in the ICAO Guidelines on the Use of the Public Internet for Aeronautical Applications (Doc 9855).

11.2 USE OF AERONAUTICAL FIXED SERVICE COMMUNICATIONS AND THE PUBLIC INTERNET — METEOROLOGICAL BULLETINS

- 11.2.1 Meteorological bulletins containing operational meteorological information to be transmitted via the aeronautical fixed service or the public Internet shall be originated by the appropriate meteorological office or aeronautical meteorological station.

Note:- Meteorological bulletins containing operational meteorological information authorized for transmission via the aeronautical fixed service are listed in ICAO Annex 10, Volume II, Chapter 4, together with the relevant priorities and priority indicators.

11.3 USE OF AERONAUTICAL FIXED SERVICE COMMUNICATIONS — WORLD AREA FORECAST SYSTEM PRODUCTS

- 11.3.1 World area forecast system products in digital form should be transmitted using binary data communications techniques. The method and channels used for the dissemination of the products should be as determined by regional air navigation agreement.

11.4 USE OF AERONAUTICAL MOBILE SERVICE COMMUNICATIONS

- 11.4.1 The content and format of meteorological information transmitted to aircraft and by aircraft shall be consistent with the provisions of this Regulation.

11.5 USE OF AERONAUTICAL DATA LINK SERVICE — CONTENTS OF D-VOLMET

- 11.5.1 D-VOLMET shall contain current METAR and SPECI, together with trend forecasts where available, TAF and SIGMET, special air-reports not covered by a SIGMET and, where available, AIRMET.

Note:- The requirement to provide METAR and SPECI may be met by the data link-flight information service (D-FIS) application entitled “Data link-aerodrome routine meteorological report (D-METAR) service”; the requirement to provide TAF may be met by the D-FIS application entitled “Data link-aerodrome forecast (D-TAF) service”; and the requirement to provide SIGMET and AIRMET messages may be met by the D-FIS application entitled “Data link-SIGMET (D-SIGMET) service”. The details of these data link services are specified in the ICAO Manual of Air Traffic Services Data Link Applications (Doc 9694).

11.6 USE OF AERONAUTICAL BROADCASTING SERVICE — CONTENTS OF VOLMET BROADCASTS

- 11.6.1 Continuous VOLMET broadcasts, normally on very high frequencies (VHF), shall contain current METAR and SPECI, together with trend forecasts where available.
- 11.6.2 Scheduled VOLMET broadcasts, normally on high frequencies (HF), shall contain current METAR and SPECI, together with trend forecasts where available and, where so determined by regional air navigation agreement, TAF and SIGMET.

CHAPTER 12 EVIDENCES (ACRONYMS / RECORDS / REFERENCES)

12.1 ACRONYMS:

+SHRA :	HEAVY SHOWER OF RAIN
+TSSNGR :	THUNDERSTORM WITH HEAVY SNOW AND HAIL
ACC :	AREA CONTROL CENTER
ADS :	AUTOMATIC DEPENDENT SURVEILLANCE
AFS :	AERONAUTICAL FIXED SERVICE
AFTN :	AERONAUTICAL FIXED TELECOMMUNICATION NETWORK
AIREP :	AIR REPORT
AIRMET :	INFORMATION CONCERNING EN-ROUTE WEATHER PHENOMENA WHICH MAY EFFECT THE SAFETY OF LOW LEVEL AIRCRAFT OPERATIONS
AMD :	AMENDMENT
AOP :	AERODROME OPERATIONAL PLANNING
APM :	AIRPORT MANAGER
AT :	AT
ATM :	AIR TRAFFIC MANAGEMENT
ATS :	AIR TRAFFIC SERVICES
ATSU :	AIR TRAFFIC SERVICES UNIT
AUTO :	METAR AND SPECI FROM AUTOMATIC OBSERVING SYSTEM
BECMG :	BECOMING
BKN :	BROKEN
BUFR :	BINARY UNIVERSAL FORM FOR THE REPRESENTATION OF MET DATA
CAT :	CLEAR AIR TURBULENCE
CB :	CUMULONIMBUS CLOUDS
CTA :	CONTROL AREA
EDR :	EDDY DISSIPATION RATE
EMBD :	EMBEDDED
ETOPS :	ENROUTE OPERATIONS
FEW :	FEW
FIC :	FLIGHT INFORMATION CENTER
FIR :	FLIGHT INFORMATION REGION
FM :	FROM
FRQ :	FREQUENT
FZDZ :	MODERATE FREEZING DRIZZLE
FZRA :	FREEZING
GAMET :	AREA FORECAST FOR LOW LEVEL FLIGHTS
hPa :	HECTOPASCAL
IAVW :	INTERNATIONAL AIRWAYS VOLCANO WATCH
ICAO :	INTERNATION CIVIL AVIATION ORGANIZATION
ISA :	INTERNATIONAL STANDARD ATMOSPHERE
ISO :	ISOLATED
mb :	MILIBAR
MET :	METEOROLOGICAL OR METEOROLOGY
METAR :	AERODROME ROUTINE METROLOGICAL REPORT (IN METEOROLOGICAL CODE)

MOR :	METEOROLOGICAL OPTICAL RANGE
MSL :	MEAN SEA LEVEL
MWO :	METEOROLOGICAL WATCH OFFICE
NDV :	NO DIRECTIONAL VARIATION(S)
NOSIG :	NO SIGNIFICANT CHANGE
NSC :	NO SIGNIFICANT CLOUD
NSW :	NO SIGNIFICANT WEATHER
OCNL :	OCCASIONAL
OPMET :	OPERATIONAL METROLOGICAL (INFORMATION)
OVC :	OVERCAST
PANS :	PROCEDURES FOR AIR NAVIGATION SERVICES
PROB :	PROBABILITY
QFE :	ATMOSPHERIC PRESSURE AT AERODROME
QNH :	ALTIMETER SUBSCALE SETTING TO OBTAIN ELEVATION WHEN ON THE GROUND
RNAV	AREA NAVIGATION
RSMC :	REGIONAL SPECIALIZED METEOROLOGICAL CENTRE
RVR :	RUNWAY VISUAL RANGE
SCT :	SCATTERED
SIGMET :	INFORMATION CONCERNING EN-ROUTE WEATHER PHENOMENA WHICH MAY AFFECT THE SAFETY OF AIRCRAFT OPERATIONS
SIGWx :	SIGNIFICANT WEATHER PHENOMENA
SLOL :	ISOLATED (31)
SNRA :	MODERATE SNOW AND RAIN
SPECI :	AERODROME SPECIAL METROLOGICAL REPORT (IN METROLOGICAL CODE)
TAF :	TERMINAL AERODROME FORECAST
TAFOR :	TERMINAL AERODROME FORECAST
TCAC :	TROPICAL CYCLONE ADVISORY CENTER
TEMPO :	TEMPORARY
TL :	TILL
TSGR :	HAIL
TSSN :	THUNDERSTROM WITH MODERATE SNOW
VOLMET :	METEOROLOGICAL INFORMATION FOR AIRCRAFT IN FLIGHT
VRB :	VARIABLE
VV :	VERTICAL VISIBILITY
WAFC :	WORLD AREA FORECAST CENTER
WAFS :	WORLD AREA FORECAST SYSTEM
WMO :	WORLD METEOROLOGICAL ORGANIZATION
UTC :	UNIVERSAL TIME COORDINATED

Appendix I. FLIGHT DOCUMENTATION – MODEL CHARTS AND FORMS:

(See Chapter 9 of this MCAR.)

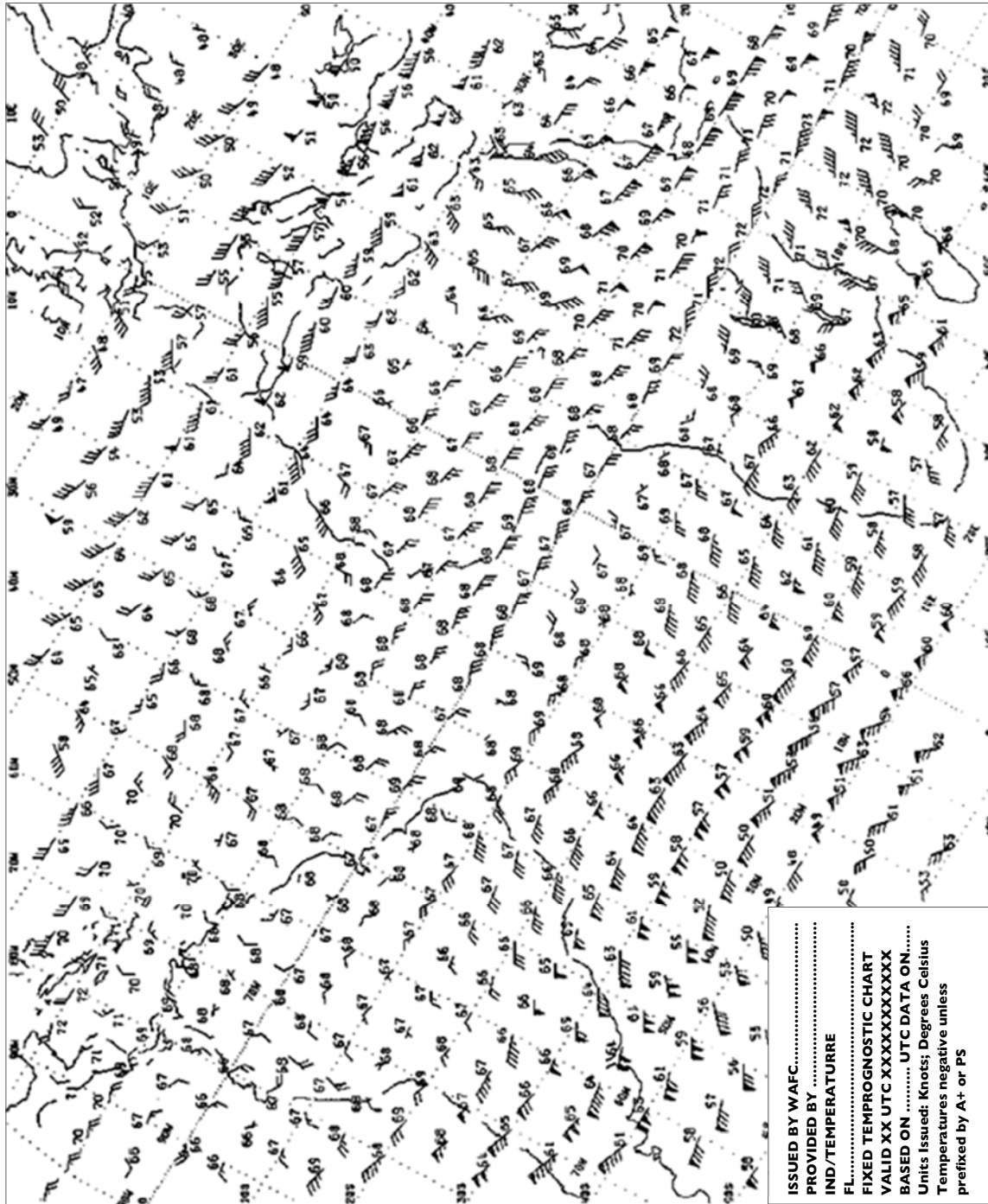
MODEL A	OPMET information
MODEL IS	Upper wind and temperature chart for standard isobaric surface Example 1: Arrows, feathers and pennants (Mercator projection) Example 2: Arrows, feathers and pennants (Polar stereographic projection)
MODEL SWH	Significant weather chart (high level) Example: Polar stereographic projection (showing the jet stream and vertical extent)
MODEL SWM	Significant weather chart (medium level)
MODEL SWL	Significant weather chart (low level) Example 1 Example 2
MODEL TCG	Tropical cyclone advisory information in graphical format
MODEL VAG	Volcanic ash advisory information in graphical format
MODEL STC	SIGMET for tropical cyclone in graphical format
MODEL SVA	SIGMET for volcanic ash in graphical format
MODEL SGE	SIGMET for phenomena other than tropical cyclone and volcanic ash in graphical format
MODEL SN	Sheet of notations used in flight documentation

I OPMET INFORMATION MODEL A

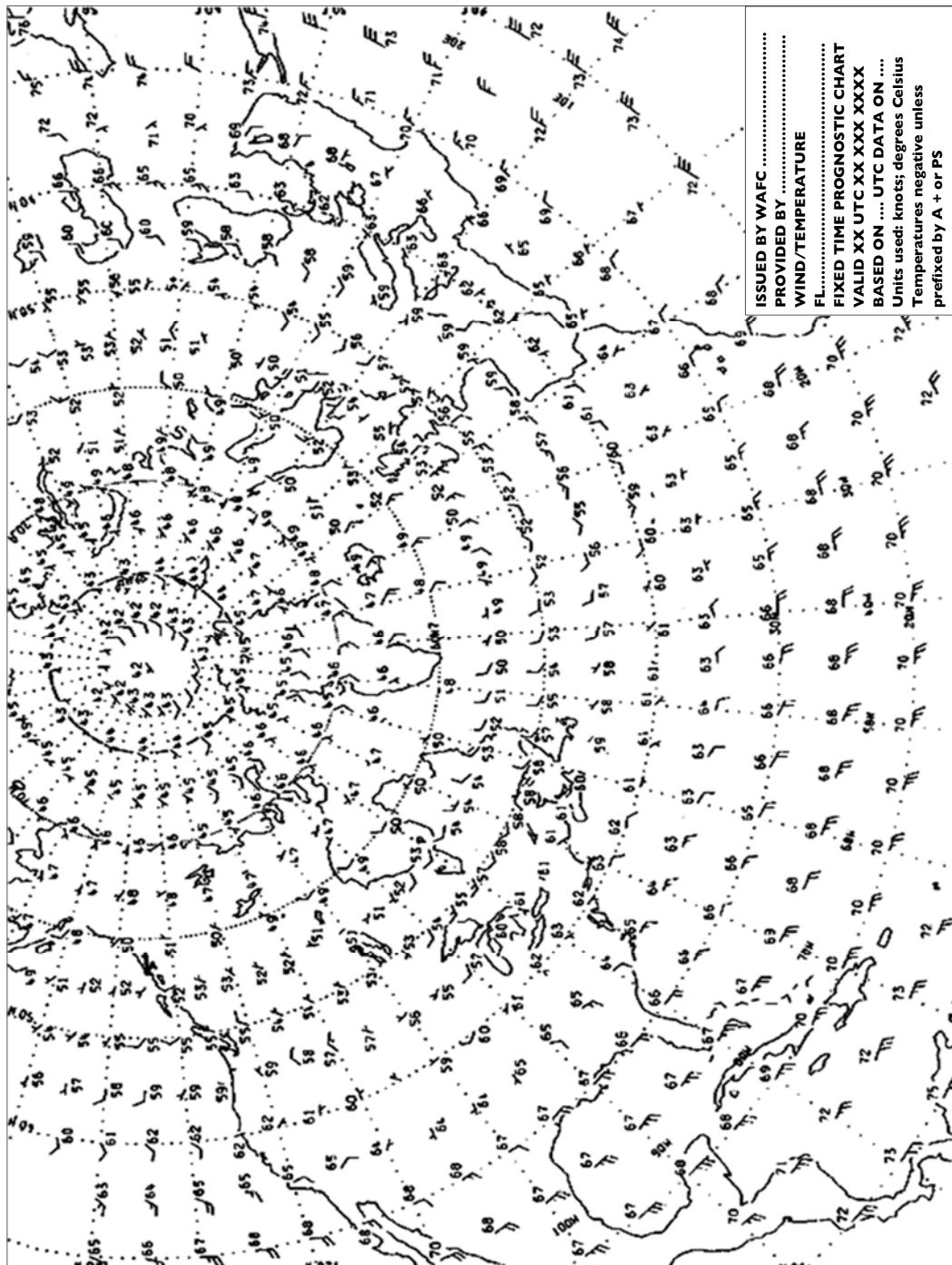
ISSUE ISSUED BY METEOROLOGICAL OFFICE (DATE, TIME UTC).....					
INTENSITY “ - ” (light); no indicator (moderate); “ + ” (heavy, or a tornado/waterspout in the case of funnel cloud(s) are used to indicate the forecast intensity of certain phenomena					
DESCRIPTORS					
MI - shallow	PR - partial	BL - blowing	TS - thunderstorm		
BC - patches	DR - low drifting	SH - shower(s)	FZ - freezing (supercooled)		
FORECAST WEATHER ABBREVIATIONS					
DZ - drizzle	GS - small hail and/or snow pellets	SA - sand			
RA - rain	BR - mist	HZ - haze			
SN - snow	FG - fog	PO - dust/sand whirls (dust devils)			
SG - snow grains	FU - smoke	SQ - squall			
IC - ice crystals (diamond dust)	VA - volcanic ash	FC - funnel cloud(s) (tornado or waterspout)			
PL - ice pellets	DU - widespread dust	SS - sandstorm			
GR - hail		DS - duststorm			
EXAMPLES					
+SHRA	- heavy shower of rain	TSSN	- thunderstorm with moderate snow		
FZDZ	- moderate freezing drizzle	SNRA	- moderate snow and rain		
+TSSNGR	- thunderstorm with heavy snow and hail				
SELECTED ICAO LOCATION INDICATORS					
CYUL	Montreal Pierre Elliot Trudeau/Intl	HECA	Cairo/Intl	OBBI	Bahrain Intl
		HKJK	Nairobi/Jomo Kenyatta	RJTT	Tokyo Intl
EDDF	Frankfurt/Main	KJFK	New York/John F. Kennedy Intl	SBGL	Rio de Janeiro/Galeão Intl
EGLL	London/Heathrow	LFPG	Paris/Charles de Gaulle	YSSY	Sydney/Kingsford Smith Intl
GMMC	Casablanca/Anfa	NZAA	Auckland Intl	ZBAA	Beijing/Capital
METAR CYUL 240700Z 27018G30KT 5000 SN FEW020 BKN045 M02/M07 Q0995=					
METAR EDDF 240950Z 05015KT 9999 FEW025 04/M05 Q1018 NOSIG=					
METAR LFPG 241000Z 07010KT 5000 SCT010 BKN040 02/M01 Q1014 NOSIG=					
SPECI GMMC 220530Z 24006KT 5000 -TSGR BKN016TCU FEW020CB SCT026 08/07 Q1013=					
TAF AMD NZAA 240855Z 2409/2506 24010KT 9999 FEW030 BECMG 2411/2413 VRB02KT 2000 HZ FM 242224010KT CAVOK=					
TAF ZBAA 240440Z 2406/2506 13004MPS 6000 NSC BECMG 2415/2416 2000 SN OVC040 TEMPO 2418/2421 1000 SN BECMG 2500/2501 32004MPS 3500 BR NSC BECMG 2503/2504 32010G20MPS CAVOK=					
TAF YSSY 240443Z 2406/2506 05015KT 3000 BR SCT030 BECMG 2414/2416 33008KT FM 2422 04020KT CAVOK=					
HECC SIGMET 2 VALID 240900/1200 HECA-					
HECC CAIRO FIR SEV TURB OBS N OF N27 FL 390/440 MOV E25KMH NC.					

2 UPPER WIND AND TEMPERATURE CHART FOR STANDARD ISOBARIC SURFACE MODEL IS

Example I – Arrows, feathers and pennants (Mercator projection)



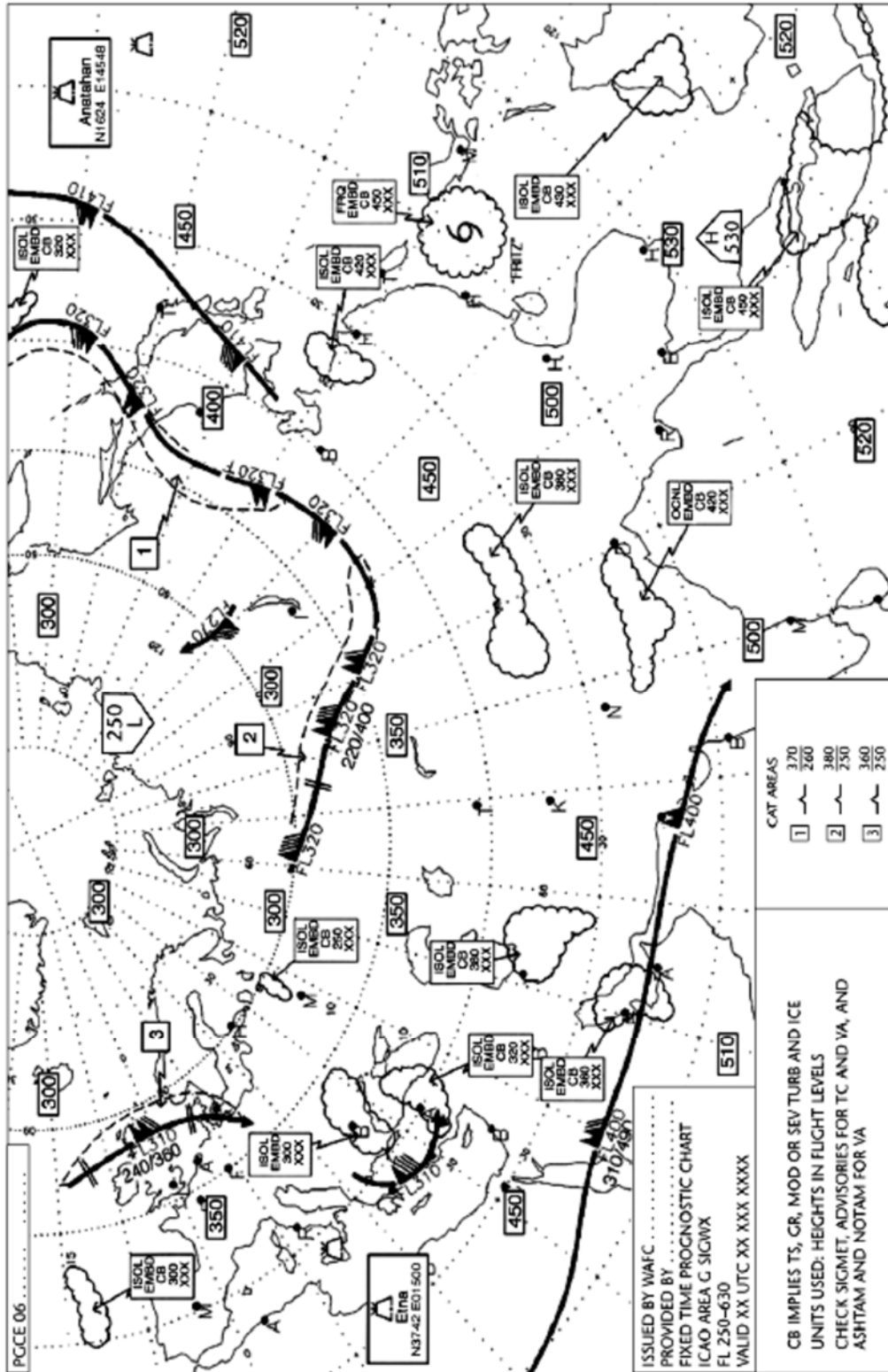
Example 2 – Arrows, feathers and pennants (Polar stereographic projection)



3 SIGNIFICANT WEATHER CHART (HIGH LEVEL)

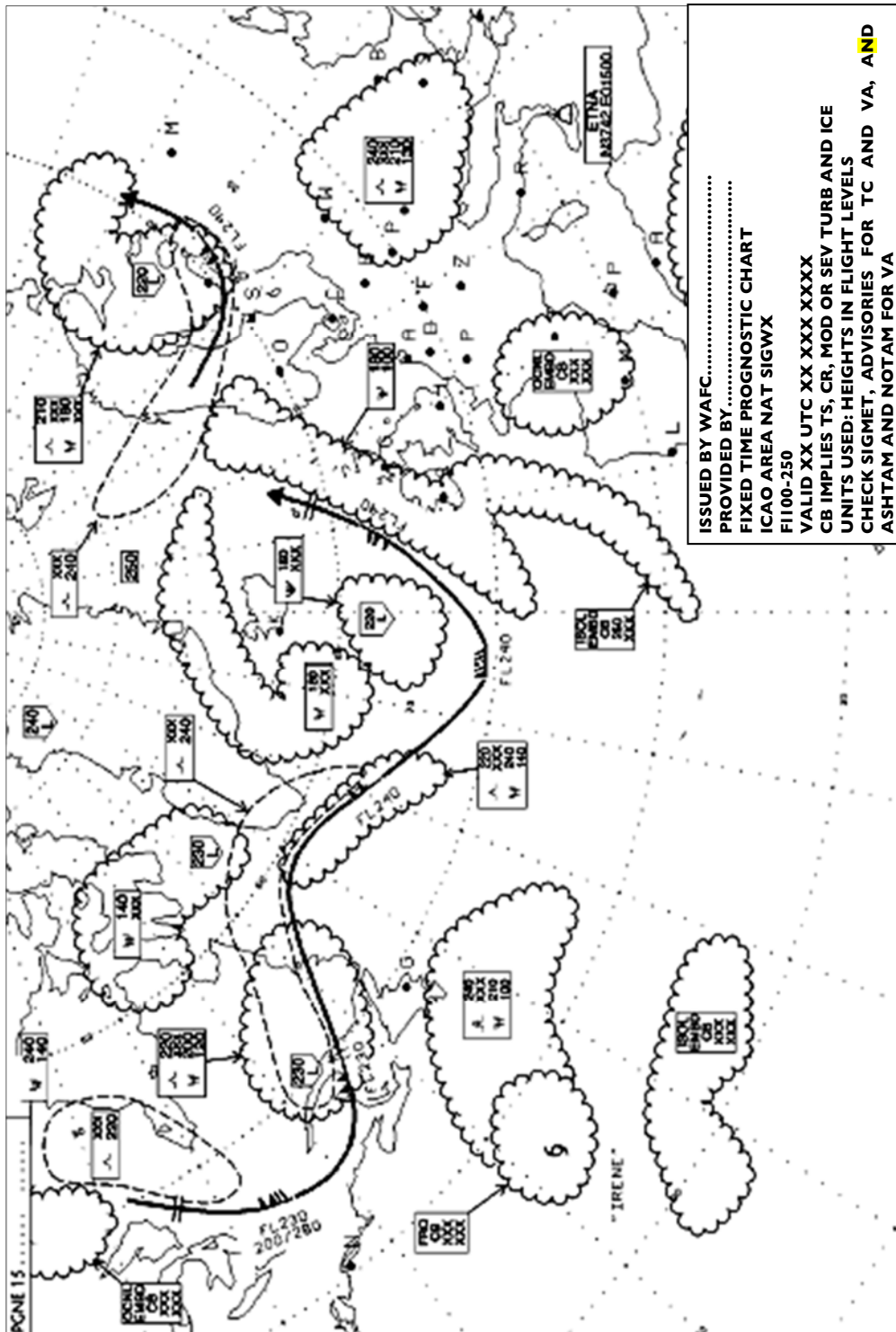
MODEL SWH

Example – Polar stereographic projection (showing the jet stream vertical extend)



4 SIGNIFICANT WEATHER CHART (MEDIUM LEVEL)

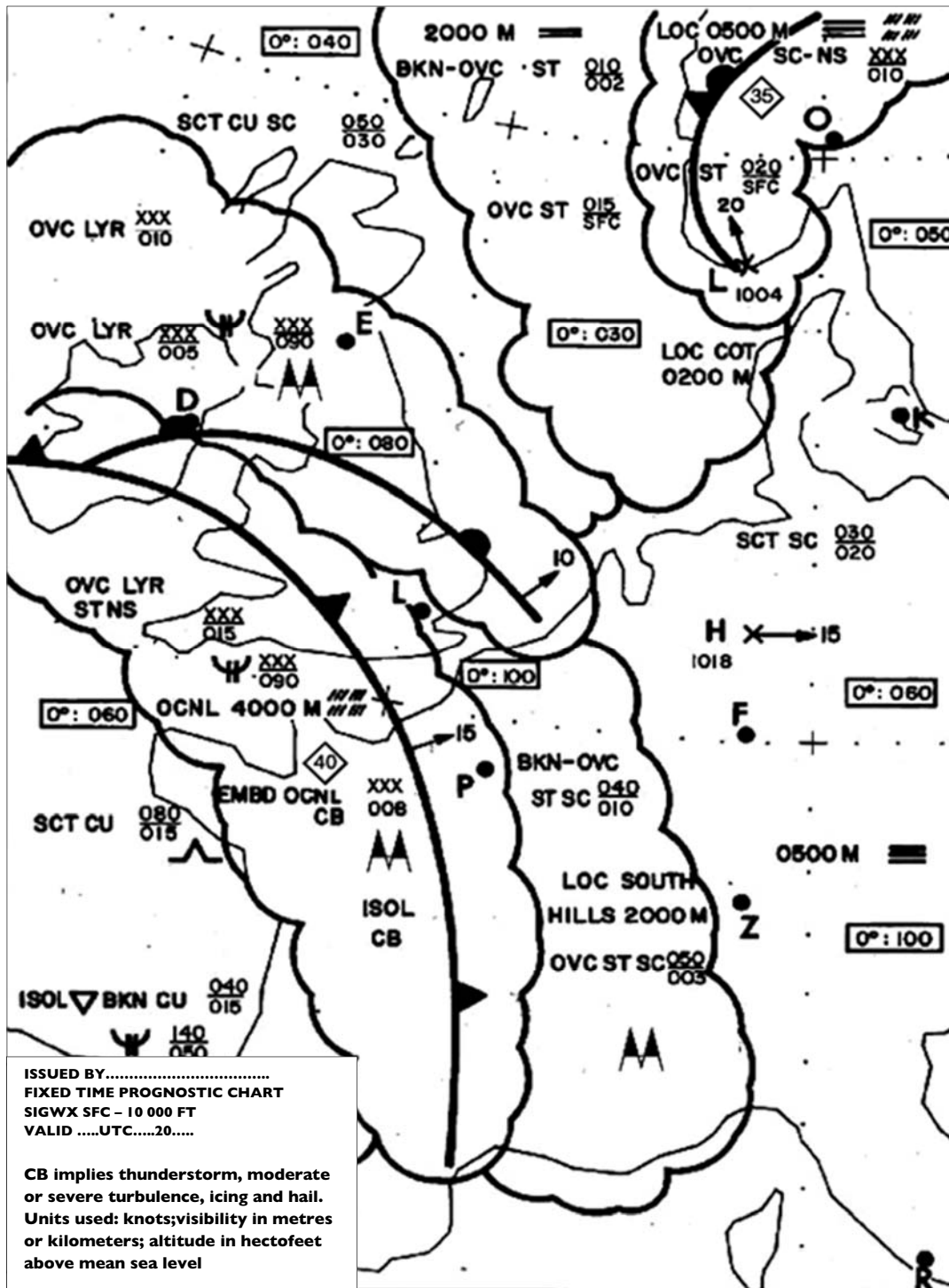
MODEL SWM



5 SIGNIFICANT WEATHER CHART (LOW LEVEL)

MODEL SWL

Example I



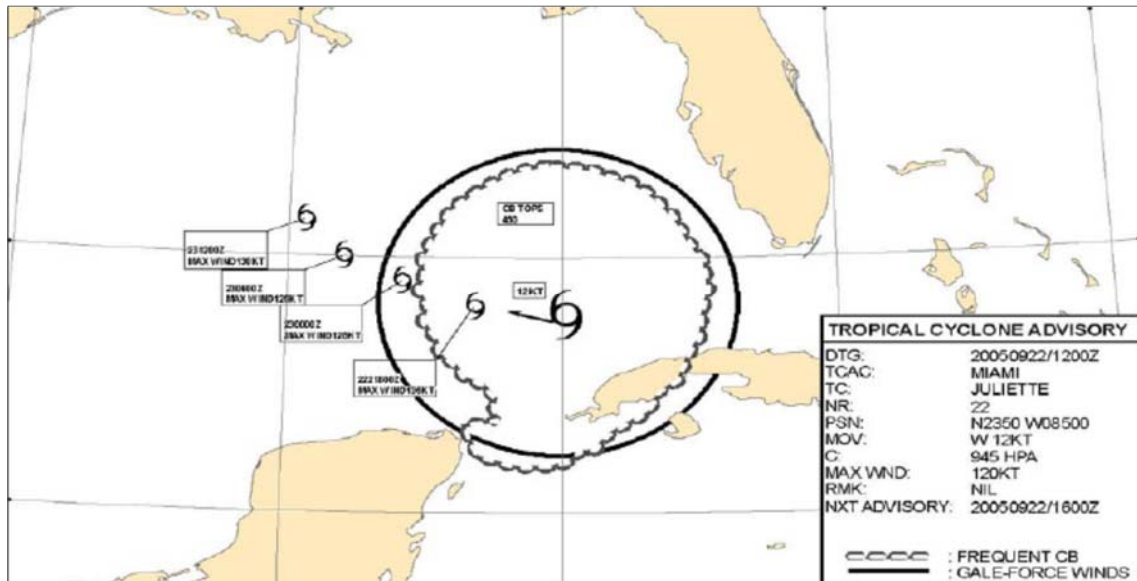
Example 2

FIXED TIME PROGNOSTIC CHART VALID..... UTC..... UTC..... 20... BASED ON..... UTC DATA ON.....		0°C	
VARIANT	VIS	SIGNIFICANT WEATHER	CLOUD, TURBULENCE, ICING
AREA A			~ SCT CU 025/080
ISOL			~ BKN CU 015/XXX √ 050/XXX
AREA B			~ OVC LVR ST NS 015/XXX √ 050/XXX
OCNL	4000	HEAVY RAIN	EMBD CB 008/XXX M
ISOL	1000	THUNDERSTORM	
AREA C			BKN to OVC ST SC 010/040
LOC SOUTH COT HILLS	2000	DRIZZLE	OVC ST SC 003/050 M
AREA D			OVC LVR SC NS 010/XXX
LOC NORTH	4500	RAIN	OVC LVR ST NS 005/XXX √ 090/XXX M
AREA E			SCT SC 020/030
LOC LAND	0500	FOG	
AREA F	2000	MIST	BKN to OVC ST 002/010
LOC COT HILLS	0200	FOG	OVC ST SFC/015
AREA G	4500	RAIN	~ OVC CU SC NS 010/XXX √ 030/XXX
LOC NORTH	0500	FOG	OVC ST SFC/010
AREA J			SCT CU SC 030/050
LOC HILLS NORTH			~ BLW 070

	<p>REMARKS: EAST TO NE GALES SHETLAND TO HEBRIDES – SEVERE MOUNTAIN WAVES NW SCOTLAND – FOG PATCHES EAST ANGLIA – WDSRPR FOG OVER NORTH FRANCE, BELGIUM AND THE NETHERLANDS</p>
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<p>SIGWX SFC – 10 000 FT ISSUED BY AT UTC Note: 1. Pressure in hPa and speeds in knots. 2. Vis in m included if less than 5 000 m AA implies vis 200 m or less. 3. Altitude in hectofeet above MSL XXXX = above 10000ft. 4. CB implies MOD/SEV Icing, turbulence and thunderstorm. 5. Only significant weather and/or weather phenomena causing visibility reduction below 5 000 m included</p>	<p>REMARKS: EAST TO NE GALES SHETLAND TO HEBRIDES – SEVERE MOUNTAIN WAVES NW SCOTLAND – FOG PATCHES EAST ANGLIA – WDSRPR FOG OVER NORTH FRANCE, BELGIUM AND THE NETHERLANDS</p>
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6 TROPICAL CYCLONE ADVISORY INFORMATION IN GRAPHICAL FORMAT MODEL TCG

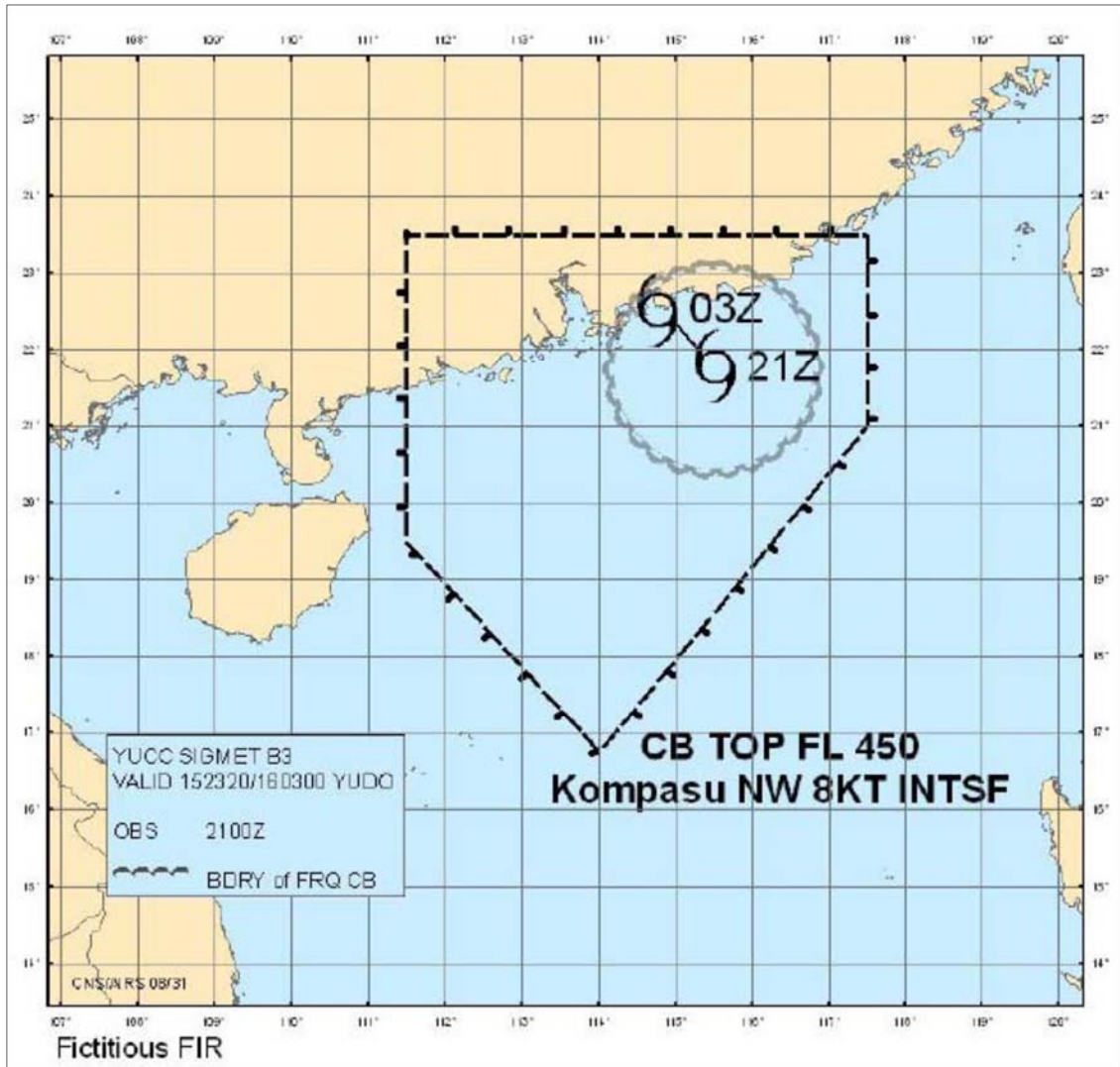


**7 VOLCANIC ASH ADVISORY INFORMATION IN GRAPHICAL FORMAT MODEL
VAG**

(Reserved)

**8 SIGMET FOR TROPICAL CYCLONE IN GRAPHICAL FORMAT
STC**

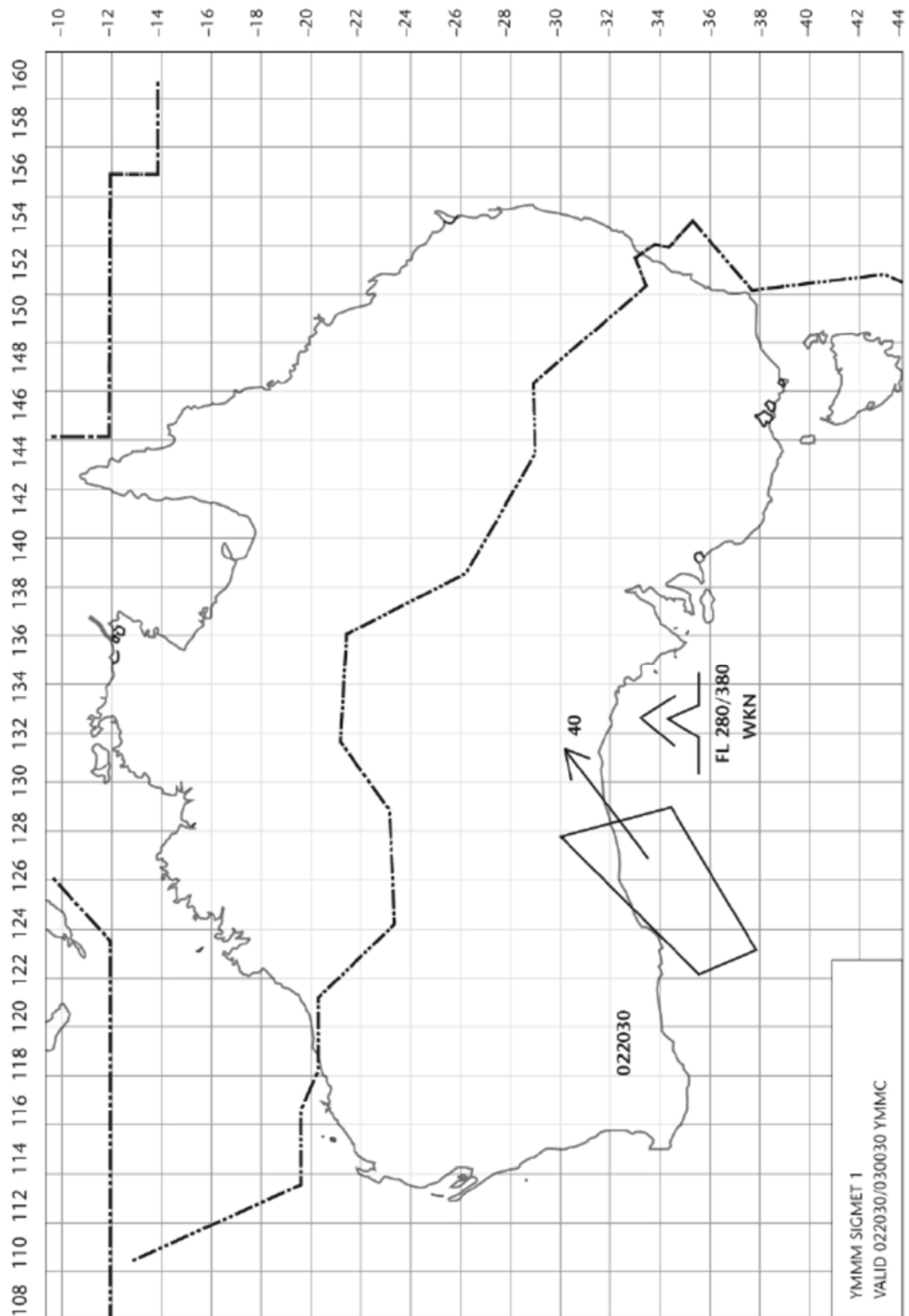
MODEL



9 SIGMET FOR VOLCANIC ASH IN GRAPHICAL FORMAT MODEL SVA

(Reserved)

10 SIGMET FOR PHENOMENA OTHER THAN TROPICAL CYCLONE AND VOLCANIC ASH IN GRAPHICAL FORMAT MODEL SGE



II SHEET OF NOTATIONS USED IN FLIGHT DOCUMENTATION MODEL SN

I. Symbols for significant weather

	Tropical cyclone		Drizzle
	Sever squall line*		Rain
	Moderate turbulence		Snow
	Server turbulence		Shower
	Mountain waves		Hail
	Moderate aircraft icing		Widespread blowing snow
	Sever aircraft icing		Sever sand or dust haze
	Widespread fog		Widespread sandstorm or duststorm
	Radioactive materials in atmosphere**		Widespread haze
	Volcanic eruption***		Widespread mist
	Mountain obstruction		Widespread smoke
			Freezing precipitation****

* in-flight documentation for flights operating up to FL100. This symbol refers to "squall line".

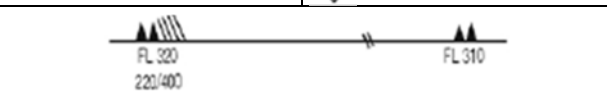
** The following information should be included at the side of the chart; radioactive materials symbol; latitude/longitude of accident site, date and time of accident check NOTAM for further information.

*** The following information should be included at the side of the chart; volcanic eruption symbol; name and international number of volcano (if known); latitude/longitude; date and time of the first eruption (if known); check SIGMETs and NOTAM or ASHTAM for volcanic ash.

**** This symbol does not refer to icing due to precipitation coming into contact with an aircraft which is at a very low temperature.

Note: Height indications between which phenomena are expected, top above base as per chart legend.

	Cold front at the surface		Position, speed and level of maximum wind
	Warm front at the surface		Convergence line
	Occluded front at the surface		Freezing level
	Quasi-stationary front at the surface		Intertropical convergence zone
	Tropopause high		State of the sea
	Tropopause low		Sea-surface temperature
	Tropopause level		Widespread strong surface wind*



Wind arrows indicate the maximum wind in jet and the flight level at which it occurs, if the maximum wind speed is 60 m/s (120 kt) or more, the flight levels between which winds are greater than 40 m/s (80 kt) is placed below the maximum wind level. In the example, winds are greater than 40 m/s (80 kt) between FL220 and FL400.

The heavy line delineating the jet axis begins/ends at the points where a wind speed of 40 m/s (80kt) is forecast.

Symbol used whenever the height of the jet axis changes by +/- 3000ft or the speed changes by +/- 20 kts.

* This symbol refers to widespread surface wind speeds exceeding 15 m/s (30 kt).

3. Abbreviation used to describe clouds

3.1 Type

CI = Cirrus	AS = Altostratus	ST = Stratus
CC = Cirrocumulus	NS = Nimbostratus	CU = Cumulus
CS = Cirrostratus	SC = Stratocumulus	CB = Cumulonimbus
AC = Altocumulus		

3.2 Amount

Clouds except CB

FEW = few (1/8 to 2/8)	BKN = broken (5/8 to 7/8)
SCT = scattered (3/8 to 4/8)	OVC = overcast (8/8)

CB only

ISOL = individual CBs (isolated)
OCNL = well-separated CBs (occasional)
FRQ = CBs with little or no separation (frequent)
EMBD = CBs embedded in layers of other clouds or concealed by haze (embedded)

3.3 Heights

Heights are indicated on SWH and SWM charts in flight levels(FL), top over base. When XXX is used, tops or bases are outside the layer of the atmosphere to which the chart applies.

In SWL charts:

- (a) Heights are indicated as altitudes above mean sea level;
- (b) The abbreviation SFC is used to indicate ground level.

4. Depicting of lines and systems on specific charts

4.1 Models SWH and SWM – Significant weather charts (high and medium)

Scalloped line	= demarcation of areas of significant weather
Heavy broken line	= delineation of area of CAT
Heavy solid line	= position of jet stream axis with indication of wind direction, speed in kt or m/s and height in flight levels, The vertical extent of the jet stream is indicated (in flight levels), e.g. FL270 accompanied by 240/290 indicates that the jet extends from FL240 to FL290.
Flight levels inside small rectangles	= height in flight levels of tropopause at spot locations, e.g. $\boxed{340}$. Low and high points of the tropopause topography are indicated by the letters L or H, respectively, inside a pentagon with the height in flight levels. Display explicit FL for jet depths and tropopause height even if outside forecast bounds.

4.2 Model SWL – Significant weather chart (low level)

X	= position of pressure centres given in hectopascals
L	= centre of low pressure
H	= centre of high pressure
Scalloped lines	= demarcation of area of significant weather
Dashed lines	= altitude of 00C isotherm in feet (hectofoet) or meters
Figures on arrows	= speed in kt or km/h of movement of frontal systems, depressions or anticyclones
Figures inside the state of the sea symbol	= total wave height in feet or meters
Figures inside the sea-surface temperature	= sea-surface temperature in °C
Figures inside the strong surface wind symbol	= wind in kt or m/s

4.3 Arrows, feathers and pennants

Arrows indicate direction. Number of pennants and/or feathers corresponds to speed

Example:	270°/115 kt (equivalent to 57.5 m/s)
	Pennants correspond to 50 kt or 25 m/s
	Feathers correspond to 10 kt or 5 m/s
	Half-feathers correspond to 5 kt or 2.5 m/s

* A conversion factor of 1 to 2 is used

Appendix 2. TECHNICAL SPECIFICATIONS RELATED TO WORLD AREA FORECAST SYSTEM AND METEOROLOGICAL OFFICES

I WORLD AREA FORECAST SYSTEM:

I.1 FORMATS AND CODES:

I.1.1 WAFCs shall adopt uniform formats and codes for the supply of forecasts.

I.2 UPPER-AIR GRIDDED FORECASTS:

I.2.1 The forecasts of upper wind; upper-air temperature; and humidity; direction, speed and flight level of maximum wind; flight level and temperature of tropopause, areas of cumulonimbus clouds, icing, clear-air and in-cloud turbulence, and geopotential altitude of flight levels shall be prepared four times a day by a WAFC and shall be valid for fixed valid times at 6, 9, 12, 15, 18, 21, 24, 27, 30, 33 and 36 hours after the time (0000, 0600, 1200 and 1800 UTC) of the synoptic data on which the forecasts were based. The dissemination of each forecast shall be in the above order and shall be completed as soon as technically feasible but not later than 6 hours after standard time of observation.

I.2.2 The grid point forecast prepared by a WAFC shall comprise:

- a. Wind and temperature data for flight levels 50 (850 hPa), 100(700 hPa), 140(600 hPa), 180 (500 hPa), 240 (400 hPa), 270 (350 hPa), 300 (300 hPa), 320 (275 hPa), 340 (250 hPa),360 (225 hPa), 390 (200 hPa), 450 (150 hPa), and 530 (100 hPa);
- b. flight level and temperature of tropopause;
- c. direction, speed and flight level of maximum wind;
- d. humidity data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa) and 180 (500 hPa);
- e. horizontal extent and flight levels of base and top of cumulonimbus clouds;
- f. icing for layers centred at flight levels 60 (800 hPa), 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa) and 300 (300 hPa);
- g. clear-air turbulence for layers centred at flight levels 240 (400 hPa), 270 (350 hPa), 300 (300 hPa), 340 (250 hPa), 390 (200 hPa) and 450 (150 hPa);
- h. in-cloud turbulence for layers centred at flight levels 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa) and 300 (300 hPa); and

Note 1:- Forecasts referred to in e) to h) are currently of an experimental nature, labelled as "trial forecasts" and only distributed through the Internet-based FTP services.

Note 2:- Layers centred at a flight level referred to in f) and h) have a depth of 100 hPa.

Note 3:- Layers centred at a flight level referred to in g) have a depth of 50 hPa.

- i. geopotential altitude data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa), 300 (300 hPa), 320 (275 hPa), 340 (250 hPa), 360 (225 hPa), 390 (200 hPa), 450 (150 hPa) and 530 (100 hPa).

- 1.2.3 The foregoing grid point forecasts shall be issued by a WAFC in binary code form using the GRIB code form prescribed by WMO.

Note:- The GRIB code form is contained in WMO Publication No. 306, Manual on Codes, Volume 1.2, Part B — Binary Codes.

- 1.2.4 The foregoing grid point forecasts shall be prepared by a WAFC in a regular grid with a horizontal resolution of 1.25° of latitude and longitude.

1.3 SIGNIFICANT WEATHER (SIGWX) FORECASTS:

1.3.1 General provisions:

- a. Forecasts of significant en-route weather phenomena shall be prepared as SIGWX forecasts four times a day by a WAFC and shall be valid for fixed valid times at 24 hours after the time (0000, 0600, 1200 and 1800 UTC) of the synoptic data on which the forecasts were based. The dissemination of each forecast shall be completed as soon as technically feasible but not later than 9 hours after standard time of observation.
- b. SIGWX forecasts shall be issued in binary code form using the BUFR code form prescribed by WMO.

Note:- The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, Volume 1.2, Part B — Binary Codes.

1.3.2 Types of SIGWX forecasts:

- a. SIGWX forecasts shall be issued as high-level SIGWX forecasts for flight levels between 250 and 630.

Note:- Medium-level SIGWX Forecasts for flight levels between 100 and 250 for limited geographical areas will continue to be issued until such time that flight documentation to be generated from the gridded forecasts of cumulonimbus clouds, icing and turbulence fully meets user requirements.

1.3.3 Items included in SIGWX

SIGWX forecasts shall include the following items:

- a. tropical cyclone provided that the maximum of the 10-minute mean surface wind speed is expected to reach or exceed 17m/s (34 kt);
- b. severe squall lines;
- c. moderate or severe turbulence (in cloud or clear air);
- d. moderate or severe icing;
- e. widespread sandstorm/dust storm;
- f. cumulonimbus clouds associated with thunderstorms and with a) to e);

Note:- Non-convective cloud areas associated with in-cloud moderate or severe turbulence and/or moderate or severe icing are to be included in the SIGWX forecasts

- g. flight level of tropopause;
- h. jet streams;
- i. information on the location of volcanic eruptions that are producing ash clouds of significance to aircraft operations, comprising: volcanic eruption symbol at the location of the volcano and, at the side of the chart, the volcano eruption symbol, the name of the volcano, latitude/longitude, the date and time of first eruption, if known, and a reference to SIGMET and NOTAM or ASHTAM issued for the area concerned; and
- j. information on the location of an accidental release of radioactive materials into the atmosphere of significance to aircraft operations, comprising: the radioactivity symbol at the site of the accident and, at the side of the chart, the radioactivity symbol, latitude/longitude of the site of the accident, date and time of the accident and a reminder to users to check NOTAM for the area concerned.

Note 1:- Medium-level SIGWX forecasts include all the items above.

Note 2:- Items to be included in low-level SIGWX forecasts (i.e. flight levels below 100) are prescribed in Appendix 5

1.3.4 Criteria for including items in SIGWX forecasts:

The following criteria shall be applied SIGWX forecasts:

- a. items a) to f) in 1.3.3.1 shall only be included if expected to occur between the lower and upper levels of the SIGWX forecast;
- b. the abbreviation “CB” shall only be included when it refers to the occurrence or expected occurrence of cumulonimbus clouds:
 - 1. affecting an area with a maximum spatial coverage of 50 per cent or more of the area concerned;
 - 2. along a line with little or no space between individual clouds; or
 - 3. embedded in cloud layers or concealed by haze.
- c. the inclusion of “CB” shall be understood to include all weather phenomena normally associated with cumulonimbus clouds, i.e. Thunderstorm, moderate or severe icing, moderate or severe turbulence and hail;
- d. where a volcanic eruption or an accidental release of radioactive materials into the atmosphere warrants the inclusion of the volcanic activity symbol or the radioactivity symbol in SIGWX forecasts, the symbols shall be included on SIGWX forecasts irrespective of the height to which the ash column or radioactive material is reported or expected to reach; and
- e. in the case of co-incident or the partial overlapping of items a), i) and j) in 1.3.3.1, the highest priority shall be given to item i), followed by items j) and a). The item with the highest priority shall be placed at the location of the event, and an arrow shall be used to link the location of the other item(s) to its associated symbol or text box.

2 METEOROLOGICAL OFFICES:

2.1 USE OF WAFS PRODUCTS:

- 2.1.1 Aerodrome meteorological offices shall use forecasts issued by the WAFCs in the preparation of flight documentation, whenever these forecasts cover the intended flight path in respect of time, altitude and geographical extent, unless otherwise agreed between the meteorological authority and the operator concerned.
- 2.1.2 In order to ensure uniformity and standardization of flight documentation, the WAFS GRIB and BUFR data received shall be decoded into standard WAFS charts in accordance with relevant provisions in this MCAR and the meteorological content and identification of the originator of the WAFS forecasts shall not be amended.

2.2 NOTIFICATION OF WAFC CONCERNING SIGNIFICANT DISCREPANCIES:

- 2.2.1 Meteorological offices using WAFS BUFR data shall notify the WAFC concerned immediately if significant discrepancies are detected or reported in respect of WAFS SIGWX forecasts concerning:
- a. icing, turbulence, cumulonimbus clouds that are obscured, frequent, embedded or occurring at a squall line, and sandstorms/dust storms; and
 - b. volcanic eruptions or an accidental release of radioactive materials into the atmosphere, of significance to aircraft operations.
- 2.2.2 The WAFC receiving the message shall acknowledge its receipt to the originator, together with a brief comment on the report and any action taken, using the same means of communication employed by the originator.

Note:- Guidance on reporting significant discrepancies is provided in the Manual of Aeronautical Meteorological Practice (Doc 8896).

3 VOLCANIC ASH ADVISORY CENTRES (VAAC):

3.1 VOLCANIC ASH ADVISORY INFORMATION:

3.1.1 Reserved

3.1.2 Reserved

4 STATE VOLCANO OBSERVATORIES
4.1 INFORMATION FROM STATE VOLCANO OBSERVATORIES

Reserved

5 TROPICAL CYCLONE ADVISORY CENTRES (TCAC)
5.1 TROPICAL CYCLONE ADVISORY INFORMATION

- 5.1.1 The advisory information on tropical cyclones shall be issued for tropical cyclones when the maximum of the 10-minute mean surface wind speed is expected to reach or exceed 17 m/s (34 kt) during the period covered by the advisory.
- 5.1.2 The advisory information on tropical cyclones shall be in accordance with the template shown in A2-2.
- 5.1.3 The tropical cyclone advisory information listed in Table A2-2, when prepared in graphical format, should be as specified in Appendix I and issued using
 - a. the portable network graphics (PNG) format; or
 - b. the BUFR code form, when exchanged in binary format.

Note:- The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, Volume 1.2, Part-B — Binary Codes.

Table A2-2. Template for advisory message for tropical cyclones

Key: = = a double line indicates that the text following it should be placed on the subsequent line.

Note 1:- The ranges and resolutions for the numerical elements included in advisory messages for tropical cyclones are shown in Appendix 6, Table A6-4.

Note 2:- The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO. Abbreviations and Codes (PANS-ABC, Doc 8400).

Note 3:- All the elements are mandatory.

Note 4:- Inclusion of a “colon” after each element heading is mandatory.

Note 5:- the numbers 1 to 19 are included only for clarity and they are not part of the advisory message, as shown in the example.

Element	Detailed content	Template(s)	Examples
1	Identification of the type of	Type of message	TC ADVISORY
2	Time of origin	Year, month, day and time in UTC of issue	DTG: nnnnnnnn/nnnnZ
3	Name of TCAC	Name of TCAC (location indicator or full name)	TCAC: nnnn or nnnnnnnnnn
4	Name of tropical cyclone	Name of tropical cyclone or “NN” for unnamed tropical cyclone	TC: nnnnnnnnnnnn or NN

Element		Detailed content	Template(s)		Examples	
5	Advisory number	Advisory number (starting with "01" for each cyclone)	NR:	nn	NR:	01
6	Position of the centre	Position of the centre of the tropical cyclone (in degrees and minutes)	PSN:	Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]	PSN:	N2706 W07306
7	Direction and speed of movement	Direction and speed of movement given in sixteen compass points and km/h (or kt), respectively, or moving slowly (< 6 km/h (3 kt)) or stationary (< 2 km/h (1 kt))	MOV:	N nnKMH (or KT) or NNE nnKMH (or KT) or NE nnKMH (or KT) or ENE nnKMH (or KT) or E nnKMH (or KT) or ESE nnKMH (or KT) or SE nnKMH (or KT) or SSE nnKMH (or KT) or S nnKMH (or KT) or SSW nnKMH (or KT) or SW nnKMH (or KT) or WSW nnKMH (or KT) or W nnKMH (or KT) or WNW nnKMH (or KT) or NW nnKMH (or KT) or NNW nnKMH (or KT) or SLW or	MOV:	NW 20KMH
8	Central pressure	Central pressure (in hPa)	C:	nnnHPA	C:	965HPA
9	Maximum surface wind	Maximum surface wind near the centre (mean over 10 minutes, in m/s (or kt))	MAX WIND:	nn[n]MPS (or nn[n]KT)	MAX WIND:	22MPS
10	Forecast of centre position (+6 HR)	Day and time (in UTC) (6 hours from the "DTG" given in Item 2); Forecast position (in degrees and minutes) of the centre of the tropical cyclone	FCST PSN +6 HR:	nn/nnnnZ Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]	FCST PSN +6 HR:	25/2200Z N2748 W07350
11	Forecast of maximum surface wind (+6 HR)	Forecast of maximum surface wind (6 hours after the "DTG" given in Item 2)	FCST MAX WIND +6 HR:	nn[n]MPS (or nn[n]KT)	FCST MAX WIND +6 HR:	22MPS
12	Forecast of centre position (+12 HR)	Day and time (in UTC) (12 hours from the "DTG" given in Item 2); Forecast position (in degrees and minutes) of the centre of the tropical cyclone	FCST PSN +12 HR:	nn/nnnnZ Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]	FCST PSN +12 HR:	26/0400Z N2830 W07430
13	Forecast of maximum surface wind (+12 HR)	Forecast of maximum surface wind (12 hours after the "DTG" given in Item 2)	FCST MAX WIND +12 HR:	nn[n]MPS (or nn[n]KT)	FCST MAX WIND +12 HR:	22MPS
14	Forecast of centre position (+18 HR)	Day and time (in UTC) (18 hours from the "DTG" given in Item 2); Forecast position (in degrees and minutes) of the centre of the tropical cyclone	FCST PSN +18 HR:	nn/nnnnZ Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]	FCST PSN +18 HR:	26/1000Z N2852 W07500
15	Forecast of maximum surface wind (+18 HR)	Forecast of maximum surface wind (18 hours after the "DTG" given in Item 2)	FCST MAX WIND +18 HR:	nn[n]MPS (or nn[n]KT)	FCST MAX WIND +18 HR:	21MPS

Element	Detailed content	Template(s)	Examples	
16	Forecast of centre position (+24 HR)	Day and time (in UTC) (24 hours from the "DTG" given in Item 2); Forecast position (in degrees and minutes) of the centre of the tropical cyclone	FCST PSN +24 HR: nn/nnnnZ Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]	FCST PSN +24 HR: 26/1600Z N2912 W07530
17	Forecast of maximum surface wind (+24 HR)	Forecast of maximum surface wind (24 hours after the "DTG" given in Item 2)	FCST MAX WIND +24 HR: nn[n]MPS (or nn[n]KT)	FCST MAX WIND +24 HR: 20MPS
18	Remarks	Remarks, as necessary	RMK: Free text up to 256 characters or NIL	RMK: NIL
19	Expected time of issuance of next advisory	Expected year, month, day and time (in UTC) of issuance of next advisory	NXT MSG: [BFR] nnnnnnnn/nnnnZ or NO MSG EXP	NXT MSG: 20040925/2000Z

Note:- Fictitious location.

Example A2-2. Advisory message for tropical cyclones

TC ADVISORY	
DTG:	20040925/1600Z
TCAC:	YUFO
TC:	GLORIA
NR:	01
PSN:	N2706 W07306
MOV:	NW 20KMH
C:	965HPA
MAX WIND:	22MPS
FCST PSN +6 HR:	25/2200Z N2748 W07350
FCST MAX WIND +6 HR:	22MPS
FCST PSN +12 HR:	26/0400Z N2830 W07430
FCST MAX WIND +12 HR:	22MPS
FCST PSN +18 HR:	26/1000Z N2852 W07500
FCST MAX WIND +18 HR:	21MPS
FCST PSN +24 HR:	26/1600Z N2912 W07530
FCST MAX WIND +24 HR:	20MPS
RMK:	NIL
NXT MSG:	20040925/2000Z

Appendix 3. TECHNICAL SPECIFICATIONS RELATED TO METEOROLOGICAL OBSERVATIONS AND REPORTS

I GENERAL PROVISIONS RELATED TO METEOROLOGICAL OBSERVATIONS

- 1.1. The meteorological instruments used at an aerodrome should be situated in such a way as to supply data which are representative of the area for which the measurements are required.

Note:- Specifications concerning the siting and construction of equipment and installations on operational areas, aimed at reducing the hazard to aircraft to a minimum, are contained in Annex 14, Volume I, Chapter 9.

- 1.2. Meteorological instruments at aeronautical meteorological stations should be exposed, operated and maintained in accordance with the practices, procedures and specifications promulgated by the World Meteorological Organization.
- 1.3. The observers at an aerodrome should be located, in so far as is practicable, so as to supply data which are representative of the area for which the observations are required.
- 1.4. Where automated equipment forms part of an integrated semi-automatic observing system, displays of data which are made available to the local ATS units should be a subset of and displayed parallel to those available in the local meteorological service unit. In those displays, each meteorological element should be annotated to identify, as appropriate, the locations for which the element is representative.

2 GENERAL CRITERIA RELATED TO METEOROLOGICAL REPORTS:

2.1 FORMAT OF METEOROLOGICAL REPORTS:

- 2.1.1 Local routine and special reports shall be issued in abbreviated plain language, in accordance with the template shown in Table A3-1.
- 2.1.2 METAR and SPECI shall be issued in accordance with the template shown in Table A3-2 and disseminated in the METAR and SPECI code forms prescribed by the World Meteorological Organization.

Note:- The METAR and SPECI code forms are contained in WMO Publication No. 306, Manual on Codes, Volume 1.1, Part A — Alphanumeric Codes.

- 2.1.3 METAR and SPECI should be disseminated, under bilateral agreements between States in a position to do so, in the WMO BUFR code form, in addition to the dissemination of the METAR and SPECI in accordance with 2.1.2.

Note:- The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, Volume 1.2, Part B — Binary Codes.

2.2 USE OF CAVOK:

2.2.1 When the following conditions occur simultaneously at the time of observation:

- a. visibility, 10 km or more, and the lowest visibility is not reported;

Note 1:- In local routine and special reports, visibility refers to the value(s) to be reported in accordance with 4.2.4.2 and 4.2.4.3; in METAR and SPECI, visibility refers to the value(s) to be reported in accordance with 4.2.4.4.

Note 2:- The lowest visibility is reported in accordance with Appendix 3, 4.2.4.4

a) no cloud of operational significance;

b) no weather of significance to aviation as given in 4.4.2.3 and 4.4.2.5;

Information on visibility, runway visual range, present weather and cloud amount, cloud type and height of cloud base shall be replaced in all meteorological reports by the term “CAVOK”.

2.3 CRITERIA FOR ISSUANCE OF LOCAL SPECIAL REPORTS AND SPECI:

2.3.1 The list of criteria for the issuance of local special reports shall include the following:

- a. those values which most closely correspond with the operating minima of the operators using the aerodrome;
- b. those values which satisfy other local requirements of the air traffic services units and of the operators;
- c. an increase in air temperature of 2°C or more from that given in the latest report, or an alternative threshold value as agreed between the meteorological authority, the appropriate ATS authority and the operators concerned;
- d. the available supplementary information concerning the occurrence of significant meteorological conditions in the approach and climb-out areas as given in Table A3-1; and
- e. those values which constitute criteria for SPECI.

2.3.2 Where required in accordance with 4.4.2 b), SPECI shall be issued whenever changes in accordance with the following criteria occur:

- a. when the mean surface wind direction has changed by 60° or more from that given in the latest report, the mean speed before and/or after the change being 5 m/s (10 kt) or more;
- b. when the mean surface wind speed has changed by 5 m/s (10 kt) or more from that given in the latest report;
- c. when the variation from the mean surface wind speed (gusts) has increased by 5 m/s (10 kt) or more from that at the time of the latest report, the mean speed before and/or after the change being 7.5 m/s (15 kt) or more;
- d. when the onset, cessation or change in intensity of any of the following weather phenomena occurs:
 1. freezing precipitation;
 2. moderate or heavy precipitation (including showers thereof); and
 3. thunderstorm (with precipitation);
- e. when the onset or cessation of any of the following weather phenomena occurs:
 1. freezing fog; and
 2. thunderstorm (without precipitation);

- f. when the amount of a cloud layer below 450 m (1 500 ft) changes:
 - 1. from SCT or less to BKN or OVC; or
 - 2. from BKN or OVC to SCT or less.

2.3.3 Where required in accordance with 4.4.2 b), SPECI should be issued whenever changes in accordance with the following criteria occur:

- a. When the wind changes through values of operational significance. The threshold values should be established by the meteorological authority in consultation with the appropriate ATS authority and operators concerned, taking into account changes in the wind which would:
 - 1. require a change in runway(s) in use; and
 - 2. indicate that the runway tailwind and crosswind components have changed through values representing the main operating limits for typical aircraft operating at the aerodrome;
- b. when the visibility is improving and changes to or passes through one or more of the following values, or when the visibility is deteriorating and passes through one or more of the following values:
 - 1. 800, 1 500 or 3 000 m; and
 - 2. 5 000 m, in cases where significant numbers of flights are operated in accordance with the visual flight rules;

Note 1:- In local special reports, visibility refers to the value(s) to be reported in accordance with 4.2.4.2 and 4.2.4.3; in SPECI, visibility refers to the value(s) to be reported in accordance with 4.2.4.4.

Note 2:- Visibility refers to “prevailing visibility” except in the case where only the lowest visibility is reported in accordance with 4.2.4.4 b).

- c. when the runway visual range is improving and changes to or passes through one or more of the following values, or when the runway visual range is deteriorating and passes through one or more of the following values: 150, 350, 600 or 800 m;
- d. when the onset, cessation or change in intensity of any of the following weather phenomena occurs:
 - 1. dust storm
 - 2. sandstorm
 - 3. funnel cloud (tornado or waterspout);
- e. when the onset or cessation of any of the following weather phenomena occurs:
 - 1. ice crystals
 - 2. low drifting dust, sand or snow
 - 3. blowing dust, sand or snow
 - 4. squall

- f. when the height of base of the lowest cloud layer of BKN or OVC extent is lifting and changes to or passes through one or more of the following values, or when the height of base of the lowest cloud layer of BKN or OVC extent is lowering and passes through one or more of the following values:
 - 1. 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft); and
 - 2. 450 m (1 500 ft), in cases where significant numbers of flights are operated in accordance with the visual flight rules;
- g. when the sky is obscured and the vertical visibility is improving and changes to or passes through one or more of the following values, or when the vertical visibility is deteriorating and passes through one or more of the following values: 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft); and
- h. any other criteria based on local aerodrome operating minima, as agreed between the meteorological authority and the operators.

Note:- Other criteria based on local aerodrome operating minima are to be considered in parallel with similar criteria for the inclusion of change groups and for the amendment of TAF developed in response to 1.3.2 j) of Appendix 5.

- 2.3.4 When a deterioration of one weather element is accompanied by an improvement in another element, a single SPECI shall be issued; it shall then be treated as a deterioration report.

3 DISSEMINATION OF METEOROLOGICAL REPORTS

3.1 METAR AND SPECI:

- 3.1.1 METAR and SPECI shall be disseminated to international OPMET databanks and the centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems, in accordance with regional air navigation agreement.
- 3.1.2 METAR and SPECI shall be disseminated to other aerodromes in accordance with regional air navigation agreement.
- 3.1.3 SPECI representing a deterioration in conditions shall be disseminated immediately after the observation. A SPECI representing a deterioration of one weather element and an improvement in another element shall be disseminated immediately after the observation.
- 3.1.4 A SPECI representing an improvement in conditions should be disseminated only after the improvement has been maintained for 10 minutes; it should be amended before dissemination, if necessary, to indicate the conditions prevailing at the end of that 10-minute period.

3.2 Local routine and special reports:

- 3.2.1 Local routine reports shall be transmitted to local air traffic services units and shall be made available to the operators and to other users at the aerodrome.

- 3.2.2 Local special reports shall be transmitted to local air traffic services units as soon as the specified conditions occur. However, by agreement between the meteorological authority and the appropriate ATS authority, they need not be issued in respect of:
- 3.2.3 any element for which there is in the local air traffic services unit a display corresponding to the one in the meteorological station, and where arrangements are in force for the use of this display to update information included in local routine and special reports; and
- 3.2.4 runway visual range, when all changes of one or more steps on the reporting scale in use are being reported to the local air traffic services unit by an observer on the aerodrome.

Local special reports shall also be made available to the operators and to other users at the aerodrome.

4 OBSERVING AND REPORTING OF METEOROLOGICAL ELEMENTS:

Introductory Note:- Selected criteria applicable to meteorological information referred to under 4.1 to 4.8 for inclusion in aerodrome reports are given in tabular form at Attachment C.

4.1 SURFACE WIND:

4.1.1 Siting:

- 4.1.1.1 Surface wind should be observed at a height of 10 ± 1 m (30 ± 3 ft) above the ground.
- 4.1.1.2 Representative surface wind observations should be obtained by the use of sensors appropriately sited. Sensors for surface wind observations for local routine and special reports should be sited to give the best practicable indication of conditions along the runway and touchdown zones. At aerodromes where topography or prevalent weather conditions cause significant differences in surface wind at various sections of the runway, additional sensors should be provided.

Note:- Since, in practice, the surface wind cannot be measured directly on the runway, surface wind observations for take-off and landing are expected to be the best practicable indication of the winds which an aircraft will encounter during take-off and landing.

4.1.2 Displays:

- 4.1.2.1 Surface wind displays relating to each sensor shall be located in the meteorological station with corresponding displays in the appropriate air traffic services units. The displays in the meteorological station and in the air traffic services units shall relate to the same sensors, and where separate sensors are required as specified in 4.1.1.2, the displays shall be clearly marked to identify the runway and section of runway monitored by each sensor.
- 4.1.2.2 The mean values of, and significant variations in, the surface wind direction and speed for each sensor should be derived and displayed by automated equipment.

4.1.3 Averaging:

4.1.3.1 The averaging period for surface wind observations shall be:

- a. 2 minutes for local routine and special reports and for wind displays in air traffic services units; and
- b. 10 minutes for METAR and SPECI, except that when the 10-minute period includes a marked discontinuity in the wind direction and/or speed, only data occurring after the discontinuity shall be used for obtaining mean values; hence, the time interval in these circumstances shall be correspondingly reduced.

Note:- A marked discontinuity occurs when there is an abrupt and sustained change in wind direction of 30° or more, with a wind speed of 5m/s (10 kt) before or after the change, or a change in wind speed of 5m/s (10 kt) or more, lasting at least 2 minutes.

4.1.3.2 The averaging period for measuring variations from the mean wind speed (gusts) reported in accordance with 4.1.5.2 c) should be 3 seconds for local routine and special reports and for METAR and SPECI and for wind displays used for depicting variations from the mean wind speed (gusts) in air traffic services units.

4.1.4 Accuracy of measurement:

4.1.4.1 The reported direction and speed of the mean surface wind, as well as variations from the mean surface wind, should meet the operationally desirable accuracy of measurement as given in Attachment A.

4.1.5 Reporting:

4.1.5.1 In local routine and special reports and in METAR and SPECI, the surface wind direction and speed shall be reported in steps of 10 degrees true and 1 metre per second (or 1 knot), respectively. Any observed value that does not fit the reporting scale in use shall be rounded to the nearest step in the scale.

4.1.5.2 In local routine and special reports and in METAR and SPECI:

- a. the units of measurement used for the wind speed shall be indicated;
- b. variations from the mean wind direction during the past 10 minutes shall be reported as follows, if the total variation is 60° or more:
 1. when the total variation is 60° or more and less than 180° and the wind speed is 1.5 m/s (3 kt) or more, such directional variations shall be reported as the two extreme directions between which the surface wind has varied;
 2. when the total variation is 60° or more and less than 180° and the wind speed is less than 1.5 m/s (3 kt), the wind direction shall be reported as variable with no mean wind direction;or

3. when the total variation is 180° or more, the wind direction shall be reported as variable with no mean wind direction;
- c. variations from the mean wind speed (gusts) during the past 10 minutes shall be reported when the maximum wind speed exceeds the mean speed by:
 1. 2.5 m/s (5 kt) or more in local routine and special reports when noise abatement procedures are applied in accordance with paragraph 7.2.6 of the PANS-ATM (Doc4444); or
 2. 5 m/s (10 kt) or more otherwise;
- d. when a wind speed of less than 0.5 m/s (1 kt) is reported, it shall be indicated as calm;
- e. when a wind speed of 50 m/s km/h (100 kt) or more is reported, it shall be indicated to be more than 49 m/s (99 kt); and
- f. when the 10-minute period includes a marked discontinuity in the wind direction and/or speed, only variations from the mean wind direction and mean wind speed occurring since the discontinuity shall be reported.

Note:- See note under 4.1.3.1.

4.1.5.3 In local routine and special reports:

- a. if the surface wind is observed from more than one location along the runway, the locations for which these values are representative shall be indicated;
- b. when there is more than one runway in use and the surface wind related to these runways is observed, the available wind values for each runway shall be given, and the runways to which the values refer shall be reported;
- c. when variations from the mean wind direction are reported in accordance with 4.1.5.2 b) 2), the two extreme directions between which the surface wind has varied shall be reported; and
- d. when variations from the mean wind speed (gusts) are reported in accordance with 4.1.5.2 c), they shall be reported as the maximum and minimum values of the wind speed attained.

4.1.5.4 In METAR and SPECI, when variations from the mean wind speed (gusts) are reported in accordance with 4.1.5.2 c), the maximum value of the wind speed attained shall be reported.

4.2 VISIBILITY:

4.2.1 Siting:

4.2.1.1 When instrumented systems are used for the measurement of visibility, the visibility should be measured at a height of approximately 2.5 m (7.5 ft) above the runway.

4.2.1.2 When instrumented systems are used for the measurement of visibility, representative visibility observations should be obtained by the use of sensors appropriately sited. Sensors for visibility

observations for local routine and special reports should be sited to give the best practicable indications of visibility along the runway and touchdown zone.

4.2.2 Displays:

4.2.2.1 When instrumented systems are used for the measurement of visibility, visibility displays relating to each sensor should be located in the meteorological station with corresponding displays in the appropriate air traffic services units. The displays in the meteorological station and in the air traffic services units should relate to the same sensors, and where separate sensors are required as specified in 4.2.1, the displays should be clearly marked to identify the area, e.g. runway and section of runway, monitored by each sensor.

4.2.3 Averaging:

4.2.3.1 When instrumented systems are used for the measurement of visibility, their output should be updated at least every 60 seconds to permit provision of current representative values. The averaging period should be:

- a. 1 minute for local routine and special reports and for visibility displays in air traffic services units; and
- b. 10 minutes for METAR and SPECI, except that when the 10-minute period immediately preceding the observation includes a marked discontinuity in the visibility, only those values occurring after the discontinuity should be used for obtaining mean values.

Note:- A marked discontinuity occurs when there is an abrupt and sustained change in visibility, lasting at least 2 minutes, which reaches or passes through criteria for the issuance of SPECI reports given in 2.3.

4.2.4 Reporting:

4.2.4.1 In local routine and special reports and in METAR and SPECI, the visibility shall be reported in steps of 50 m when the visibility is less than 800 m; in steps of 100 m, when it is 800 m or more but less than 5 km; in kilometre steps, when the visibility is 5 km or more but less than 10 km; and it shall be given as 10 km when the visibility is 10 km or more, except when the conditions for the use of CAVOK apply. Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

Note:- Specifications concerning the use of CAVOK are given in 2.2.

4.2.4.2 In local routine and special reports, visibility along the runway(s) shall be reported together with the units of measurement used to indicate visibility.

4.2.4.3 In local routine and special reports, when instrumented systems are used for the measurement of visibility:

- a. if the visibility is observed from more than one location along the runway as specified in Para D4.6..2.2, the values representative of the touchdown zone should be reported first,

followed, as necessary, by the values representative of the mid-point and stop-end of the runway, and the locations for which these values are representative should be indicated; and

- b. when there is more than one runway in use and the visibility is observed related to these runways, the available visibility values for each runway should be reported, and the runways to which the values refer should be indicated.

4.2.4.4 In METAR and SPECI, visibility should be reported as prevailing visibility, as defined in Para D1. When the visibility is not the same in different directions and

- a. when the lowest visibility is different from the prevailing visibility, and
 - i. less than 1 500 m or
 - ii. less than 50 per cent of the prevailing visibility and less than 5 000 m;

the lowest visibility observed should also be reported and, when possible, its general direction in relation to the aerodrome reference point indicated by reference to one of the eight points of the compass. If the lowest visibility is observed in more than one direction, then the most operationally significant direction should be reported; and

- b. when the visibility is fluctuating rapidly, and the prevailing visibility cannot be determined, only the lowest visibility should be reported, with no indication of direction.

4.3 RUNWAY VISUAL RANGE:

4.3.1 Siting:

4.3.1.1 Runway visual range should be assessed at a height of approximately 2.5 m (7.5 ft) above the runway.

4.3.1.2 Runway visual range should be assessed at a lateral distance from the runway centre line of not more than 120 m. The site for observations to be representative of the touchdown zone should be located about 300 m along the runway from the threshold. The sites for observations to be representative of the mid- point and stop-end of the runway should be located at a distance of 1 000 to 1 500 m along the runway from the threshold and at a distance of about 300 m from the other end of the runway. The exact position of these sites and, if necessary, additional sites should be decided after considering aeronautical, meteorological and climatological factors such as long runways, swamps and other fog-prone areas.

4.3.2 Instrumented systems:

Note: Since accuracy can vary from one instrument design to another, performance characteristics are to be checked before selecting an instrument for assessing RVR. The calibration of a forward-scatter meter has to be traceable and verifiable to a transmissometer standard, the accuracy of which has been verified over the intended operational range. Guidance on the use of transmissometers and forward-scatter meters in instrumented RVR systems is given in the Manual of Runway Visual Range Observing and Reporting Practices (Doc 9328).

- 4.3.2.1 Instrumented systems based on transmissometers or forward-scatter meters shall be used to assess runway visual range on runways intended for Category II and III instrument approach and landing operations.
- 4.3.2.2 Instrumented systems based on transmission meters or forward-scatter meters should be used to assess runway visual range on runways intended for Category I instrument approach and landing operations.
- 4.3.3 Display:
- 4.3.3.1 Where runway visual range is determined by instrumented systems, one display or more, if required, shall be located in the meteorological station with corresponding displays in the appropriate air traffic services units. The displays in the meteorological station and in the air traffic services units shall be related to the same sensors, and where separate sensors are required as specified in 4.3.1.2, the displays shall be clearly marked to identify the runway and section of runway monitored by each sensor.
- 4.3.3.2 Where runway visual range is determined by human observers, runway visual range should be reported to the appropriate local air traffic services units, whenever there is a change in the value to be reported in accordance with the reporting scale (except where the provisions of 3.2.2 a) or b) apply). The transmission of such reports should normally be completed within 15 seconds after the termination of the observation.
- 4.3.4 Averaging:
- 4.3.4.1 Where instrumented systems are used for the assessment of runway visual range, their output shall be updated at least every 60 seconds to permit the provision of current, representative values. The averaging period for runway visual range values shall be:
- a. 1 minute for local routine and special reports and for runway visual range displays in air traffic services units; and
 - b. 10 minutes for METAR and SPECI, except that when the 10-minute period immediately preceding the observation includes a marked discontinuity in runway visual range values, only those values occurring after the discontinuity shall be used for obtaining mean values.
- Note:- A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least 2 minutes, which reaches or passes through the values included in criteria for the issuance of SPECI reports given in 2.3.3 c).*
- 4.3.5 Runway light intensity:
- 4.3.5.1 When instrumented systems are used for the assessment of runway visual range, computations should be made separately for each available runway. RVR should not be computed for a light intensity of 3 per cent or less of the maximum light intensity available on a runway. For local routine and special reports, the light intensity to be used for the computation should be:

- a. for a runway with the lights switched on, the light intensity actually in use on that runway; and
- b. for a runway with lights switched off (or at the lowest setting pending the resumption of operations), the optimum light intensity that would be appropriate for operational use in the prevailing conditions.

4.3.5.2 In METAR and SPECI, the runway visual range should be based on the maximum light intensity available on the runway.

Note:- Guidance on the conversion of instrumented readings into runway visual range is given at attachment D.

4.3.6 Reporting:

4.3.6.1 In local routine and special reports and in METAR and SPECI, the runway visual range shall be reported in steps of 25 m when the runway visual range is less than 400 m; in steps of 50 m when it is between 400 m and 800 m; and in steps of 100 m when the runway visual range is more than 800 m. Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

4.3.6.2 Fifty metres should be considered the lower limit and 2 000 metres the upper limit for runway visual range. Outside of these limits, local routine and special reports and METAR and SPECI should merely indicate that the runway visual range is less than 50 m or more than 2 000m.

4.3.6.3 In local routine and special reports and in METAR and SPECI:

- a. when runway visual range is above the maximum value that can be determined by the system in use, it shall be reported using the abbreviation “ABV” in local routine and special reports and the abbreviation “P” in METAR and SPECI, followed by the maximum value that can be determined by the system; and
- b. when the runway visual range is below the minimum value that can be determined by the system in use, it shall be reported using the abbreviation “BLW” in local routine and special reports and the abbreviation “M” in METAR and SPECI, followed by the minimum value that can be determined by the system.

4.3.6.4 In local routine and special reports:

- a. the units of measurement used shall be included;
- b. if runway visual range is observed from only one location along the runway, i.e. the touchdown zone, it shall be included without any indication of location;
- c. if the runway visual range is observed from more than one location along the runway, the value representative of the touchdown zone shall be reported first, followed by the values representative of the mid-point and stop-end and the locations for which these values are representative shall be indicated; and

- d. when there is more than one runway in use, the available runway visual range values for each runway shall be reported and the runways to which the values refer shall be indicated.

4.3.6.5 In METAR and SPECI:

- a. only the value representative of the touchdown zone should be reported and no indication of location on the runway should be included; and
- b. where there is more than one runway available for landing, touchdown zone runway visual range values should be included for all such runways, up to a maximum of four, and the runways to which the values refer should be indicated.

4.3.6.6 In METAR and SPECI when instrumented systems are used for the assessment of runway visual range, the variations in runway visual range during the 10-minute period immediately preceding the observation should be included as follows:

- a. if the runway visual range values during the 10-minute period have shown a distinct tendency, such that the mean during the first 5 minutes varies by 100 m or more from the mean during the second 5 minutes of the period, this should be indicated. When the variation of the runway visual range values shows an upward or downward tendency, this should be indicated by the abbreviation “U” or “D”, respectively. In circumstances when actual fluctuations during the 10-minute period show no distinct tendency, this should be indicated using the abbreviation “N”. When indications of tendency are not available, no abbreviations should be included; and
- b. if the 1-minute runway visual range values during the 10-minute period vary from the mean value by more than 50 m or more than 20 per cent of the mean value, whichever is greater, the 1-minute mean minimum and the 1-minute mean maximum values should be reported instead of the 10-minute mean value. If the 10-minute period immediately preceding the observation includes a marked discontinuity in runway visual range values, only those values occurring after the discontinuity should be used to obtain variations.

Note:- A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least 2 minutes, which reaches or passes through criteria for the issuance of SPECI given in 2.3.3 c).

4.4 PRESENT WEATHER:

4.4.1 Siting:

- 4.4.1.1 When instrumented systems are used for observing present weather phenomena listed under 4.4.2.3 and 4.4.2.6, representative information should be obtained by the use of sensors appropriately sited.

4.4.2 Reporting:

- 4.4.2.1 In local routine and special reports, observed present weather phenomena shall be reported in terms of type and characteristics and qualified with respect to intensity, as appropriate.
- 4.4.2.2 In METAR and SPECI, observed present weather phenomena shall be reported in terms of type and characteristics and qualified with respect to intensity or proximity to the aerodrome, as appropriate.
- 4.4.2.3 In local routine and special reports and in METAR and SPECI, the following types of present weather phenomena should be reported, using their respective abbreviations and relevant criteria, as appropriate:

a. Precipitation

Drizzle	DZ
Rain	RA
Snow grains	SN
Snow	SG
Ice pellets	PL
Ice crystals (very small ice crystals in suspension, also known as diamond dust)	IC
— Reported only when associated visibility is 5000m or less.	
Hail	GR
— Reported when diameter of largest hailstones is 5 mm or more.	
Small hail and/or snow pellets	GS
— Reported when diameter of largest hailstones is less than 5 mm;	

b. Obscurations (hydrometeors)

Fog	FG
— Reported when visibility is less than 1000 m, except when qualified by “MI”, “BC”, “PR” or “VC” (see 4.4.2.5 and 4.4.2.6).	
Mist	BR
— Reported when visibility is at least 1 000 m but not more than 5 000 m;	

c. Obscurations (lithometeors)

- The following should be used only when the obscuration consists predominantly of lithometeors and the visibility is 5 000 m or less except “SA” when qualified by “DR” (see 4.4.2.5) and volcanic ash.

Sand	SA
Dust (widespread)	DU
Haze	HZ
Smoke	FU
Volcanic ash	VA

d. Other phenomena

Dust/sand whirls (dust devils)	PO
Squall	SQ

Funnel cloud (Tornado or waterspout)	FC
Duststorm	DS
Sandstorm	SS

4.4.2.4 In automated local routine and special reports and METAR and SPECI, in addition to the precipitation types listed under 4.4.2.3 a), the abbreviation UP should be used for unidentified precipitation when the type of precipitation cannot be identified by the automatic observing system.

4.4.2.5 In local routine and special reports and in METAR and SPECI, the following characteristics of present weather phenomena, as necessary, shall be reported, using their respective abbreviations and relevant criteria, as appropriate:

a. Thunderstorm TS

Used to report a thunderstorm with precipitation in accordance with the templates shown in Tables A3-1 and A3-2. When thunder is heard or lightning is detected at the aerodrome during the 10-minute period preceding the time of observation but no precipitation is observed at the aerodrome, the abbreviation “TS” shall be used without qualification.

b. Freezing FZ

Supercooled water droplets or precipitation, used with types of present weather phenomena in accordance with the templates shown in Tables A3-1 and A3-2.

Note:- At aerodromes with human observers, lightning detection equipment may supplement human observations. For aerodromes with automatic observing systems, guidance on the use of lightning detection equipment intended for thunderstorm reporting is given in the Manual on Automatic Meteorological Observing Systems at Aerodromes (Doc 9837).

4.4.2.6 In local routine and special reports and in METAR and SPECI, the following characteristics of present weather phenomena, as necessary, should be reported, using their respective abbreviations and relevant criteria, as appropriate:

a. Shower SH

Used to report showers in accordance with the templates shown in Tables A3-1 and A3-2. Showers observed in the vicinity of the aerodrome (see 4.4.2.7) should be reported as “VCSH” without qualification regarding type or intensity of precipitation.

b. Blowing BL

Used in accordance with the templates shown in Tables A3-1 and A3-2 with types of present weather phenomena raised by the wind to a height of m (6 ft) or more above the ground.

c. Low drifting DR

Used in accordance with the templates shown in Tables A3-1 and A3-2 with types of present weather phenomena raised by the wind to less than 2 m (6 ft) above ground level.

- d. Shallow MI
Less than 2 m (6 ft) above ground level.
- e. Patches BC
Fog patches randomly covering the aerodrome.
- f. Partial PR
A substantial part of the aerodrome covered by fog while the remainder is clear.

4.4.2.7 In local routine and special reports and in METAR and SPECI, the relevant intensity or, as appropriate, the proximity to the aerodrome of the reported present weather phenomena should be indicated as follows:

	(local routine & special reports)	(METAR & SPECI)
Light	FBL	—
Moderate	MOD	(no indication)
Heavy	HVY	+

Used with types of present weather phenomena in accordance with the templates shown in Tables A3-1 and A3-2. Light intensity should be indicated only for precipitation.

Vicinity VC
Between approximately 8 and 16 km of the aerodrome reference point and used only in METAR and SPECI with present weather in accordance with the template shown in Table A3-2 when not reported under 4.4.2.6.

- 4.4.2.8 In local routine and special reports and in METAR and SPECI:
- a. one or more, up to a maximum of three, of the present weather abbreviations given in 4.4.2.3 and 4.4.2.5 shall be used, as necessary, together with an indication, where appropriate, of the characteristics and intensity or proximity to the aerodrome, so as to convey a complete description of the present weather of significance to flight operations;
 - b. the indication of intensity or proximity, as appropriate, shall be reported first followed respectively by the characteristics and the type of weather phenomena; and
 - c. where two different types of weather are observed, they shall be reported in two separate groups, where the intensity or proximity indicator refers to the weather phenomenon which follows the indicator. However, different types of precipitation occurring at the time of observation shall be reported as one single group with the dominant type of precipitation reported first and preceded by only one intensity qualifier which refers to the intensity of the total precipitation.

4.5 CLOUDS:

4.5.1 Siting:

4.5.1.1 When instrumented systems are used for the measurement of the cloud amount and the height of cloud base, representative observations should be obtained by the use of sensors appropriately sited. For local routine and special reports, in the case of aerodromes with precision approach runways, sensors for cloud amount and height of cloud base should be sited to give the best practicable indications of the height of cloud base and cloud amount at the middle marker site of the instrument landing system or, at aerodromes where a middle marker beacon is not used, at a distance of 900 to 1 200 m (3 000 to 4 000 ft) from the landing threshold at the approach end of the runway.

Note:- Specifications concerning the middle marker site of an instrument landing system are given in Annex 10, Volume I, Chapter 3 and at Attachment C, Table C-5.

4.5.2 Display:

4.5.2.1 When automated equipment is used for the measurement of the height of cloud base, height of cloud base display(s) should be located in the meteorological station with corresponding display(s) in the appropriate air traffic services units. The displays in the meteorological station and in the air traffic services units should relate to the same sensor, and where separate sensors are required as specified in 4.5.1, the displays should clearly identify the area monitored by each sensor.

4.5.3 Reference level:

4.5.3.1 The height of cloud base shall be reported above aerodrome elevation. When a precision approach runway is in use which has a threshold elevation 15 m (50 ft) or more below the aerodrome elevation, local arrangements shall be made in order that the height of cloud bases reported to arriving aircraft shall refer to the threshold elevation. In the case of reports from offshore structures, the height of cloud base shall be given above mean sea level.

4.5.4 Reporting:

4.5.4.1 In local routine and special reports and in METAR and SPECI, the height of cloud base shall be reported in steps of 30 m (100 ft) up to 3 000 m (10 000 ft). Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

4.5.4.2 At aerodromes where low-visibility procedures are established for approach and landing, as agreed between the meteorological authority and the appropriate ATS authority, in local routine and special reports the height of cloud base should be reported in steps of 15 m (50 ft) up to and including 90 m (300 ft) and in steps of 30 m (100 ft) between 90 m (300 ft) and 3 000 m (10 000 ft), and the vertical visibility in steps of 15 m (50 ft) up to and including 90 m (300 ft) and in steps of 30 m (100 ft) between 90 m (300 ft) and 600 m (2 000 ft). Any observed value which does not fit the reporting scale shall be rounded down to the nearest lower step in the scale.

4.5.4.3 In local routine and special reports and in METAR and SPECI:

- a. cloud amount should be reported using the abbreviations “FEW” (1 to 2 oktas), “SCT” (3 to 4 oktas), “BKN” (5 to 7 oktas) or “OVC” (8 oktas);
- b. cumulonimbus clouds and towering cumulus clouds should be indicated as “CB” and “TCU”, respectively;
- c. the vertical visibility should be reported in steps of 30 m (100 ft) up to 600 m (2 000 ft);
- d. if there are no clouds of operational significance and no restriction on vertical visibility and the abbreviation “CAVOK” is not appropriate, the abbreviation “NSC” should be used;
- e. when several layers or masses of cloud of operational significance are observed, their amount and height of cloud base should be reported in increasing order of the height of cloud base, and in accordance with the following criteria:
 1. the lowest layer or mass, regardless of amount to be reported as FEW, SCT, BKN or OVC as appropriate;
 2. the next layer or mass, covering more than 2/8 to be reported as SCT, BKN or OVC as appropriate;
 3. the next higher layer or mass, covering more than 4/8 to be reported as BKN or OVC as appropriate; and
 4. cumulonimbus and/or towering cumulus clouds, whenever observed and not reported in 1 to 3;
- f. when the cloud base is diffuse or ragged or fluctuating rapidly, the minimum height of cloud base, or cloud fragments, should be reported; and
- g. when an individual layer (mass) of cloud is composed of cumulonimbus and towering cumulus clouds with a common cloud base, the type of cloud should be reported as cumulonimbus only.

Note:- Towering cumulus indicates cumulus congestus clouds of great vertical extent.

4.5.4.4 In local routine and special reports:

- a. the units of measurement used for the height of cloud base and vertical visibility shall be indicated; and
- b. when there is more than one runway in use and the heights of cloud bases are observed by instruments for these runways, the available heights of cloud bases for each runway shall be reported and the runways to which the values refer shall be indicated.

4.5.4.5 In automated local routine and special reports and METAR and SPECI:

- a. when the cloud type cannot be observed by the automatic observing system, the cloud type in each cloud group should be replaced by “//”;
- b. when no clouds are detected by the automatic observing system, it should be indicated by using the abbreviation “NCD”; and
- c. when cumulonimbus clouds or towering cumulus clouds are detected by the automatic observing system and the cloud amount and the height of cloud base cannot be observed, the cloud amount and the height of cloud base should be replaced by “/////”.

4.6 AIR TEMPERATURE AND DEW POINT TEMPERATURE:

4.6.1 Display:

4.6.1.1 When automated equipment is used for the measurement of air temperature and dew-point temperature, air temperature and dew-point temperature displays should be located in the meteorological station with corresponding displays in the appropriate air traffic services units. The displays in the meteorological station and in the air traffic services units should relate to the same sensors.

4.6.2 Reporting:

4.6.2.1 In local routine and special reports and in METAR and SPECI, the air temperature and the dew-point temperature shall be reported in steps of whole degrees Celsius. Any observed value which does not fit the reporting scale in use shall be rounded to the nearest whole degree Celsius, with observed values involving 0.5° rounded up to the next higher whole degree Celsius.

4.6.2.2 In local routine and special reports and in METAR and SPECI, a temperature below 0°C shall be identified.

4.7 ATMOSPHERIC PRESSURE:

4.7.1 Display:

4.7.1.1 When automated equipment is used for the measurement of atmospheric pressure, QNH and, if required in accordance with 4.7.3.2 b), QFE displays relating to the barometer shall be located in the meteorological station with corresponding displays in the appropriate air traffic services units. When QFE values are displayed for more than one runway, as specified in 4.7.3.2 d), the displays shall be clearly marked to identify the runway to which the QFE value displayed refers.

4.7.2 Reference level:

4.7.2.1 The reference level for the computation of QFE should be the aerodrome elevation. For non-precision approach runways, the thresholds of which are 2 m (7 ft) or more below the aerodrome elevation, and for precision approach runways, the QFE, if required, should refer to the relevant threshold elevation.

4.7.3 Reporting:

4.7.3.1 For local routine and special reports and in METAR and SPECI, QNH and QFE shall be computed in tenths of hectopascals and reported therein in steps of whole hectopascals, using four digits. Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower whole hectopascal.

4.7.3.2 In local routine and special reports:

- a. QNH shall be included;
- b. QFE shall be included if required by users or, if so agreed locally between the meteorological and air traffic services authorities and operators concerned, on a regular basis;
- c. the units of measurement used for QNH and QFE values shall be included; and
- d. if QFE values are required for more than one runway, the required QFE values for each runway shall be reported and the runways to which the values refer shall be indicated.

4.7.3.3 In METAR and SPECI, only QNH values shall be included.

4.8 SUPPLEMENTARY INFORMATION:

4.8.1 Reporting:

4.8.1.1 In local routine and special reports and in METAR and SPECI, the following recent weather phenomena, i.e. weather phenomena observed at the aerodrome during the period since the last issued routine report or last hour, whichever is the shorter, but not at the time of observation, should be reported, up to a maximum of three groups, in accordance with the templates shown in Tables A3-1 and A3-2, in the supplementary information:

- a. freezing precipitation
- b. moderate or heavy precipitation (including showers thereof)
- c. blowing snow
- d. dust storm, sandstorm
- e. thunderstorm
- f. funnel cloud (tornado or water spout)
- g. volcanic ash

4.8.1.2 In local routine and special reports, the following significant meteorological conditions, or combinations thereof, should be reported in supplementary information:

a. cumulonimbus clouds	CB
b. thunderstorm	TS
c. moderate or severe Turbulence	MOD TURB, SEV TURB
d. wind shear	WS
e. hail	GR
f. severe squall line	SEV SQL
g. moderate or severe icing	MOD ICE, SEV ICE
h. freezing precipitation	FZDZ, FZRA
i. severe mountain waves	SEV MTW
j. dust storm, sandstorm	DS, SS
k. blowing snow	BLSN
l. funnel cloud (tornado or water spout)	FC

The location of the condition should be indicated. Where necessary, additional information should be included using abbreviated plain language.

4.8.1.3 In automated local routine and special reports, METAR, and SPECI, in addition to the recent weather phenomena listed under 4.8.1.1, recent unknown precipitation should be reported in accordance with the template shown in Table A3-2 when the type of precipitation cannot be identified by the automatic observing system.

4.8.1.4 In METAR and SPECI, where local circumstances so warrant, information on wind shear should be added.

Note:- The local circumstances referred to in 4.8.1.4 include, but are not necessarily limited to, wind shear of a non-transitory nature such as might be associated with low-level temperature inversions or local topography.

4.8.1.5 In METAR and SPECI, the following information should be included in the supplementary information, in accordance with regional air navigation agreement:

- a. information on sea-surface temperature and the state of the sea from aeronautical meteorological stations established on offshore structures in support of helicopter operations; and

b. information on the state of the runway provided by the appropriate airport authority.

Note 1:- The state of the sea is specified in WMO Publication No. 306, Manual on Codes, Volume 1.1, Part A — Alphanumeric Codes, Code Table 3700.

Note 2:- The state of the runway is specified in WMO Publication No. 306, Manual on Codes, Volume 1.1, Part A — Alphanumeric Codes, Code Tables 0366, 0519, 0919 and 1079.

Table A3-1 : Template for the local routine (MET REPORT) and local special (SPECIAL) reports

Key: M = inclusion mandatory, part of every message;
C = inclusion conditional, dependent on meteorological conditions
O = inclusion optional.

Note 1:- The ranges and resolutions for the numerical elements included in the local routine and special reports are shown in Table A3-4.

Note 2:- The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

Element as specified in D4	Detailed Content	Templates	Example	
Identification of the type of report (M)	Type of report	MET REPORT or SPECIAL	MET REPORT SPECIAL	
Location indicator (M)	ICAO location indicator (M)	nnnn	YUDO I	
Time of the observation (M)	Day and actual time of the observation in UTC	nnnnnnZ	221630Z	
Identification of an automated report (C)	Automated report identifier (C)	AUTO	AUTO	
Surface wind (M)	Name of the element (M)	WIND	WIND 240/4MPS (WIND 240/8KT) WIND RWY 18 TDZ 190/6MPS (WIND RWY 18 TDZ 190/12KT) WIND VRB1MPS WIND CALM (WIND VRB2KT) WIND VRB BTN 350/ AND 050/1MPS (WIND VRB BTN 350/ AND 050/2KT) WIND 270/ABV 49MPS (WIND 270/ABV 99KT) WIND 120/3MPS MAX9 MNM2 (WIND 120/6KT MAX18 MNM4) WIND 020/5MPS VRB BTN 350/ AND 070/	
	Runway (O) 2	RWY nn[L] or RWY nn[C] or RWY nn[R]		
	Runway section (O)3	TDZ		
	Wind direction (M)	nnn/ VRB BTN nnn/AND nnn/ or VRB		C A L M
	Wind speed (M)	[ABV]n[n][n]MPS (or [ABV] n[n]KT)		
	Significant speed variations (C)4	MAX [ABV] nn [n] MNM n [n]		C A L M
	Significant directional variations (C)5	VRB BTN nnn/ AND nnn/ -		
	Runway section (O)3 Wind direction (O)3	MID nnn/ VRB BTN nnn/ AND nnn/ or VRB		C A L M
	Wind speed (O)3	[ABV] n[n][n]MPS(or [ABV] n[n]KT)		
	Significant speed variations (C)4	MAX [ABV] nn [n] MNM n [n]		C A L M
Significant directional variations (C)5	VRB BTN nnn/ AND nnn/			

Element as specified in D4	Detailed Content	Templates		Example
				(WIND 020/10KT VRB BTN 350/ AND 070/) WIND RWY 14R MID 140/6MPS (WIND RWY 14R MID 140/12KT)
	Runway section (O)3	END		WIND RWY 27 TDZ 240/8MPS MAX14 MNM5 END 250/7MPS (WIND RWY 27 TDZ 240/16KT MAX28 MNM10 END 250/14KT)
	Wind direction (O)3	nnn/	VRB BTN nnn/ AND nnn/ Or VBR	
	Wind speed (O)3	ABV] n[n][n]KMH (or [ABV] n[n]KT)		
	Significant speed variations (C)4	MAX [ABV] nn [n] MNM n [n]		
	Significant directional variations (C)5	VRB BTN nnn/ AND — nnn/		
Visibility (M)	Name of the element (M)	VIS		C A V O K VIS 350M CAVOK VIS 7KM VIS 10KM VIS RWY 09 TDZ 800M END 1200M VIS RWY 18C TDZ 6KM RWY 27 TDZ 4000M
	Runway (O)2	RWY nn[L] or RWY nn[C] or RWY nn[R]		
	Runway section (O)3	TDZ		
	Visibility (M)	nn[n][n]M or n[n]KM		
	Runway section (O)3	MID		
	Visibility (O)3	nn[n][n]M or n[n]KM		
	Runway section (O)3	END		
	Visibility (O)3	nn[n][n]M or n[n]KM		
RVR (C)6	Name of the element (M)	RVR		C A V O K RVR RWY 32 400M RVR RWY 20 1600M RVR RWY 10L BLW 50M RVR RWY 14 ABV 2000M RVR RWY 10 BLW 150M RVR RWY 12 ABV 1200M RVR RWY 12 TDZ 1100M MID ABV 1400M RVR RWY 16 TDZ 600M MID 500M END 400M RVR RWY 26 500M RWY 20 800M RVR RWY 10L BLW 50M RVR RWY 14 ABV 2000M RVR RWY 10 BLW 150M RVR RWY 12 ABV 1200MRVR RVR RWY 12 TDZ 1100M MID ABV 1400M RWY 16 TDZ 600M MID 500M END 400M RVR RWY 26 500M RWY 20 800M
	Runway (C)7	RWY nn[L] or RWY nn[C] or RWY nn[R]		
	Runway section (C)8	TDZ		
	RVR (M)	[ABV or BLW] nn[n][n]M		
	Runway section (C)8	MID		
	RVR (C)8	[ABV or BLW] nn[n][n]M		
	Runway section (C)8	END		
	RVR (C)8	[ABV or BLW] nn[n][n]M		
Present weather (C)9, 10	Intensity of present weather (C)9	FBL or MOD or HVY	-	C A V O K MOD RA HZ HVY TSRA FG HVY DZ VA FBL SN MIFG HVY TSRASN FBL SNRA FBL DZ FG HVY SHSN BLSN HVY TSUP
	Characteristics and type of present weather (C)9,11	DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZUP12 or FC13 or FZRA or SHGR or SHGS or SHRA or SHSN or SHUP12 or TSGR or TSGS or IC or FG or BR or SA or DU or HZ or FU or VA or SQ or PO or FC or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or		

Element as specified in D4	Detailed Content	Templates			Example
		TSRA or TSSN or TSUPI2 or UPI2	PRFG		
Cloud (M) 12	Name of the element (M)	CLD			CLD NSC CLD SCT 300M OVC 600M (CLD SCT 1000FT OVC 2000FT) CLD OBSC VER VIS 150M (CLD OBSC VER VIS 500FT) CLD BKN TCU 270M (CLD BKN TCU 900FT) CLD RWY 08R BKN 60M RWY 26 BKN 90M (CLD RWY 08R BKN 200FT RWY 26 BKN 300FT) CLD /// CB 400M (CLD /// CB 1200FT) CLD NCD
	Runway (O)2	RWY nn[L] or RWY nn[C] or RWY nn[R]			
	Cloud amount (M) or vertical visibility (O)9	FEW or SCT or BKN or OVC or III12	OBSC	NSC or NCD12	
	Cloud type (C)9	CB or TCU or III12	-		
	Height of cloud base or the value of vertical visibility (C)	nn[n][n]M (or nnn[n]FT)	[VER VIS nn[n]M (or VER VIS nnn[n]FT)]		
Air temperature (M)	Name of the element (M)	T			T17 TMS0
	Air temperature (M)	[MS]nn			
Dew-point temperature (M)	Name of the element (M)	DP			DP15 DPMS18
	Dew-point temperature (M)	[MS]nn			
Pressure values (M)	Name of the element (M)	QNH			QNH 0995HPA QNH 1009HPA QNH 1022HPA QFE 1001HPA QNH 0987HPA QFE RWY 18 0956HPA RWY 24 0955HPA
	QNH (M)	nnnnHPA			
	Name of the element (O)	QFE			
	QFE (O)	[RWY nn[L] or RWY nn[C] or RWY nn[R]] nnnnHPA [RWY nn[L] or RWY nn[C] or RWY nn[R]] nnnnHPA			
Supplementary information (C)9	Significant meteorological phenomena (C)9	CB or TS or MOD TURB or SEV TURB or WS or GR or SEV SQL or MOD ICE or SEV ICE or FZDZ or FZRA or SEV MTW or SS or DS or BLSN or FC15			FC IN APCH WS IN APCH 60M-WIND: 360/13MPS WS RWY 12 REFZRA CB IN CLIMB-OUT RETSRA
	Location of the phenomena (C)9	IN APCH [nnnnM-WIND nnn/nnMPS] or IN CLIMB-OUT [nnnnM-WIND nnnn/nnMPS] (IN APCH [nnnnFT-WIND nnn/nnKT] or IN CLIMBOUT- [nnnnFT-WIND nnn/nnKT]) or RWY nn[n]			
	Recent weather (C)9, 10	REFZDZ or REFZRA or REDZ or RE[SH]RA or RERASN or RE[SH]SN or RESG or RESHGR or RESHGS or REBLSN or RESS or REDS or RETSRA or RETSSN or RETSGR or RETSGS or REFC or REPL or REUPI2 or REFZUPI2 or RETSUP12 or RESHUPI2 or REVA or RETS			
Trend forecast (O)15	Name of the element (M)	TREND			TREND NOSIG TREND BECMG FEW 600M (TREND BECMG FEW 2000FT) TREND TEMPO 250/18MPS MAX 25 (TREND TEMPO 250/36KT MAX 50) TREND BECMG AT1800 VIS 10KM NSW TREND BECMG TLI700 VIS 800M FG
	Change indicator (M)17	NOSIG	BECMG or TEMPO		
	Period of change (C)9		FMnnnn and/or TLnnnn or ATnnnn		
	Wind (C)9		nnn/ [ABV] n[n][n]MPS [MAX[ABV]nn[n]] (or nnn/ [ABV] n[n]KT [MAX[ABV]nn])		

Element as specified in D4	Detailed Content	Templates			Example
	Visibility (C)9	VIS nn[n][n]M or VIS n[n]KM			C A V O K TREND BECMG FM1030 TL1130 CAVOK TREND TEMPO TL1200 VIS 600M BECMG AT1230 VIS 8KM NSW CLD NSC TREND TEMPO FM0300 TL0430 MOD FZRA TREND BECMG FM1900 VIS 500M HVY SNRA TREND BECMG FM1100 MOD SN TEMPO FM1130 BLSN TREND BECMG AT1130 CLD OVC 300M (TREND BECMG AT1130 CLD OVC 1000FT) TREND TEMPO TL1530 HVY SHRA CLD BKN CB 360M (TREND TEMPO TL1530 HVY SHRA CLD BKN CB 1200FT)
	Weather phenomenon: intensity (C)9	FBL or MOD or HVY		NSW	
	Weather phenomenon: characteristics and type (C)9, 10, 11	DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZRA or SHGR or SHGS or SHRA or SHSN or TSGR or TSGS or TSRA or TSSN	IC or FG or BR or SA or DU or HZ or FU or VA or SQ or PO or FC or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or PRFG		
	Name of the element (C)9		CLD		
	Cloud amount and vertical visibility (C)9	FEW or SCT or BKN or OVC	OBSC	NSC	
	Cloud type (C)9	CB or TCU	-		
	Height of cloud base or the value of vertical visibility (C)9	nn[n][n]M (or nnn[n]FT)	[VER VIS nn[n]M (or VER VIS nnn[n]FT)]		

Notes:-

1. Fictitious location.
2. Optional values for one or more runways.
3. Optional values for one or more sections of the runway.
4. To be included in accordance with 4.1.5.2 c).
5. To be included in accordance with 4.1.5.2 b) 1).
6. To be included if visibility or RVR < 1 500 m.
7. To be included in accordance with 4.3.6.4 d).
8. To be included in accordance with 4.3.6.4 c).
9. To be included whenever applicable.
10. One or more, up to a maximum of three groups, in accordance with 4.4.2.8 a), 4.8.1.1 and Appendix 5, 2.2.4.3.
11. Precipitation types listed under 4.4.2.3 a) may be combined in accordance with 4.4.2.8 c) and Appendix 5, 2.2.4.1. Only moderate or heavy precipitation to be indicated in trend forecasts in accordance with Appendix 5, 2.2.4.1.
12. For automated reports only.
13. Heavy used to indicate tornado or waterspout, moderate used to indicate funnel cloud not reaching the ground.
14. Up to four cloud layers in accordance with 4.5.4.3 e).

- 15. Abbreviated plain language may be used in accordance with 4.8.1.2.
- 16. To be included in accordance with Para 6.3.2 of this M
- 17. Number of change indicators to be kept to a minimum in accordance with Appendix 5, 2.2.1, normally not exceeding three groups.

Table A3-2 : Template for METAR and SPECI

Key: M = inclusion mandatory, part of every message;
 C = inclusion conditional, dependent on meteorological conditions or method of observation;
 O = inclusion optional.

Note 1:- The ranges and resolutions for the numerical elements included in METAR and SPECI are shown in Table A3-5 of this appendix.

Note 2:- The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

Element as specified in D4	Detailed content	Template(s)		Examples
Identification of the type of report (M)	Type of report (M)	METAR, METAR COR, SPECI or SPECI COR		METAR METAR COR SPECI
Location indicator (M)		nnnn		YUDO I
Time of the observation (M)		nnnnnZ		221630Z
Identification of an automated or missing report (C)2		AUTO or NIL		AUTO NIL
END OF METAR IF THE REPORT IS MISSING.				
Surface wind (M)	Wind direction (M)	nnn	VRB	24004MPS VRB01MPS (24008KT) (RB02KT) 19006MPS (19012KT) 00000MPS (00000KT) 140P149MPS (140P99KT) 12003G09MPS (12006G18KT) 24008G14MPS (24016G28KT) 02005MPS 350V070 (02010KT 350V070)
	Wind speed (M)	[P]nn[n]		
	Significant speed variations (C)3	G[P]nn[n]		
	Units of measurement (M)	MPS (or KT)		
	Significant directional variations (C)4	nnVnnn	-	
Visibility (M)	Prevailing or minimum visibility (M)5	nnnn		0350 7000 9999 0800
	Minimum visibility and direction of the minimum visibility (C)6	nnnn[N] or nnnn[NE] or nnnn[E] or nnnn[SE] or nnnn[S] or nnnn[SW] or nnnn[W] or nnnn[NW]		2000 1200NW 6000 2800E 6000 2800
RVR (C)7	Name of the element (M)	R		R32/0400 R12R/1700
	Runway (M)	nn[L]/or nn[C]/ or nn[R]/		R10/M0050 R14L/P2000

Element as specified in D4	Detailed content	Template(s)			Examples
	RVR (M)	[P or M]nnnn			R16L/0650 R16C/0500 R16R/0450 R17L/0450 R20/0700V1200 R19/0350VPI200 R12/1100U R26/0550N R20/0800D R09/0375V0600U R10/M0150V0500D
	RVR variations (C)8	V[P or M]nnnn			
	RVR past tendency (C)9	U, D or N			
Present weather (C) 2,10	Intensity or proximity of present weather (C)11	- or +	-	VC	RA HZ VCFG +TSRA FG VCSH +DZ VA VCTS -SN MIFG VCBLSA +TSRASN -SNRA DZ FG +SHSN BLSN UP FZUP TSUP FZUP
	Characteristics and type of present weather (M)12	DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZRA or FZUP13 or FC14 or SHGR or SHGS or SHRA or SHSN or SHUP13 or TSGR or TSGS or TSRA or TSSN or TSUP13 or UPI3	IC or FG or BR or SA or DU or HZ or FU or VA or SQ or PO or FC or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or PRFG	FG or PO or FC or DS or SS or TS or SH or BLSN or BLSA or BLDU or VA	
Cloud (M)14	Cloud amount and height of cloud base or vertical visibility (M)	FEWnnn or SCTnnn or BKNnnn or OVCnnn or /////13	VVnnn or VV///	NSC or NCD13	FEW015 VV005 OVC030 VV/// NSC SCT010 OVC020 BKN025/// BKN009TCU NCD SCT008 BKN025CB /////CB
	Cloud type (C)2	CB or TCU or ///13	-		
Air and dew-point temperature (M)	Air and dew-point temperature (M)	[M]nn/[M]nn			17/10 02/M08 M01/M10
Pressure values (M)	Name of the element (M)	Q			Q0995 Q1009 Q1022 Q0987
	QNH (M)	nnn			
Supplementary information (C)	Recent weather (C)2, 10	REFZDZ or REFZRA or REDZ or RE[SH]RA or RERASN or RE[SH]SN or RESG or RESHGR or RESHGS or REBLSN or RESS or REDS or RETSRA or RETSSN or RETSGR or RETSGS or RETS or REFC or REVA or REPL or REUPI3 or REFZUPI3 or RETSUP13 or RESHUPI3			REFZRA RETSRA
	Wind shear (C)2	WS Rnn[L] or WS Rnn[C] or WS Rnn[R] or WS ALL RWY			WS R03 WS ALL RWY WS R18C

Element as specified in D4	Detailed content	Template(s)	Examples		
	Sea-surface temperature and state of the sea (C)15	W[M]nn/Sn	W15/S2		
	State of the runway (C)16	R nn[L]/ or Rnn[C]/ or Rnn[R]/	R/SNOCLO R99/421594 R/SNOCLO R14L/CLRD//		
	Runway designator (M)				
	Runway deposits (M)	n or /			
	Extent of runway contamination (M)	n or /			
	Depth of deposit (M)	nn or //			
	Friction coefficient or braking action (M)	nn or //			
Trend forecast (O)17	Change indicator (M)18	NOSIG	BECMG or TEMPO		
	Period of change (C)2	FMnnnn and/or TLnnnn or ATnnnn			
	Wind (C)2	nnn[P]nn[n][G [P]nn[n]]MPS (or nnn[P]nn[G[P] nn]KT)			
	Prevailing visibility (C)2		C A V O K		
	Weather phenomenon: intensity (C)11	- or +	- N S W		
	Weather phenomenon: characteristics and type (C)2, 10, 12	DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZRA or SHGR or SHGS or SHRA or SHSN or TSGR or TSGS or TSRA or TSSN	IC or FG or BR or SA or DU or HZ or FU or VA or SQ or PO or FC or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or PRFG	NOSIG BECMG FEW020 TEMPO 25018G25MPS (TEMPO 25036G50KT) BECMG FM1030 TL1130 CAVOK BECMG TL1700 0800 FG BECMG AT1800 9000 NSW BECMG FM1900 0500 +SNRA BECMG FM1100 SN TEMPO FM1130 BLSN TEMPO FM0330 TL0430 FZRA	
	Cloud amount and height of cloud base or vertical visibility (C)	FEWnnn or SCTnnn or BKNnnn or OVCnnn	VVnnn or VV///	N S C	TEMPO TL1200 0600 BECMG AT1200 8000 NSW NSC BECMG AT1130 OVC010
	Cloud type (C)2	CB or TCU	-		TEMPO TL1530 +SHRA BKN012CB

Notes:

1. Fictitious location.
2. To be included whenever applicable.
3. To be included in accordance with 4.1.5.2 c).
4. To be included in accordance with 4.1.5.2 b) i.).
5. To be included in accordance with 4.2.4.4 b).
6. To be included in accordance with 4.2.4.4 a).
7. To be included if visibility or RVR < 1 500 m; for up to a maximum of four runways in accordance with 4.3.6.5 b).
8. To be included in accordance with 4.3.6.6 b).
9. To be included in accordance with 4.3.6.6 a).
10. One or more, up to a maximum of three groups, in accordance with 4.4.2.8 a), 4.8.1.1 and APPENDIX 5, 2.2.4.1.
11. To be included whenever applicable; no qualifier for moderate intensity in accordance with 4.4.2.7.
12. Precipitation types listed under 4.4.2.3 a) may be combined in accordance with 4.4.2.8 c) and APPENDIX 5, 2.2.4.1. Only moderate or heavy precipitation to be indicated in trend forecasts in accordance with APPENDIX 5, .2.2.4.1.
13. For automated reports only.
14. Heavy used to indicate tornado or waterspout; moderate (no qualifier) to indicate funnel cloud not reaching the ground.
15. Up to four cloud layers in accordance with 4.5.4.3 e).
16. To be included in accordance with 4.8.1.5 a).
17. To be included in accordance with 4.8.1.5 b).
18. To be included in accordance with Chapter 6.3.2 of this MCAR.
19. Number of change indicators to be kept to a minimum in accordance with APPENDIX 5, .2.2.1, normally not exceeding three groups.

Table A3-3. Use of change indicators in trend forecasts

Change indicator	Time indicator and period	Meaning	
NOSIG	-	no significant changes are forecast	
BECMG	FMnInInInI TLn2n2n2	the change is forecast to	commence at nInInInI UTC and be completed by n2n2n2n2 UTC
	TLnnnn		commence at the beginning of the trend forecast period and be completed by nnnn UTC
	FMnnnn		commence at nnnn UTC and be completed by the end of the trend forecast period
	ATnnnn		occur at nnnn UTC (specified time)
	-		a) commence at the beginning of the trend forecast period and be completed by the end of the trend forecast period; or b) the time is uncertain
TEMPO	FMnInInInI TLn2n2n2	temporary fluctuations are forecast to	commence at nInInInI UTC and cease by n2n2n2n2 UTC
	TLnnnn		commence at the beginning of the trend forecast period and cease by nnnn UTC
	FMnnnn		commence at nnnn UTC and cease by the end of the trend forecast period
	-		commence at the beginning of the trend forecast period and cease by the end of the trend forecast period

Change indicator	Time indicator and period	Meaning

Table A3-4. Ranges and resolutions for the numerical elements included in local reports

Element as specified in D4		Range	Resolution
Runway:		01 – 36	1
Wind direction:	°true	010 – 360	10
Wind speed:	MPS KT	1 – 99* 1 – 199*	1
Visibility:	M M KM KM	0 – 750 800 – 4 900 5 – 9 10 –	50 100 1 0 (fixed value: 10 KM)
RVR:	M M M	0 – 375 400 – 750 800 – 2 000	25 50 100
Vertical visibility:	M M FT FT	0 – 75** 90 – 600 0 – 250** 300 – 2 000	15 30 50 100
Clouds: height of cloud base:	M M FT FT	0 – 75** 90 – 3 000 0 – 250** 300 – 10 000	15 30 50 100
Air temperature; Dew-point temperature:	°C	-80 – +60	1
QNH; QFE:	hPa	0500 – 1 100	1
* There is no aeronautical requirement to report surface wind speeds of 50 m/s (100 kt) or more; however, provision has been made for reporting wind speeds up to 99 ms/ (199 kt) for non-aeronautical purposes, as necessary			
** Under circumstances as specified in 4.5.4.3; otherwise a resolution of 30 m (100 ft) is to be used			

Table A3-5. Ranges and resolutions for the numerical elements included in METAR and SPECI

Element as specified in D4		Range	Resolution
Runway:	no units	01 – 36	1
Wind direction:	°true	010 – 360	10
Wind speed:	MPS KT	00 – 99* 00 – 199*	1 1
Visibility:	M M M M	0000 – 0750 0800 – 4 900 5 000 – 9 000 10 000 –	50 100 1 000 0 (fixed value:9 999)
RVR:	M M M	0000 – 0375 0400 – 0750 0800 – 2 000	25 50 100
Vertical visibility:	30's M (100's FT)	000 – 020	1
Clouds: height of cloud base:	30's M (100's FT)	000 – 100	1
Air temperature; Dew-point temperature:	°C	-80 – +60	1
QNH;	hPa	0850 – 1 100	1
Sea-surface temperature:	°C	-10 – +40	1
State of the sea:	(no units)	0 – 9	1
State of the runway	Runway designator: (no units)	01 – 36; 88; 99	1
	Runway deposits: (no units)	0 – 9	1
	Extent of runway contamination: (no units)	1; 2; 5; 9	-
	Depth of deposit: (no units)	00 – 90; 92 – 99	1
	Friction coefficient/braking action: (no units)	00 – 95; 99	1

Element as specified in D4	Range	Resolution
* There is no aeronautical requirement to report surface wind speeds of 50 m/s (100 kt) or more; however, provision has been made for reporting wind speeds up to 99 m/s (199 kt) for non-aeronautical purposes, as necessary.		

Example A3-1. Routine Report

a. Local routine report (same location and weather conditions as METAR):

MET REPORT YUDO 221630Z WIND 240/4MPS VIS 600M RVR RWY 12 TDZ 1000M MOD DZ FG CLD SCT 300M OVC 600M T17 DP16 QNH 1018HPA TREND BECMG TL1700 VIS 800M FG BECMG AT1800 VIS 10KM NSW

b. METAR for YUDO (Donlon/International)*:

METAR YUDO 221630Z 24004MPS 0600 R12/1000U DZ FG SCT010 OVC020 17/16 Q1018 BECMG TL1700 0800 FG BECMG AT1800 9999 NSW

Meaning of both reports:

Routine report for Donlon/International* issued on the 22nd of the month at 1630 UTC; surface wind direction 240 degrees; wind speed 4 meters per second; visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) 600 metres; runway visual range representative of the touchdown zone for runway 12 is 1 000 metres and the runway visual range values have shown an upward tendency during previous 10 minutes (RVR tendency to be included in METAR only); and moderate drizzle and fog; scattered cloud at 300 metres; overcast at 600 metres; air temperature 17 degrees Celsius; dew-point temperature 16 degrees Celsius; QNH 1 018 hectopascals; trend during next 2 hours, visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) becoming 800 metres in fog by 1700 UTC; at 1800 UTC visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) becoming 10 kilometres or more and nil significant weather.

* Fictitious location

Note: In this example, the primary units “meter per second” and “metre” were used for wind speed and height of cloud base, respectively. However, in accordance with MCAR- 1.1, the corresponding non-SI alternative units “knot” and “foot” may be used instead.

Example A3-2. Special report

a. Local special report (same location and weather conditions as SPECI):

SPECIAL YUDO 151115Z WIND 050/25KT MAX37 MNM10 VIS 1200M RVR RWY 05 ABV 1800M HVY TSRA CLD BKN CB 500FT T25 DP22 QNH 1018HPA TREND TEMPO TL1200 VIS 600M BECMG AT1200 VIS 8KM NSW NSC

b. SPECI for YUDO (Donlon/International)*:

SPECI YUDO 151115Z 05025G37KT 3000 1200NE+TSRA BKN005CB 25/22 Q1008 TEMPO TL1200 0600 BECMG AT1200 8000 NSW NSC

Meaning of both reports:

Special report for Donlon/International* issued on the 15th of the month at 1115 UTC; surface wind direction 050 degrees; wind speed 25 knots gusting between 10 and 37 knots (minimum wind speed not to be included in SPECI) visibility 1 200 metres (along the runway(s) in the local special report); prevailing visibility 3 000 metres (in SPECI) with minimum visibility 1 200 metres to north east (directional variations to be included in SPECI only); RVR above 1 800 metres on runway 0 (RVR not

required in SPECI with prevailing visibility of 3 000 metres); thunderstorm with heavy rain; broken cumulonimbus cloud at 500 feet; air temperature 25 degrees Celsius; dew-point temperature 22 degrees Celsius; QNH 1018 hectopascals; trend during next 2 hours, visibility (along the runway(s) in the local special report; prevailing visibility in SPECI) temporarily 600 metres from 1115 to 1200, becoming at 1200 UTC visibility (along the runway(s) in the local special report; prevailing visibility in SPECI) 8 kilometres, thunderstorm ceases and nil significant weather and nil significant cloud.

* Fictitious location

Note: In this example, the non-SI alternative units “knot” and “foot” were used for wind speed and height of cloud base, respectively. However, in accordance with MCAR 5-1.1, the corresponding primary units “meters per second” and “metre” may be used instead.

Appendix 4. TECHNICAL SPECIFICATIONS RELATED TO AIRCRAFT OBSERVATIONS AND REPORTS

I CONTENTS OF AIR-REPORTS

I.1 Routine air-reports by air-ground data link:

I.1.1 When air-ground data link is used and automatic dependent surveillance (ADS) or SSR Mode S is being applied, the elements contained in routine air-reports shall be:

Message type designator
Aircraft identification

- a. Data block 1
 - i. Latitude
 - ii. Longitude
 - iii. Level
 - iv. Time
- b. Data block 2
 - i. Wind direction
 - ii. Wind speed
 - iii. Wind quality flag
 - iv. Air temperature
 - v. Turbulence (if available)
 - vi. Humidity (if available)

Note:- When ADS or SSR Mode S is being applied, the requirements of routine air-reports may be met by the combination of the basic ADS/SSR Mode S data block (data block 1) and the meteorological information data block (data block 2), available from ADS or SSR Mode S reports. The ADS message format is specified in the PANS-ATM (Doc 4444), 4.11.4 and Chapter 13 and the SSR Mode S message format is specified in Annex 10, Volume III, Part I — Digital Data Communication Systems, Chapter 5.

I.1.2 When air-ground data link is used while ADS and SSR Mode S are not being applied, the elements contained in routine reports shall be:

Message type designator
Section 1 (Position information)
Aircraft identification
Position or latitude and longitude
Time
Flight level or altitude
Next position and time over
Ensuing significant point
Section 2 (Operational information)
Estimated time of arrival

Endurance
Section 3 (Meteorological information)
Air temperature
Wind direction
Wind speed
Turbulence
Aircraft icing
Humidity (if available)

Note:- When air-ground data link is used while ADS and SSR Mode S are not being applied, the requirements of routine air-reports may be met by the controller-pilot data link communication (CPDLC) application entitled "Position report". The details of this data link application are specified in the Manual of Air Traffic Services Data Link Applications (Doc 9694) and in Annex 10, Volume III, Part-I.

I.2 Special air-reports by air-ground data link:

I.2.1 When air-ground data link is used, the elements contained in special air-reports shall be:

Message type designator
Aircraft identification
Data block 1
Latitude
Longitude
Level
Time
Data block 2
Wind direction
Wind speed
Wind quality flag
Air temperature
Turbulence (if available)
Humidity (if available)
Data block 3

Condition prompting the issuance of a special air-report (one condition to be selected from the list presented in Table A4-2).

Note 1:- The requirements of special air-reports may be met by the data link flight information service (D-FIS) application entitled "Special air-report service". The details of this data link application are specified in Doc 9694.

Note 2:- In the case of a special air-report of pre-eruption volcanic activity, volcanic eruption or volcanic ash cloud, additional requirements are indicated in 4.2.

I.3 Special air-reports by voice communications:

I.3.1 When voice communications are used, the elements contained in special air-reports shall be:

Message type designator
Section 1 (Position information)
Aircraft identification
Position or latitude and longitude
Time
Level or range of levels
Section 3 (Meteorological information)
Condition prompting the issuance of a special air-report, to be selected from the list presented in Table A4-1.

Note 1:- Air-reports are considered routine by default. The message type designator for special air-reports is specified in the PANS-ATM (Doc 4444), Appendix 1.

2 CRITERIA FOR REPORTING:

2.1 General:

When air-ground data link is used, the wind direction, wind speed, wind quality flag, air temperature, turbulence and humidity included in air-reports shall be reported in accordance with the following criteria.

2.2 Wind direction:

The wind direction shall be reported in terms of degrees true, rounded to the nearest whole degree.

2.3 Wind speed:

The wind speed shall be reported in meters per second or knots, rounded to the nearest 1 m/s (1 knot). The units of measurement used for the wind speed shall be indicated.

2.4 Wind quality flag:

The wind quality flag shall be reported as 0 when the roll angle is less than 5 degrees and as 1 when the roll angle is 5 degrees or more.

2.5 Air temperature:

The air temperature shall be reported to the nearest tenth of a degree Celsius.

2.6 Turbulence:

The turbulence shall be reported in terms of the cube root of the eddy dissipation rate(EDR).

2.6.1 Routine air-reports:

The turbulence shall be reported during the en-route phase of the flight and shall refer to the 15-minute period immediately preceding the observation. Both the average and peak value of turbulence, together with the time of occurrence of the peak value to the nearest minute, shall be observed. The average and peak values shall be reported in terms of the cube root of EDR. The time of occurrence of the peak value shall be reported as indicated in Table A4-1. The turbulence shall be

reported during the climb-out phase for the first 10 minutes of the flight and shall refer to the 30-second period immediately preceding the observation. The peak value of turbulence shall be observed.

2.6.2 Interpretation of the turbulence report:

2.6.2.1 Turbulence shall be considered:

- a. severe when the peak value of the cube root of EDR exceeds 0.7;
- b. moderate when the peak value of the cube root of EDR is above 0.4 and below or equal to 0.7;
- c. light when the peak value of the cube root of EDR is above 0.1 and below or equal to 0.4; and
- d. nil when the peak value of the cube root of EDR is below or equal to 0.1.

Note:- The EDR is an aircraft-independent measure of turbulence. However, the relationship between the EDR value and the perception of turbulence is a function of aircraft type, and the mass, altitude, configuration and airspeed of the aircraft. The EDR values given above describe the severity levels for a medium-sized transport aircraft under typical en-route conditions (i.e. altitude, airspeed and weight).

2.6.3 Special air-reports:

2.6.3.1 Special air-reports on turbulence shall be made during any phase of the flight whenever the peak value of the cube root of EDR exceeds 0.4. The special air-report on turbulence shall be made with reference to the 1-minute period immediately preceding the observation. Both the average and peak value of turbulence shall be observed. The average and peak values shall be reported in terms of the cube root of EDR. Special air-reports shall be issued every minute until such time as the peak values of the cube root of EDR fall below 0.4.

2.6.4 Humidity:

2.6.4.1 The humidity shall be reported as the relative humidity, rounded to the nearest whole per cent.

Note:- The ranges and resolutions for the meteorological elements included in air-reports are shown in Table A4-3.

3 EXCHANGE OF AIR-REPORTS

3.1 Responsibilities of the meteorological watch offices:

3.1.1 The meteorological watch office shall transmit without delay the special air-reports received by voice communications to WAFCs.

3.1.2 The meteorological watch office shall transmit without delay special air-reports of pre-eruption volcanic activity, a volcanic eruption or volcanic ash cloud received to the associated VAACs.

3.1.3 When a special air-report is received at the meteorological watch office but the forecaster considers that the phenomenon causing the report is not expected to persist and, therefore, does not warrant issuance of a SIGMET, the special air-report shall be disseminated in the same way that SIGMET

messages are disseminated in accordance with 1.2.1, i.e. to meteorological watch offices, WAFCs, and other meteorological offices in accordance with regional air navigation agreement.

Note:- The template used for special air-reports which are uplinked to aircraft in flight is in Appendix 6, Table A6-1.

3.2 Responsibilities of world area forecast centres:

3.2.1 Air-reports received at WAFCs shall be further disseminated as basic meteorological data.

Note:- The dissemination of basic meteorological data is normally carried out on the WMO global telecommunication system.

3.3 Supplementary dissemination of air-reports:

3.3.1 Where supplementary dissemination of air-reports is required to satisfy special aeronautical or meteorological requirements, such dissemination should be arranged between the meteorological authorities concerned.

3.4 Format of air-reports:

3.4.1 Air-reports shall be exchanged in the format in which they are received.

4 SPECIFIC PROVISIONS RELATED TO REPORTING WIND SHEAR AND VOLCANIC ASH:

4.1 Reporting of wind shear:

4.1.1 When reporting aircraft observations of wind shear encountered during the climb-out and approach phases of flight, the aircraft type should be included.

4.1.2 Where wind shear conditions in the climb-out or approach phases of flight were reported or forecast but not encountered, the pilot-in-command should advise the appropriate air traffic services unit as soon as practicable unless the pilot-in-command is aware that the appropriate air traffic services unit has already been so advised by a preceding aircraft.

4.2 (Reserved)

Table A4-1: Template for the special air-report (downlink)

Key: M = inclusion mandatory, part of every message;
C = inclusion conditional; included whenever available.

Note:- Message to be prompted by the pilot-in-command. Currently only the condition "SEV TURB" can be automated (see 2.6.3).

Element as specified in D5	Detailed content	Template(s)	Examples
Message type designator (M)	Type of air-report (M)	ARS	ARS
Aircraft identification (M)	Aircraft radiotelephony call sign (M)	nnnnnn	VA812
DATA BLOCK 1			
Latitude (M)	Latitude in degrees and minutes (M)	Nnnnn or Snnnn	S4506
Longitude (M)	Longitude in degrees and minutes (M)	Wnnnnn or Ennnnn	E01056
Level (M)	Flight level (M)	FLnnn or FLnnn to FLnnn	FL330 FL280 to FL310
Time (M)	Time of occurrence in hours and minutes (M)	OBS AT nnnnZ	OBS AT 1216Z
DATA BLOCK 2			
Wind direction (M)	Wind direction in degrees true (M)	nnn/	262/
Wind speed (M)	Wind speed in kilometres per hour (or knots) (M)	nnnMPS (or nnnKT)	40MPS (080KT)
Wind quality flag (M)	Wind quality flag (M)	n	1
Air Temperature (M)	Air temperature in tenths of degrees C (M)	T[M]nnn	T127 TM455
Turbulence (C)	Turbulence in hundredths of m/2/3s-1 and the time of occurrence of the peak value (C)I	EDRnnn/nn	EDR064/08
Humidity (C)	Relative humidity in per cent (C)	RHnnn	RH054
DATA BLOCK 3			
Condition prompting the issuance of a special air-report (M)		SEV TURB [EDRnnn]2 or SEV ICE or SEV MTW or TS GR3 or TS3 or HVY SS4 or VA CLD [FL nnn/nnn] or VA5 [MT nnnnnnnnnnnnnnnnnnnnnn] or MOD TURB [EDRnnn] 2 or MOD ICE	SEV TURB EDR076 VA CLD FL050/100

Notes:-

1. The time of occurrence to be reported in accordance with Table A4-1.
2. The turbulence to be reported in accordance with .2.6.3.
3. Obscured, embedded or widespread thunderstorms or thunderstorms in squall lines.
4. Dust storm or sandstorm.
5. Pre-eruption volcanic activity or a volcanic eruption.

Table A4-2 : Time of occurrence of the peak value to be reported

Peak value of turbulence occurring during the ne-minute period minutes prior to the observation	Value to be reported
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0 – 1	0
1 – 2	1
2- 3	2
..	..
13 – 14	13
14 – 15	14
No timing information available	15

Table A4-3: Ranges and resolutions for the meteorological elements included in air-reports

Element as specified in Para D5		Range	Resolution
Wind direction:	°true	000 – 360	1
Wind speed:	MPS	00 – 125	1
	KT	00 – 250	1
Wind quality flag:	(index)*	0 – 1	1
Temperature:	°C	-80 – +60	0.1
Turbulence: routine air-report: (time of occurrence)*	m2/3 s-1	0 – 2 0	0.01
		- 15	1
Turbulence: special air-report:	m2/3 s-1	0 – 2	0.01
Humidity:	%	0 – 100	1
* Non-dimensional			

Appendix 5. TECHNICAL SPECIFICATIONS RELATED TO FORECASTS:

(See Chapter 6 of this MCAR)

I CRITERIA RELATED TO TAF:

I.1 TAF format:

- I.1.1 TAF shall be issued in accordance with the template shown in Table A5-1 and disseminated in the TAF code form prescribed by the World Meteorological Organization.

Note:- The TAF code form is contained in WMO Publication No. 306, Manual on Codes, Volume 1.1, Part A —Alphanumeric Codes.

- I.1.2 TAF should be disseminated, under bilateral agreements between States in a position to do so, in the WMO BUFR code form, in addition to the dissemination of the TAF in accordance with I.1.1.

Note:- The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, Volume 1.2, Part B — Binary Codes.

I.2 I.2 Inclusion of meteorological elements in TAF:

Note:- Guidance on operationally desirable accuracy of forecasts is given in Attachment B

I.2.1 Surface wind:

- I.2.1.1 In forecasting surface wind, the expected prevailing direction shall be given. When it is not possible to forecast a prevailing surface wind direction due to its expected variability, for example, during light wind conditions (less than 1.5 m/s (3 kt)) or thunderstorms, the forecast wind direction shall be indicated as variable using “VRB”. When the wind is forecast to be less than 0.5 m/s (1 kt), the forecast wind speed shall be indicated as calm. When the forecast maximum speed (gust) exceeds the forecast mean wind speed by 5 m/s (10 kt) or more, the forecast maximum wind speed shall be indicated. When a wind speed of 50 m/s (100 kt) or more is forecast, it shall be indicated to be more than 49 m/s (99 kt)

I.2.2 Visibility:

- I.2.2.1 When the visibility is forecast to be less than 800 m, it should be expressed in steps of 50 m; when it is forecast to be 800 m or more but less than 5 km, in steps of 100 m; 5 km or more but less than 10 km, in kilometre steps; and when it is forecast to be 10 km or more, it should be expressed as 10 km, except when conditions of CAVOK are forecast to apply. The prevailing visibility should be forecast. When visibility is forecast to vary in different directions and the prevailing visibility cannot be forecast, the lowest forecast visibility should be given.

I.2.3 Weather phenomena:

- I.2.3.1 One or more, up to a maximum of three, of the following weather phenomena or combinations thereof, together with their characteristics and, where appropriate, intensity, shall be forecast if they are expected to occur at the aerodrome:
- a. freezing precipitation
 - b. freezing fog
 - c. moderate or heavy precipitation (including showers thereof)
 - d. low drifting dust, sand or snow
 - e. blowing dust, sand or snow
 - f. duststorm
 - g. sandstorm
 - h. thunderstorm (with or without precipitation)
 - i. squall
 - j. funnel cloud (tornado or waterspout)
 - k. other weather phenomena given in Appendix 3 Para 4.4.2.3, as agreed by the meteorological authority with the ATS authority and operators concerned.

I.2.3.2 The expected end of occurrence of those phenomena shall be indicated by the abbreviation “NSW”.

I.2.4 Cloud:

I.2.4.1 Cloud amount should be forecast using the abbreviations “FEW”, “SCT”, “BKN” or “OVC” as necessary. When it is expected that the sky will remain or become obscured and clouds cannot be forecast and information on vertical visibility is available at the aerodrome, the vertical visibility should be forecast in the form “VV” followed by the forecast value of the vertical visibility. When several layers or masses of cloud are forecast, their amount and height of base should be included in the following order:

- a. the lowest layer or mass regardless of amount, to be forecast as FEW, SCT, BKN or OVC as appropriate;
- b. the next layer or mass covering more than 2/8, to be forecast as SCT, BKN or OVC as appropriate;
- c. the next higher layer or mass covering more than 4/8, to be forecast as BKN or OVC as appropriate; and
- d. cumulonimbus clouds and/or towering cumulus clouds, whenever forecast and not already included under a) to c).

Cloud information should be limited to cloud of operational significance; when no cloud of operational significance is forecast, and “CAVOK” is not appropriate, the abbreviation “NSC” should be used.

I.2.5 Temperature:

I.2.5.1 When forecast temperatures are included in accordance with regional air navigation agreement, the maximum and minimum temperatures expected to occur during the period of validity of the TAF should be given, together with their corresponding times of occurrence.

I.3 Use of change groups:

Note:- Guidance on the use of change and time indicators in TAF is given in Table A5-2.

I.3.1 The criteria used for the inclusion of change groups in TAF or for the amendment of TAF shall be based on any of the following weather phenomena or combinations thereof being forecast to begin or end or change in intensity:

- a. freezing precipitation
- b. moderate or heavy precipitation (including showers thereof)
- c. thunderstorm (with precipitation)
- d. duststorm
- e. sandstorm.

I.3.2 The criteria used for the inclusion of change groups in TAF or for the amendment of TAF should be based on the following:

- a. when the mean surface wind direction is forecast to change by 60° or more, the mean speed before and/or after the change being 5 m/s (10 kt) or more
- b. when the mean surface wind speed is forecast to change by 5 m/s (10 kt) or more;
- c. when the variation from the mean surface wind speed (gusts) is forecast to increase by 5 m/s (10 kt) or more, the mean speed before and/or after the change being 7.5 m/s (15 kt) or more;
- d. when the surface wind is forecast to change through values of operational significance. The threshold values should be established by the Meteorological Authority in consultation with the appropriate ATS Authority and operators concerned, taking into account changes in the wind which would:
 1. require a change in runway(s) in use; and
 2. indicate that the runway tailwind and crosswind components will change through values representing the main operating limits for typical aircraft operating at the aerodrome;
- e. when the visibility is forecast to improve and change to or pass through one or more of the following values, or when the visibility is forecast to deteriorate and pass through one or more of the following values:
 1. 150, 350, 600, 800, 1 500 or 3 000 m; or
 2. 5 000 m in cases where significant numbers of flights are operated in accordance with
 3. the visual flight rules;
- f. when any of the following weather phenomena or combinations thereof are forecast to begin or end:
 1. ice crystals
 2. freezing fog
 3. low drifting dust, sand or snow
 4. blowing dust, sand or snow
 5. thunderstorm (without precipitation)

6. squall
7. funnel cloud (tornado or waterspout);
- g. when the height of base of the lowest layer or mass of cloud of BKN or OVC extent is forecast to lift and change to or pass through one or more of the following values, or when the height of the lowest layer or mass of cloud of BKN or OVC extent is forecast to lower and pass through one or more of the following values:
 1. 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft); or
 2. 450 m (1 500 ft) in cases where significant numbers of flights are operated in accordance with the visual flight.
- h. when the amount of a layer or mass of cloud below 450 m (1 500 ft) is forecast to change:
 1. from NSC, FEW or SCT to BKN or OVC; or
 2. from BKN or OVC to NSC, FEW or SCT;
- i. when the vertical visibility is forecast to improve and change to or pass through one or more of the following values, or when the vertical visibility is forecast to deteriorate and pass through one or more of the following values: 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft); and
- j. any other criteria based on local aerodrome operating minima, as agreed between the Meteorological Authority and the operators.

Note:- Other criteria based on local aerodrome operating minima are to be considered in parallel with similar criteria for the issuance of SPECI developed in response to Appendix 3 2.3.3.h).

- 1.3.3 When a change in any of the elements given in D6.2.3 is required to be indicated in accordance with the criteria given in 1.3.2, the change indicators “BECMG” or “TEMPO” should be used followed by the time period during which the change is expected to occur. The time period should be indicated as the beginning and end of the period in whole hours UTC. Only those elements for which a significant change is expected should be included following a change indicator. However, in the case of significant changes in respect of cloud, all cloud groups, including layers or masses not expected to change, should be indicated.
- 1.3.4 The change indicator “BECMG” and the associated time group should be used to describe changes where the meteorological conditions are expected to reach or pass through specified threshold values at a regular or irregular rate and at an unspecified time during the time period. The time period should normally not exceed 2 hours but in any case should not exceed 4 hours.
- 1.3.5 The change indicator “TEMPO” and the associated time group should be used to describe expected frequent or infrequent temporary fluctuations in the meteorological conditions which reach or pass specified threshold values and last for a period of less than one hour in each instance and, in the aggregate, cover less than one-half of the forecast period during which the fluctuations are expected to occur. If the temporary fluctuation is expected to last one hour or longer, the change group “BECMG” should be used in accordance with 1.3.4 or the validity period should be subdivided in accordance with 1.3.6.

1.3.6 Where one set of prevailing weather conditions is expected to change significantly and more or less completely to a different set of conditions, the period of validity should be subdivided into self-contained periods using the abbreviation “FM” followed immediately by a four-figure time group in whole hours and minutes UTC indicating the time the change is expected to occur. The subdivided period following the abbreviation “FM” should be self-contained and all forecast conditions given before the abbreviation should be superseded by those following the abbreviation.

1.4 Use of probability groups:

1.4.1 The probability of occurrence of an alternative value of a forecast element or elements should be indicated, as necessary, by use of the abbreviation “PROB” followed by the probability in tens of per cent and the time period during which the alternative value(s) is (are) expected to apply. The probability information should be placed after the element or elements forecast and be followed by the alternative value of the element or elements. The probability of a forecast of temporary fluctuations in meteorological conditions should be indicated, as necessary, by use of the abbreviation “PROB” followed by the probability in tens of per cent, placed before the change indicator “TEMPO” and associated time group. A probability of an alternative value or change of less than 30 per cent should not be considered sufficiently significant to be indicated. A probability of an alternative value or change of 50 per cent or more, for aviation purposes, should not be considered a probability but instead should be indicated, as necessary, by use of the change indicators “BECMG” or “TEMPO” or by subdivision of the validity period using the abbreviation “FM”. The probability group should not be used to qualify the change indicator “BECMG” nor the time indicator “FM”.

1.5 Numbers of change and probability groups:

1.5.1 The number of change and probability groups should be kept to a minimum and should not normally exceed five groups.

1.6 Dissemination of TAF:

1.6.1 TAF and amendments thereto shall be disseminated to international OPMET databanks and the centers designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems, in accordance with regional air navigation agreement.

2 CRITERIA RELATED TO TREND FORECASTS:

2.1 Format of trend forecasts:

2.1.1 Trend forecasts shall be issued in accordance with the templates shown in Appendix 3, Table A3-1 and A3-2. The units and scales used in the trend forecast shall be the same as those used in the report to which it is appended.

Note:- Examples of trend forecasts are given in Appendix 3.

2.2 Inclusion of meteorological elements in trend forecasts:

2.2.1 General provisions:

2.2.1.1 The trend forecast shall indicate significant changes in respect of one or more of the elements surface wind, visibility, weather and clouds. Only those elements shall be included for which a significant change is expected. However, in the case of significant changes in respect of cloud, all cloud groups including layers or masses not expected to change, shall be indicated. In the case of a significant change in visibility, the phenomenon causing the reduction of visibility shall also be indicated. When no change is expected to occur, this shall be indicated by the term “NOSIG”.

2.2.2 Surface wind:

2.2.2.1 The trend forecast shall indicate changes in the surface wind which involve:

- a. a change in the mean wind direction of 60° or more, the mean speed before and/or after the change being 5 m/s (10 kt) or more;
- b. a change in mean wind speed of 5 m/s (10 kt) or more; and
- c. changes in the wind through values of operational significance. The threshold values shall be established by the Meteorological Authority in consultation with the appropriate ATS Authority and operators concerned, taking into account changes in the wind which would:
 1. require a change in runway(s) in use; and
 2. indicate that the runway tailwind and crosswind components will change through values representing the main operating limits for typical aircraft operating at the aerodrome.

2.2.3 Visibility:

2.2.3.1 When the visibility is expected to improve and change to or pass through one or more of the following values, or when the visibility is expected to deteriorate and pass through one or more of the following values: 150, 350, 600, 800, 1500 or 3000 m, the trend forecast shall indicate the change. When significant numbers of flights are conducted in accordance with the visual flight rules, the forecast shall additionally indicate changes to or passing through 5000 m.

Note: In trend forecasts appended to local routine and special reports, visibility refers to the forecast visibility along the runway(s); in trend forecasts appended to METAR and SPECI, visibility refers to the forecast prevailing visibility.

2.2.4 Weather phenomena:

2.2.4.1 The trend forecast shall indicate the expected onset, cessation or change in intensity of one or more of the following weather phenomena or combinations thereof:

- a. freezing precipitation
- b. moderate or heavy precipitation (including showers thereof)
- c. thunderstorm (with precipitation)
- d. duststorm
- e. sandstorm
- f. other weather phenomena given in Appendix 3, 4.2.3, as agreed by the meteorological authority with the ATS authority and operators concerned.

- 2.2.4.2 The trend forecast shall indicate the expected onset or cessation of one or more of the following weather phenomena or combinations thereof:
- a. ice crystals
 - b. freezing fog
 - c. low drifting dust, sand or snow
 - d. blowing dust, sand or snow
 - e. thunderstorm (without precipitation)
 - f. squall
 - g. funnel cloud (tornado or waterspout).

2.2.4.3 The total number of phenomena reported in 2.2.4.1 and 2.2.4.2 shall not exceed three.

2.2.4.4 The expected end of occurrence of the weather phenomena shall be indicated by the abbreviation “NSW”.

2.2.5 Clouds:

2.2.5.1 When the height of the base of a cloud layer of BKN or OVC extent is expected to lift and change to or pass through one or more of the following values, or when the height of the base of a cloud layer of BKN or OVC extent is expected to lower and pass through one or more of the following values: 30, 60, 150, 300 and 450 m (100, 200, 500, 1 000 and 1 500 ft), the trend forecast shall indicate the change. When the height of the base of a cloud layer is below or is expected to fall below or rise above 450 m (1 500 ft), the trend forecast shall also indicate changes in cloud amount from FEW, or SCT increasing to BKN or OVC, or changes from BKN or OVC decreasing to FEW or SCT. When no clouds of operational significance are forecast and “CAVOK” is not appropriate, the abbreviation “NSC” shall be used.

2.2.6 Vertical visibility:

2.2.6.1 When the sky is expected to remain or become obscured and vertical visibility observations are available at the aerodrome, and the vertical visibility is forecast to improve and change to or pass through one or more of the following values, or when the vertical visibility is forecast to deteriorate and pass through one or more of the following values: 30, 60, 150 or 300m (100, 200, 500 or 1000 ft), the trend forecast shall indicate the change.

2.2.7 Additional criteria:

2.2.7.1 Criteria for the indication of changes based on local aerodrome operating minima, additional to those specified in 2.2.2 to 2.2.6, shall be used as agreed between the Meteorological Authority and the operator(s) concerned.

2.3 Use of change groups:

Note:- Guidance on the use of change indicators in trend forecasts is given in Appendix 3, Table A3-3.

- 2.3.1 When a change is expected to occur, the trend forecast shall begin with one of the change indicators “BECMG” or “TEMPO”.
- 2.3.2 The change indicator “BECMG” shall be used to describe forecast changes where the meteorological conditions are expected to reach or pass through specified values at a regular or irregular rate. The period during which, or the time at which, the change is forecast to occur shall be indicated, using the abbreviations “FM”, “TL” or “AT”, as appropriate, each followed by a time group in hours and minutes. When the change is forecast to begin and end wholly within the trend forecast period, the beginning and end of the change shall be indicated by using the abbreviations “FM” and “TL”, respectively, with their associated time groups. When the change is forecast to commence at the beginning of the trend forecast period but be completed before the end of that period, the abbreviation “FM” and its associated time group shall be omitted and only “TL” and its associated time group shall be used. When the change is forecast to begin during the trend forecast period and be completed at the end of that period, the abbreviation “TL” and its associated time group shall be omitted and only “FM” and its associated time group shall be used. When the change is forecast to occur at a specified time during the trend forecast period, the abbreviation “AT” followed by its associated time group shall be used. When the change is forecast to commence at the beginning of the trend forecast period and be completed by the end of that period or when the change is forecast to occur within the trend forecast period but the time is uncertain, the abbreviations “FM”, “TL” or “AT” and their associated time groups shall be omitted and the change indicator “BECMG” shall be used alone.
- 2.3.3 The change indicator “TEMPO” shall be used to describe forecast temporary fluctuations in the meteorological conditions which reach or pass specified values and last for a period of less than one hour in each instance and, in the aggregate, cover less than one-half of the period during which the fluctuations are forecast to occur. The period during which the temporary fluctuations are forecast to occur shall be indicated, using the abbreviations “FM” and/or “TL”, as appropriate, each followed by a time group in hours and minutes. When the period of temporary fluctuations in the meteorological conditions is forecast to begin and end wholly within the trend forecast period, the beginning and end of the period of temporary fluctuations shall be indicated by using the abbreviations “FM” and “TL”, respectively, with their associated time groups. When the period of temporary fluctuations is forecast to commence at the beginning of the trend forecast period but cease before the end of that period, the abbreviation “FM” and its associated time group shall be omitted and only “TL” and its associated time group shall be used. When the period of temporary fluctuations is forecast to begin during the trend forecast period and cease by the end of that period, the abbreviation “TL” and its associated time group shall be omitted and only “FM” and its associated time group shall be used. When the period of temporary fluctuations is forecast to commence at the beginning of the trend forecast period and cease by the end of that period, both abbreviations “FM” and “TL” and their associated time groups shall be omitted and the change indicator “TEMPO” shall be used alone.

2.4 Use of the probability indicator:

- 2.4.1 The indicator “PROB” shall not be used in trend forecasts.

3 CRITERIA RELATED TO FORECASTS FOR TAKE-OFF:

3.1 Format of forecasts for take-off:

3.1.1 The format of the forecast should be as agreed between the Meteorological Authority and the operator concerned. The order of the elements and the terminology, units and scales used in forecasts for take-off should be the same as those used in reports for the same aerodrome.

3.2 Amendments to forecasts for take-off:

3.2.1 The criteria for the issuance of amendments for forecasts for take-off for surface wind direction and speed, temperature and pressure and any other elements agreed locally should be agreed between the meteorological authority and the operators concerned. The criteria should be consistent with the corresponding criteria for special reports established for the aerodrome in accordance with Appendix 3 2.3.1.

4 CRITERIA RELATED TO AREA FORECASTS FOR LOW-LEVEL FLIGHTS:

4.1 Format and content of GAMET area forecasts:

4.1.1 When prepared in GAMET format, area forecasts shall contain two sections: Section I related to information on en-route weather phenomena hazardous to low-level flights, prepared in support of the issuance of AIRMET information, and Section II related to additional information required by low-level flights. The content and order of elements in a GAMET area forecast, when prepared, shall be in accordance with the template shown in Table A5-3. Additional elements in Section II shall be included in accordance with regional air navigation agreement. Elements which are already covered by a SIGMET message shall be omitted from GAMET area forecasts.

4.2 Amendments to GAMET area forecasts:

4.2.1 When a weather phenomenon hazardous to low-level flights has been included in the GAMET area forecast and the phenomenon forecast does not occur, or is no longer forecast, a GAMET AMD shall be issued, amending only the weather element concerned.

Note:- Specifications regarding the issuance of AIRMET information amending the area forecast in respect of weather phenomena hazardous for low-level flights are given in APPENDIX 6.

4.3 Content of area forecasts for low-level flights in chart form:

4.3.1 When chart form is used for area forecasts for low-level flights, the forecast of upper wind and upper-air temperature shall be issued for points separated by no more than 500 km (300 NM) and for at least the following altitudes: 600, 1 500 and 3 000 m (2 000, 5 000 and 10 000 ft), and 4 500 m (15 000 ft) in mountainous areas.

4.3.2 When chart form is used for area forecasts for low-level flights, the forecast of SIGWX phenomena shall be issued as low-level SIGWX forecast for flight levels up to 100 (or up to flight level 150 in mountainous areas, or higher, where necessary). Low-level SIGWX forecasts shall include the following items:

- a) the phenomena warranting the issuance of a SIGMET as given in APPENDIX 6 and which are expected to affect low-level flights; and
- b) the elements in area forecasts for low-level flights as given in Table A5-4 except elements concerning:
 - 1. upper winds and temperatures; and
 - 2. forecast QNH.

Note:- Guidance on the use of terms “ISOL”, “OCNL” and “FRQ” referring to cumulonimbus and towering cumulus clouds, and thunderstorms is given in Appendix 6.

4.4 Exchange of area forecasts for low-level flights:

4.4.1 Area forecasts for low-level flights prepared in support of the issuance of AIRMET information shall be exchanged between meteorological offices responsible for the issuance of flight documentation for low-level flights in the flight information regions concerned.

Table A5-1: Template for TAF

Key: M = inclusion mandatory, part of every message;
 C = inclusion conditional, dependent on meteorological conditions or method of observation;
 O = inclusion optional;

Note 1:- The ranges and resolutions for the numerical elements included in TAF are shown in Table A5-4 of this appendix.

Note 2:- The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

Element as specified in D6	Detailed content	Template(s)	Examples
Identification of the type of forecast (M)	Type of forecast (M)	TAF or TAF AMD or TAF COR	TAF TAF AMD
Location indicator (M)	ICAO location indicator (M)	nnnn	YUDO I
Time of issue of forecast (M)	Day and time of issue of the forecast in UTC (M)	nnnnnZ	16000Z
Identification of a missing forecast (C)	Missing forecast identifier (C)	NIL	NIL
END OF TAF IF THE FORECAST IS MISSING.			
Days and period of validity of forecast (M)	Days and period of the validity of the forecast in UTC (M)	nnnn/nnnn	1606/1624 0812/0918

Element as specified in D6	Detailed content	Template(s)			Examples
Identification of a cancelled forecast (C)	Cancelled forecast identifier (C)	CNL			CNL
END OF TAF IF THE FORECAST IS CANCELLED.					
Surface wind (M)	Wind direction (M)	nnn or VRB2			24004MPS; VRB01MPS (24008KT); (VRB02KT) 19005MPS (19010KT) 00000MPS (00000KT) 140P49MPS (140P99KT) 12003G09MPS (12006G18KT) 24008G14MPS (24016G28KT)
	Wind speed (M)	[P]nn[n]			
	Significant speed variations (C)3	G[P]nn[n]			
	Units of measurement (M)	MPS(or KT)			
Visibility (M)	Prevailing visibility (M)	nnnn		C A V O K	0350 7000 9000 9999 CAVOK
Weather (C)4, 5	Intensity of weather phenomena (C)6	- or +	-		
	Characteristics and type of weather phenomena (C)7	DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZRA or SHGR or SHGS or SHRA or SHSN or TSGR or TSGS or TSRA or TSSN	IC or FG or BR or SA or DU or HZ or FU or VA or SQ or PO or FC or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or PRFG		
Cloud (M)8	Cloud amount and height of base or vertical visibility (M)	FEWnnn or SCTnnn or BKNnnn or OVCnnn	VVnnn or VV///	NSC	FEW010 VV05 OVC020 VV/// NSC SCT005 BKN012 SCT008 BKN025CB
	Cloud type (C)4	CB or TCU	-		
Temperature (O)9	Name of the element (M)	TX			TX25/1013Z TN09/1005Z TX05/2112Z TNM02/2103Z
	Maximum temperature (M)	[M]nn/			
	Day and time of occurrence of the maximum temperature (M)	nnnnZ			
	Name of the element (M)	TN			
	Minimum temperature (M)	[M]nn/			

Element as specified in D6	Detailed content	Template(s)			Examples
	Day and time of occurrence of the minimum temperature (M)	nnnnZ			
Expected significant changes to one or more of the above elements during the period of validity (C)4, 10	Change or probability indicator (M)	PROB30 [TEMPO] or PROB40 [TEMPO] or BECMG or TEMPO or FM			
	Period of occurrence or change (M)	nnnn/nnnn			
	Wind (C)4	nnn[P]nn[n][G[P]nn[n]]MPS or VRBnnMPS (or nnn[P]nn[G[P]nn]KT or VRBnnKT)			
	Prevailing visibility (C)4	nnnn			C A V O K
	Weather phenomenon: intensity (C)6	-or+	-	NSW	
	Weather phenomenon: characteristics and type (C)4, 7	DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZRA or SHGR or SHGS or SHRA or SHSN or TSGR or TSGS or TSRA or TSSN	IC or FG or BR or SA or DU or HZ or FU or VA or SQ or PO or FC or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or PRFG		
Cloud amount and height of base or vertical visibility (C)4	FEWnnn or SCTnnn or BKNnnn or OVCnnn	VVnnn or VV///	NSC		(FM051230 15008KT 9999 BKN020) FM051230 15015KMH 9999 BKN020 BECMG 1618/1620 8000 NSW NSC
Cloud type (C)4	CB or TCU	-			BECMG 2306/2308 SCT015CB BKN020

Notes:-

1. Fictitious location.
2. To be used in accordance with 1.2.1.
3. To be included in accordance with 1.2.1.
4. To be included whenever applicable.
5. One or more, up to a maximum of three, groups in accordance with 1.2.3.
6. To be included whenever applicable in accordance with 1.2.3. No qualifier for moderate intensity.

7. *Weather phenomena to be included in accordance with 1.2.3.*
8. *Up to four cloud layers in accordance with 1.2.4.*
9. *To be included in accordance with 1.2.5. consisting of up to a maximum of four temperatures (two*
10. *maximum temperatures and two minimum temperatures).*
11. *To be included in accordance with 1.3, 1.4 and 1.5.*

Table A5-2. Use of change and time indicators in TAF

Change or time indicator		Time period	Meaning	
FM		ndndnhnhnmnm	used to indicate a significant change in most weather elements occurring at ndnd day, nhnh hours and nmnm minutes (UTC); all the elements given before “FM” are to be included following “FM” (i.e. they are all superseded by those following the abbreviation)	
BECMG		nd lnd lnh lnh l/nd2nd2nh2nh2	the change is forecast to commence at nd lnd l day and nh lnh l hours (UTC) and be completed by nd2nd2 day and nh2nh2 hours (UTC); only those elements for which a change is forecast are to be given following “BECMG”; the time period nd lnd lnh lnh l/nd2nd2nh2nh2 should normally be less than 2 hours and in any case should not exceed 4 hours	
TEMPO		nd lnd lnh lnh l/nd2nd2nh2nh2	temporary fluctuations are forecast to commence at nd lnd l day and nh lnh l hours (UTC) and cease by nd2nd2 day and nh2nh2 hours (UTC); only those elements for which fluctuations are forecast are to be given following “TEMPO”; temporary fluctuations should not last more than one hour in each instance, and in the aggregate, cover less than half of the period nd lnd lnh lnh l/nd2nd2nh2nh2	
PROBnn	-	nd lnd lnh lnh l/nd2nd2nh2nh2	probability of occurrence (in %) of an alternative value of a forecast element or elements; nn = 30 or nn = 40 only ;to be placed after the element(s) concerned	-
	TEMPO	nd lnd lnh lnh l/nd2nd2nh2nh2		probability of occurrence of temporary fluctuations

Table A5-3: Template for GAMET

- Key: M = inclusion mandatory, part of every message;
 C = inclusion conditional, dependent on meteorological conditions;
 O = inclusion optional;
 = = a double line indicates that the text following it should be placed on the subsequent line.

Element	Detailed content		Template(s)	Examples
Location indicator of FIR/CTA (M)	ICAO location indicator of the nnnn ATS unit serving the FIR or CTA to which the GAMET refers (M)			YUCCI
Identification (M)	Message identification (M)	GAMET		GAMET
Validity period (M)	Day-time groups indicating	VALID nnnnnn/nnnnnn		VALID 220600/221200

Element	Detailed content	Template(s)		Examples	
Location indicator of FIR/CTA (M)	ICAO location indicator of the nnnn ATS unit serving the FIR or CTA to which the GAMET refers (M)			YUCCI	
	the period of validity in UTC (M)				
Location indicator of meteorological office (M)	Location indicator of meteorological office originating the message with a separating hyphen (M)	nnnn-		YUDO-I	
Name of the FIR/CTA or part thereof (M)	Location indicator and name of the FIR/CTA, or part thereof for which the GAMET is issued (M)	nnnn nnnnnnnnnn FIR[/n] [BLW FLnnn] or nnnn nnnnnnnnnn CTA[/n] [BLW FLnnn]		YUCC AMSWELL FIR/2 BLW FL120 YUCC AMSWELL FIR	
Element	Detailed content	Identifier and time	Template(s) Content	Location Examples	
Indicator for the beginning of Section I (M)	Indicator to identify the beginning of Section I (M)	SECN I		SECN I	
Surface wind (C)	Widespread surface wind exceeding 15 m/s (30 kt)	SFC WSPD: [nn/nn]	[n]nn MPS (or [n]nn KT)	[N of Nnn or Snn] or [S of Nnn or Snn] or [W of Wnnn or Ennn] or [E of Wnnn or Ennn] or [nnnnnnnnn]2	SFC WSPD: 10/12 16 MPS SFC WSPD: 40 KT E OF W110
Surface visibility (C)	Widespread surface visibility below 5 000 m including the weather phenomena causing the reduction in visibility	SFC VIS: [nn/nn]	nnnn M FG or BR or SA or DU or HZ or FU or VA or PO or DS or SS or DZ or RA or SN or SG or IC or FC or GR or		SFC VIS: 06/08 3000 M BR N of N51
Significant weather (C)	Significant weather conditions encompassing thunderstorms and heavy sandstorm and duststorm	SIGWX: [nn/nn]	ISOL TS or OCNL TS or FRQ TS or OBSC TS or EMBD TS or HVV DS or HVV SS or SQL TS or ISOL TSGR or OCNL TSGR or FRQ TSGR or OBSC TSGR or EMBD TSGR or SQL TSGR or VA		SIGWX: 11/12 ISOL TS SIGWX: 12/14 SS S OF N35
Mountain obscuration (C)	Mountain obscuration	MT OBSC: [nn/nn]	nnnnnnnnn2		MT OBSC: MT PASSES S OF N48
Cloud (C)	Widespread areas of broken or overcast	SIG CLD: [nn/nn]	BKN or OVC nnn[n]/nnn[n] M		SIG CLD: 06/09 OVC 800/1100 FT AGL

Element	Detailed content	Template(s)		Examples
Location indicator of FIR/CTA (M)	ICAO location indicator of the nnnn ATS unit serving the FIR or CTA to which the GAMET refers (M)			YUCCI
	cloud with height of base less than 300 m (1 000 ft) above ground level (AGL) or above mean sea level (AMSL) and/or any occurrence of cumulonimbus (CB) or towering cumulus (TCU) clouds		(or nnn[n]/nnn[n] FT) AGL or AMSL ISOL or OCNL or FRQ or OBSC or EMBD CB3 or TCU3 nnn[n]/nnn[n] M (or nnn[n]/nnn[n] FT) AGL or AMSL	N OF N51 10/12 ISOL TCU 1200/8000 FT AGL
Icing (C)	Icing (except for that occurring in convective clouds and for severe icing for which a SIGMET message has already been issued)	ICE: [nn/nn]	MOD FLnnn/nnn or MOD ABV FLnnn or SEV FLnnn/nnn or SEV ABV FLnnn	ICE: MOD FL050/080
Turbulence (C)	Turbulence (except for that occurring in convective clouds and for severe turbulence for which a SIGMET message has already been issued)	TURB: [nn/nn]	MOD FLnnn/nnn or MOD ABV FLnnn or SEV FLnnn/nnn or SEV ABV FLnnn	TURB: MOD ABV FL090
Mountain wave (C)	Mountain wave (except for severe mountain wave for which a SIGMET message has already been issued)	MTW: [nn/nn]	MOD FLnnn/nnn or MOD ABV FLnnn or SEV FLnnn/nnn or SEV ABV FLnnn	MTW: MOD ABV FL080 N OF N63
SIGMET (C)	SIGMET messages applicable to the FIR/CTA concerned or a sub-area thereof, for which the area forecast is valid	SIGMET APPLICABLE:	n [,n] [,n]	SIGMET APPLICABLE: 3,5
or HAZARDOUS WX NIL (C)4		HAZARDOUS WX NIL		HAZARDOUS WX NIL
Indicator for the beginning of Section II (M)	Indicator to identify the beginning of Section II (M)	SECN II		SECN II
Pressure centres and fronts (M)	Pressure centres and fronts and their expected movements and	PSYS: [nn]	L [n]nnn HPA or H [n]nnn HPA or Nnnnn or Snnnn Wnnnnn or Ennnnn	PSYS: 06 L 1004 HPA N5130 E01000 MOV NE 25KT WKN

Element	Detailed content	Template(s)		Examples	
Location indicator of FIR/CTA (M)	ICAO location indicator of the nnnn ATS unit serving the FIR or CTA to which the GAMET refers (M)			YUCCI	
	developments		FRONT or NIL	or Nnnnn or Snnnn Wnnnnn or Ennnnn TO Nnnnn or Snnnn Wnnnnn or Ennnnn	
			MOV N or NE or E or SE or S or SW or W or NW nnKMH (nnKT) WKN or NC or INTSF	-	
Upper winds and temperatures (M)	Upper winds and upper-air temperatures for at least the following altitudes: 600, 1 500 and 3 000 m (2 000, 5 000 and 10 000 ft)	WIND/T:	[n]nnn M (or [n]nnn FT) nnn/[n]nn MPS (or nnn/[n]nn KT) PSnn or MSnn	Nnnnn or Snnnn Wnnnnn or Ennnnn or [N of Nnn or Snn] or [S of Nnn or Snn] or [W of Wnnn or Ennn] or [E of Wnnn or Ennn] or [nnnnnnnnn]2	WIND/T: 2000 FT 270/18 MPS PS03 5000 FT 250/20 MPS MS02 10000 FT 240/22 MPS MS11
Cloud (M)	Cloud information not included in Section I giving type, height of base and top above ground level (AGL) or above mean sea level (AMSL)	CLD: [nn/nn]	FEW or SCT or BKN or OVC ST or SC or CU or AS or AC or NS [n]nnn/[n]nnn M (or [n]nnn/[n]nnn FT) AGL or AMSL or NIL		CLD: BKN SC 2500/8000 FT AGL
Freezing level (M)	Height indication of 0°C level(s) above ground level (AGL) or above mean sea level (AMSL), if lower than the top of the airspace for which the forecast is supplied	FZLVL:	[ABV] nnnn FT AGL or AMSL		FZLVL: 3000 FT AGL
Forecast QNH (M)	Forecast lowest QNH during the period of validity	MNM QNH:	[n]nnn HPA		MNM QNH: 1004 HPA

Element	Detailed content		Template(s)	Examples
Location indicator of FIR/CTA (M)	ICAO location indicator of the nnnn ATS unit serving the FIR or CTA to which the GAMET refers (M)			YUCCI
Sea-surface temperature and state of the sea (O)	Sea-surface temperature and state of the sea if required by regional air navigation agreement	SEA:	Tnn HGT [n]n M	SEA: T15 HGT 5 M
Volcanic eruptions (M)	Name of volcano	VA:	nnnnnnnnnn or NIL	VA:ETNA

Notes:-

1. *Fictitious location.*
2. *Free text describing well-known geographical locations should be kept to a minimum.*
3. *The location of the CB and/or TCU should be specified in addition to any widespread areas of broken or overcast cloud as given in the example.*
4. *When no elements are included in Section I.*

Table A5-4. Ranges and resolutions for the numerical elements included in TAF

Element as specified in D6		Range	Resolution
Wind direction:	° true	000 – 360	10
Wind speed:	MPS KT	0 0	1
Visibility:	M M M M	0000 – 0750 0800 – 4900 5000 – 9000 1000 –	50 100 1 000 (fixed value:9999)
Vertical visibility:	30's M (100's FT)	000 – 020	1
Cloud: height of cloud base:	30's M (100's FT)	000 – 100	1
Air temperature (maximum and minimum):	°C	-80 – +60	1
* There is no aeronautical requirement to report surface wind speeds of 50 m/s (100 kt) or more; however, provision has been made for reporting wind speeds up to 99 m/s (199 kt) for non-aeronautical purposes, as necessary.			

Example A5-1. TAF

TAF for YUDO (Donlon/International):*

TAF YUDO 160000Z 1606/1624 13005MPS 9000 BKN020 BECMG 1606/1608 SCT015CB BKN020 TEMPO 1608/1612 17006G12MPS 1000 TSRA SCT010CB BKN020 FM161230 15004MPS 9999 BKN020

Meaning of the forecast:

TAF for Donlon/International* issued on the 16th of the month at 0000 UTC valid from 0600 UTC to 2400 UTC on the 16th of the month; surface wind direction 130 degrees; wind speed 5 meters per second; visibility 9 kilometres, broken cloud at 600 metres; becoming between 0600 UTC and 0800 UTC on the 16th of the month, scattered cumulonimbus cloud at 450

metres and broken cloud at 600 metres; temporarily between 0800 UTC and 1200 UTC on the 16th of the month surface wind direction 170 degrees; wind speed 6 meters per second gusting to 12 meters per second; visibility 1 000 metres in a thunderstorm with moderate rain, scattered cumulonimbus cloud at 300 metres and broken cloud at 600 metres; from 1230 UTC on the 16th of the month surface wind direction 150 degrees; wind speed 4 meters per second; visibility 10 kilometres or more; and broken cloud at 600 metres.

* Fictitious location

Note.— In this example, the primary units “meter per second” and “metre” were used for wind speed and height of cloud base, respectively. However, in accordance with Annex 5, the corresponding non-SI alternative units “knot” and “foot” may be used instead.

Example A5-2. Cancellation of TAF

Cancellation of TAF for YUDO (Donlon/International):*

TAF AMD YUDO 161500Z 1606/1624 CNL

Meaning of the forecast:

Amended TAF for Donlon/International* issued on the 16th of the month at 1500 UTC cancelling the previously issued TAF valid from 0600 UTC to 2400 UTC on the 16th of the month.

* Fictitious location

Example A5-3. GAMET area forecast

YUCC GAMET VALID 220600/221200 YUDO
YUCC AMSWELL FIR/2 BLW FL120

SECN I
SFC WSPD: 10/12 16 MPS
SFC VIS: 06/08 3000 M BR N OF N51
SIGWX: 11/12 ISOL TS
SIG CLD: 06/09 OVC 800/1100 FT AGL N OF N51 10/12 ISOL TCU 1200/8000 FT AGL
ICE: MOD FL050/080
TURB: MOD ABV FL090
SIGMETS APPLICABLE: 3, 5

SECN II
PSYS: 06 L 1004 HPA N5130 E01000 MOV NE 25 KT WKN
WIND/T: 2000 FT 270/18 MPS PS03 5000 FT 250/20 MPS MS02 10000 FT 240/22 MPS MS11
CLD: BKN SC 2500/8000 FT AGL
FZLVL: 3000 FT AGL
MNM QNH: 1004 HPA
SEA: T15 HGT 5M
VA: NIL

Meaning: An area forecast for low-level flights (GAMET) issued for sub-area two of the Amwell* flight region (identified by YUCC Amwell area control centre) for below flight level 120 by the Donlon/International* meteorological office (YUDO); the message is valid from 0600 UTC to 1200 UTC on the 22nd of the month.

Section I:
surface wind speeds: between 1000 UTC and 1200 UTC 16 meters per second;

surface visibility:	between 0600 UTC and 0800 UTC 3 000 metres north of 51 degrees north (due to mist);
significant weather phenomena:	between 1100 UTC and 1200 UTC isolated thunderstorms without hail;
significant clouds:	between 0600 UTC and 0900 UTC overcast base 800, top 1 100 feet above ground level
north of 51 degrees north;	between 1000 UTC and 1200 UTC isolated towering cumulus base 1 200, top 8 000 feet above ground level;
icing:	moderate between flight level 050 and 080;
turbulence:	moderate above flight level 090 (at least up to flight level 120);
SIGMET messages:	3 and 5 applicable to the validity period and sub-area concerned.
Section II:	
pressure systems:	at 0600 UTC low pressure of 1 004 hectopascals at 51.5 degrees north 10.0 degrees east, expected to move north-eastwards at 25 knots and to weaken;
winds and temperatures:	at 2 000 feet above ground level wind direction 270 degrees; wind speed 18 meters per second, temperature plus 3 degrees Celsius; at 5000 feet above ground level wind direction 250 degrees; wind speed 20 meters per second, temperature minus 2 degrees Celsius; at 10 000 feet above ground level wind direction 240 degrees; wind speed 22 meters per second, temperature minus 11 degrees Celsius;
clouds:	broken stratocumulus, base 2 500 feet, top 8 000 feet above ground level;
freezing level:	3 000 feet above ground level;
minimum QNH:	1 004 hectopascals;
sea:	surface temperature 15 degrees Celsius; and state of the sea 5 metres;
volcanic ash:	nil
* Fictitious location	

Appendix 6. TECHNICAL SPECIFICATIONS RELATED TO SIGMET AND AIRMET INFORMATION, AERODROME WARNINGS AND WIND SHEAR WARNINGS AND ALERTS:

(See Chapter 7 of this MCAR)

Note:- Data type designators to be used in abbreviated headings for SIGMET, AIRMET, tropical cyclone and volcanic ash advisory messages are given in WMO Publication No. 386, Manual on the Global Telecommunication System.

I SPECIFICATIONS RELATED TO SIGMET INFORMATION:

I.1 Format of SIGMET messages:

I.1.1 The content and order of elements in a SIGMET message shall be in accordance with the template shown in Table A6-1.

I.1.2 Messages containing SIGMET information shall be identified as: "SIGMET".

I.1.3 The sequence number referred to in the template in Table A6-1 shall correspond with the number of SIGMET messages issued for the flight information region since 0001 UTC on the day concerned. The meteorological watch offices whose area of responsibility encompasses more than one FIR and/or CTA shall issue separate SIGMET messages for each FIR and/or CTA within its area of responsibility.

I.1.4 In accordance with the template in Table A6-1, only one of the following phenomena shall be included in a SIGMET message, using the abbreviations as indicated below:

I.1.4.1 At cruising levels (irrespective of altitude):

- | | |
|---|-----------|
| a. thunderstorm | |
| i. obscured | OBSC TS |
| ii. embedded | EMBD TS |
| iii. frequent | FRQ TS |
| iv. squall line | SQL TS |
| v. obscured with hail | OBSC TSGR |
| vi. embedded with hail | EMBD TSGR |
| vii. frequent, with hail | FRQ TSGR |
| viii. squall line with hail | SQL TSGR |
| b. tropical cyclone | |
| i. tropical cyclone with 10-minute mean TC (+ cyclone name) surface wind speed of 17 m/s (34 kt) or more. | |
| c. turbulence | |
| i. severe turbulence | SEV TURB |

- d. icing
 - i. severe icing SEV ICE
 - ii. severe icing due to freezing rain SEV ICE (FZRA)

- e. mountain wave
 - i. severe mountain wave SEV MTW

- f. duststorm
 - i. heavy duststorm HVY DS

- g. sandstorm
 - i. heavy sandstorm HVY SS

- h. volcanic ash
 - i. volcanic ash VA (+ volcano name, if known)

- i. radioactive cloud R DOACT CLD

1.1.5 SIGMET information shall not contain unnecessary descriptive material. In describing the weather phenomena for which the SIGMET is issued, no descriptive material additional to that given in 1.1.4 shall be included. SIGMET information concerning thunderstorms or a tropical cyclone shall not include references to associated turbulence and icing.

1.1.6 Meteorological watch offices in a position to do so should issue SIGMET information in graphical format using the WMO BUFR code form, in addition to the issuance of this SIGMET information in abbreviated plain language in accordance with 1.1.1.

Note:- The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, Volume 1.2, Part B — Binary Codes.

1.1.7 SIGMET, when issued in graphical format, should be as specified in Appendix.

1.2 Dissemination of SIGMET messages:

1.2.1 SIGMET messages shall be disseminated to meteorological watch offices, WAFCs and to other meteorological offices in accordance with regional air navigation agreement. SIGMET messages for volcanic ash shall also be disseminated to VAACs.

1.2.2 SIGMET messages shall be disseminated to international OPMET databanks and the centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems, in accordance with regional air navigation agreement.

2 SPECIFICATIONS RELATED TO AIRMET INFORMATION:

2.1 Format of AIRMET messages:

- 2.1.1 The content and order of elements in an AIRMET message shall be in accordance with the Template shown in Table A6-1.
- 2.1.2 The sequence number referred to in the template in Table A6-1 shall correspond with the number of AIRMET messages issued for the flight information region since 0001 UTC on the day concerned. The meteorological watch offices whose area of responsibility encompasses more than one FIR and/or CTA shall issue separate AIRMET messages for each FIR and/or CTA within its area of responsibility. 2.1.3 The flight information region shall be divided in sub-areas, as necessary.
- 2.1.3 In accordance with the template in Table A6-1, only one of the following phenomena shall be included in an AIRMET message, using the abbreviations as indicated below:
- 2.1.3.1 At cruising levels below flight level 100 (or below flight level 150 in mountainous areas, or higher, where necessary):
- a. surface wind speed
 - i. widespread mean surface wind speed above 15 m/s (30 kt) SFC WSPD (+ wind speed & units)
 - b. surface visibility
 - i. widespread areas affected SFC VIS by reduction of visibility to less than 5000m, including the weather phenomenon causing the reduction of visibility: (+ visibility) (+ one of the following weather phenomena or combinations thereof: BR, DS, DU, DZ, FC, FG, FU, GR, GS, HZ, IC, PL, PO, RA, SA, SG, SN, SQ, SS or VA)
 - c. thunderstorms
 - i. isolated thunderstorms without hail ISOL TS
 - ii. occasional thunderstorms without hail OCNL TS
 - iii. isolated thunderstorms with hail ISOL TSGR
 - iv. occasional thunderstorms with hail OCNL TSGR
 - d. mountain obscuration
 - i. mountains obscured MT OBSC
 - e. cloud
 - i. widespread areas of broken or overcast cloud with height of base less than 300 m (1 000 ft) above ground level:
 - broken BKN CLD (+ height of the base and top and units)
 - overcast OVC CLD (+ height of the base and top and units)
 - ii. cumulonimbus clouds which are:
 - isolated ISOL CB

occasional	OCNL CB
frequent	FRQ CB
iii. towering cumulus clouds which are:	
isolated	ISOL TCU
occasional	OCNL TCU
frequent	FRQ TCU
f. icing	
i. moderate icing (except for icing in convective clouds)	MOD ICE
g. turbulence	
i. moderate turbulence (except for turbulence in convective clouds)	MOD TURB
h. mountain wave	
i. moderate mountain wave	MOD MTW

2.1.4 AIRMET information shall not contain unnecessary descriptive material. In describing the weather phenomena for which the AIRMET is issued, no descriptive material additional to that given in 2.1.4 shall be included. AIRMET information concerning thunderstorms or cumulonimbus clouds shall not include references to associated turbulence and icing.

Note:- The specifications for SIGMET information which is also applicable to low-level flights are given in 1.1.4.

2.2 Dissemination of AIRMET messages:

2.2.1 AIRMET messages should be disseminated to meteorological watch offices in adjacent flight information regions and to other meteorological offices, as agreed by the meteorological authorities concerned.

2.2.2 AIRMET messages should be transmitted to international operational meteorological databanks and the centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems, in accordance with regional air navigation agreement.

3 SPECIFICATIONS RELATED TO SPECIAL AIR-REPORTS:

Note:- This Appendix deals with the uplink of special air-reports. The general specifications related to special air reports are given in Appendix 4

3.1 Special air-reports should be uplinked for 60 minutes after their issuance.

3.2 Information on wind and temperature included in automated special air-reports should not be uplinked to other aircraft in flight.

4 DETAILED CRITERIA RELATED TO SIGMET AND AIRMET MESSAGES AND SPECIAL AIR-REPORTS (UPLINK):

4.1 Identification of the flight information region:

- 4.1.1 In cases where the airspace is divided into a flight information region (FIR) and an upper flight information region (UIR), the SIGMET should be identified by the location indicator of the air traffic services unit serving the FIR.

Note:- The SIGMET message applies to the whole airspace within the lateral limits of the FIR, i.e. to the FIR and to the UIR. The particular areas and/or flight levels affected by the meteorological phenomena causing the issuance of the SIGMET are given in the text of the message.

4.2 Criteria related to phenomena included in SIGMET and AIRMET messages and special air reports (uplink):

- 4.2.1 An area of thunderstorms and cumulonimbus clouds should be considered:
- obscured (OBSC) if it is obscured by haze or smoke or cannot be readily seen due to darkness;
 - embedded (EMBD) if it is embedded within cloud layers and cannot be readily recognized;
 - isolated (ISOL) if it consists of individual features which affect, or are forecast to affect, an area with a maximum spatial coverage less than 50 per cent of the area concerned (at a fixed time or during the period of validity); and
 - occasional (OCNL) if it consists of well-separated features which affect, or are forecast to affect, an area with a maximum spatial coverage between 50 and 75 per cent of the area concerned (at a fixed time or during the period of validity).
- 4.2.2 An area of thunderstorms should be considered frequent (FRQ) if within that area there is little or no separation between adjacent thunderstorms with a maximum spatial coverage greater than 75 per cent of the area affected, or forecast to be affected, by the phenomenon (at a fixed time or during the period of validity).
- 4.2.3 Squall line (SQL) should indicate a thunderstorm along a line with little or no space between individual clouds.
- 4.2.4 Hail (GR) should be used as a further description of the thunderstorm, as necessary.
- 4.2.5 Severe and moderate turbulence (TURB) should refer only to: low-level turbulence associated with strong surface winds; rotor streaming; or turbulence whether in cloud or not in cloud (CAT). Turbulence should not be used in connection with convective clouds.
- 4.2.6 Turbulence shall be considered:
- severe whenever the peak value of the cube root of EDR exceeds 0.7; and
 - moderate whenever the peak value of the cube root of EDR is above 0.4 and below or equal to 0.7.
- 4.2.7 Severe and moderate icing (ICE) should refer to icing in other than convective clouds. Freezing rain (FZRA) should refer to severe icing conditions caused by freezing rain.

- 4.2.8 A mountain wave (MTW) should be considered:
- a. severe whenever an accompanying downdraft of 3.0 m/s (600 ft/min) or more and/or severe turbulence is observed or forecast; and
 - b. moderate whenever an accompanying downdraft of 1.75–3.0 m/s (350–600 ft/min) and/or moderate turbulence is observed or forecast.

5 SPECIFICATIONS RELATED TO AERODROME WARNINGS:

5.1 Format and dissemination of aerodrome warnings:

- 5.1.1 The aerodrome warnings shall be issued in accordance with the template in Table A6-2 where required by operators or aerodrome services, and shall be disseminated in accordance with local arrangements to those concerned.
- 5.1.2 The sequence number referred to in the template in Table A6-2 shall correspond with the number of aerodrome warnings issued for the aerodrome since 0001 UTC on the day concerned.
- 5.1.3 In accordance with the template in Table A6-2, aerodrome warnings should relate to the occurrence or expected occurrence of one or more of the following phenomena:
- a. tropical cyclone (to be included if the 10-minute mean surface wind speed at the aerodrome is expected to be 17 m/s (34 kt) or more)
 - b. thunderstorm
 - c. hail
 - d. snow (including the expected or observed snow accumulation)
 - e. freezing precipitation
 - f. hoar frost or rime
 - g. sandstorm
 - h. duststorm
 - i. rising sand or dust
 - j. strong surface wind and gusts
 - k. squall
 - l. frost
 - m. volcanic ash
 - n. tsunami
 - o. volcanic ash deposition
 - p. toxic chemicals
 - q. other phenomena as agreed locally.
- 5.1.4 The use of text additional to the abbreviations listed in the template in Table A6-2 should be kept to a minimum. The additional text should be prepared in abbreviated plain language using approved ICAO abbreviations and numerical values. If no ICAO approved abbreviations are available, English plain language text should be used.

5.2 Quantitative criteria for aerodrome warnings

- 5.2.1 When quantitative criteria are necessary for the issue of aerodrome warnings covering, for example, the expected maximum wind speed or the expected total snowfall, the criteria should be established by agreement between the meteorological office and the users of the warnings.

6 SPECIFICATIONS RELATED TO WIND SHEAR WARNINGS

6.1 Detection of wind shear

- 6.1.1 Evidence of the existence of wind shear should be derived from:

- a. ground-based, wind shear remote-sensing equipment, for example, Doppler radar;
- b. ground-based, wind shear detection equipment, for example, a system of surface wind and/or pressure sensors located in an array monitoring a specific runway or runways and associated approach and departure paths;
- c. aircraft observations during the climb-out or approach phases of flight to be made in accordance with Chapter 5; or
- d. other meteorological information, for example, from appropriate sensors located on existing masts or towers in the vicinity of the aerodrome or nearby areas of high ground.

Note:- Wind shear conditions are normally associated with the following phenomena:

- i. thunderstorms, micro bursts, funnel cloud (tornado or waterspout), and gust fronts*
- ii. frontal surfaces*
- iii. strong surface winds coupled with local topography*
- iv. sea breeze fronts*
- v. mountain waves (including low-level rotors in the terminal area)*
- vi. low-level temperature inversions.*

6.2 Format and dissemination of wind shear warnings and alerts

Note:- Information on wind shear is also to be included as supplementary information in local routine and special reports and METAR and SPECI in accordance with the templates in Appendix 3, Tables A3-1 and A3-2.

- 6.2.1 The wind shear warnings shall be issued in accordance with the template in Table A6-3 and shall be disseminated in accordance with local arrangements to those concerned.
- 6.2.2 The sequence number referred to in the template in Table A6-3 shall correspond with the number of wind shear warnings issued for the aerodrome since 0001 UTC on the day concerned.
- 6.2.3 The use of text additional to the abbreviations listed in the template in Table A6-3 should be kept to a minimum. The additional text should be prepared in abbreviated plain language using approved ICAO abbreviations and numerical values. If no ICAO approved abbreviations are available, English plain language text should be used.
- 6.2.4 When an aircraft report is used to prepare a wind shear warning, or to confirm a warning previously issued, the corresponding aircraft report, including the aircraft type, should be disseminated unchanged in accordance with local arrangements to those concerned.

Note 1:- Following reported encounters by both arriving and departing aircraft, two different wind shear warnings may exist: one for arriving aircraft and one for departing aircraft.

Note 2:- Specifications for reporting the intensity of wind shear are still undergoing development. It is recognized, however, that pilots, when reporting wind shear, may use the qualifying terms “moderate”, “strong” or “severe”, based to a large extent on their subjective assessment of the intensity of the wind shear encountered.

- 6.2.5 The wind shear alerts shall be disseminated from automated, ground-based, wind shear remote sensing or detection equipment in accordance with local arrangements to those concerned.
- 6.2.6 Where micro bursts are observed, reported by pilots or detected by ground-based, wind shear detection or remote-sensing equipment, the wind shear warning and wind shear alert should include a specific reference to microburst.
- 6.2.7 Where information from ground-based, wind shear detection or remote-sensing equipment is used to prepare a wind shear alert, the alert shall, if practicable, relate to specific sections of the runway and distances along the approach path or take-off path as agreed between the meteorological authority, the appropriate ATS authority and the operators concerned.

Table A6-1: Template for SIGMET and AIRMET messages and special air-reports (uplink)

KEY: M = inclusion mandatory, part of every message;
 C = inclusion conditional, included whenever applicable;
 = = a double line indicates that the text following it should be placed on the subsequent line.

Note: The ranges and resolutions for the numerical elements included in SIGMET/AIRMET messages and in special air-reports are shown in Table A6-4.

Element as specified in Para D5 and Appendix 6	Detailed content	Template(s)			Examples
		SIGMET	AIRMET	SPECIAL AIR-REPORT I	
Location indicator of FIR/CTA (M)2	ICAO location indicator of the ATS unit serving the FIR or CTA to which the SIGMET/AIRMET refers (M)	nnnn		-	YUCC3 YUDD3
Identification (M)	Message identification and sequence number4 (M)	SIGMET [nn]n	AIRMET [nn]n	ARS	SIGMET 5 SIGMET A3 AIRMET 2 ARS
Validity period (M)	Day-time groups indicating the period of	VALID nnnnnn/nnnnn		— 5	VALID 221215/221600 VALID 101520/101800 VALID 251600/252200

Element as specified in Para D5 and Appendix 6	Detailed content	Template(s)			Examples
		SIGMET	AIRMET	SPECIAL AIR-REPORT I	
	validity in UTC (M)				
Location indicator of MWO (M)	Location indicator of MWO originating the message with a separating hyphen (M)	nnnn-			YUDO— 3 YUSO— 3
Name of the FIR/CTA or aircraft identification (M)	Location indicator and name of the FIR/CTA6 for which the SIGMET/AIRMET is issued or aircraft radiotelephony call sign (M)	nnnn nnnnnnnnnn FIR[/UIR] or nnnn nnnnnnnnnn CTA	nnnn nnnnnnnnnn FIR[/n]	nnnnnn	YUCC AMSWELL FIR3 YUDD SHANLON FIR/UIR3 YUCC AMSWELL FIR/23 YUDD SHANLON FIR3 VA812
IF THE SIGMET IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE.					
Phenomenon (M)7	Description of phenomenon causing the issuance of SIGMET/AIRMET (C)	OBSC8 TS[GR9] EMBD10 TS[GR] FRQ11 TS[GR] SQL12 TS[GR] TC nnnnnnnnnn or NN25 SEV TURB13 SEV ICE14 SEV ICE (FZRA)14 SEV MTW15 HVY DS HVY SS [VA ERUPTION] [MT] [nnnnnnnnnn] [PSN Nnn[nn] or Snn[nn] Ennn[nn] or Wnnn[nn]] VA CLD RDOACT CLD	SFC WSPD nn[n]MPS (or SFC WSPD nn[n]KT) SFC VIS nnnnM (nn)16 ISOL17 TS[GR]9 OCNL18 TS[GR] MT OBSC BKN CLD nnn/[ABV]nnnnM (or BKN CLD nnn/[ABV]nnnnFT) OVC CLD nnn/[ABV]nnnnM (or OVC CLD nnn/[ABV]nnnnFT) ISOL17 CB19 OCNL18 CB FRQ11 CB ISOL17 TCU19 OCNL18 TCU19 FRQ11 TCU MOD TURB13 MOD ICE14 MOD MTW15	TS TSGR SEV TURB SEV ICE SEV MTW HVY SS VA CLD [FL nnn/nnn] VA[MT nnnnnnnnnn] MOD TURB MOD ICE	SEV TURB FRQ TS OBSC TSGR EMBD TSGR TC GLORIA TCNN VA ERUPTION MT ASHVAL PSN S15 E073 VA CLD MOD TURB MOD MTW ISOL CB BKN CLD 120/900M (BKN CLD 400/3000FT) OVC CLD 270/ABV3000M (OVC CLD 900/ABV10000FT) SEV ICE RDOACT CLD
Observed or forecast phenomenon (M)	Indication whether the Information is observed and expected to continue, or forecast (M)	OBS [AT nnnnZ] FCST [AT nnnnZ]		OBS AT nnnnZ	OBS AT 1210Z OBS FCST AT 1815Z
Location (C)26	Location (referring to	Nnn[nn] Wnnn[nn] or Nnn[nn] Ennn[nn] or Snn[nn] Wnnn[nn] or		NnnnnWnnnnn or NnnnnEnnnnn	S OF N54 N OF N50 N2020 W07005 AT YUSB3

Element as specified in Para D5 and Appendix 6	Detailed content	Template(s)			Examples	
		SIGMET	AIRMET	SPECIAL AIR-REPORT I		
	latitude and longitude (in degrees and minutes) or locations or geographic features well known internationally)	<p>Snn[nn] Ennn[nn] or N OF Nnn[nn] or S OF Nnn[nn] or N OF Snn[nn] or S OF Snn[nn] or [AND] W OF Wnnn[nn] or E OF Wnnn[nn] or W OF Ennn[nn] or E OF Ennn[nn] or [N OF, NE OF, E OF, SE OF, S OF, SW OF, W OF, NW OF] [LINE] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] – Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] or [N OF, NE OF, E OF, SE OF, S OF, SW OF, W OF, NW OF, AT] nnnnnnnnnnn or WI Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] – Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] – Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] – [Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] – Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]</p>			<p>or SnnnnWnnnnn or SnnnnEnnnnn</p>	<p>N2706 W07306 N48 E010 N OF N1515 AND W OF E13530 W OF E1554 N OF LINE S2520 W11510 - S2520 W12010 WI N6030 E02550 – N6055 E02500 – N6050 E02630</p>
Level (C)26	Flight level or altitude and extent ²⁰ (C)	<p>[SFC/]FLnnn or [SFC/]nnnnM (or [SFC/]nnnnFT) or FLnnn/nnn or TOP FLnnn or [TOP] ABV FLnnn or [TOP] BLW FLnnn or BLW nnnnM (or BLW nnnnFT) or 21 CB TOP [ABV] FLnnn WI nnnKM OF CENTRE (or CB TOP [ABV] FLnnn WI nnnNM OF CENTRE) or CB TOP [BLW] FLnnn WI nnnKM OF CENTRE (or CB TOP [BLW] FLnnn WI nnnNM OF CENTRE) or 22 FLnnn/nnn [APRX nnnKM BY nnnKM] [nnKM WID LINE²³ BTN (nnNM WID LINE BTN)] [Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] – Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [– Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [– Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]] (or FLnnn/nnn [APRX nnnNM BY nnnNM] [Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] – Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [– Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [– Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]])</p>			<p>FLnnn or nnnnM (or nnnnFT)</p>	<p>FL180 FL050/080 TOP FL390 SFC/FL070 TOP ABV FL100 FL310/450 CB TOP FL500 WI 270KM OF CENTRE (CB TOP FL500 WI 150NM OF CENTRE) FL310/350 APRX 220KM BY 35KM</p>

Element as specified in Para D5 and Appendix 6	Detailed content	Template(s)			Examples
		SIGMET	AIRMET	SPECIAL AIR-REPORT I	
Movement or expected movement (C)26	Movement or expected movement (direction and speed) with reference to one of the sixteen points of compass, or stationary (C)	MOV N [nnKMH] or MOV NNE [nnKMH] or MOV NE [nnKMH] or MOV ENE [nnKMH] or MOV E [nnKMH] or MOV ESE [nnKMH] or MOV SE [nnKMH] or MOV SSE [nnKMH] or MOV S [nnKMH] or MOV SSW [nnKMH] or MOV SW [nnKMH] or MOV WSW [nnKMH] or MOV W [nnKMH] or MOV WNW [nnKMH] or MOV NW [nnKMH] or MOV NNW [nnKMH] (or MOV N [nnKT] or MOV NNE [nnKT] or MOV NE [nnKT] or MOV ENE [nnKT] or MOV E [nnKT] or MOV ESE [nnKT] or MOV SE [nnKT] or MOV SSE [nnKT] or MOV S [nnKT] or MOV SSW [nnKT] or MOV SW [nnKT] or MOV WSW [nnKT] or MOV W [nnKT] or MOV WNW [nnKT] or MOV NW [nnKT] or MOV NNW [nnKT]) or STNR		-	MOV E 40KMH (MOV E 20KT) MOV SE STNR
Changes in intensity (C)26	Expected changes in intensity (C)	INTSF or WKN or NC		-	WKN
Forecast position (C)20,26	Forecast position of volcanic ash cloud or the centre of the TC at the end of the validity period of the SIGMET message (C)	FCST nnnnZ TC CENTRE Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] or FCST nnnnZ VA CLD APRX [nnKM WID LINE23 BTN (nnNM WID LINE BTN)] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] – Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [– Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [– Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [AND]27	-	-	FCST 2200Z TC CENTRE N2740 W07345 FCST 1700Z VA CLD APRX S15 E075 – S15 E081 – 517 E083 – 518 E079 – S15 E075
OR					
Cancellation of SIGMET/ AIRMET (C)27	Cancellation of SIGMET/AIRMET referring to its identification	CNL SIGMET [nn]n nnnnnn/nnnnnn or CNL SIGMET [nn]n nnnnnn/nnnnnn	CNL AIRMET [nn]n nnnnnn/nnnnnn	-	CNL SIGMET 2 101200/10160024 CNL SIGMET 3 251030/251430 VA MOV TO YUDO FIR24 CNL AIRMET

Element as specified in Para D5 and Appendix 6	Detailed content	Template(s)			Examples
		SIGMET	AIRMET	SPECIAL AIR-REPORT I	
		[VA MOV TO nnnn FIR] ²²			151520/15180024

Notes:-

1. No wind and temperature to be uplinked to other aircraft in flight in accordance with 3.2.
2. See 4.1.
3. Fictitious location.
4. In accordance with 1.1.3 and 2.1.2.
5. See 3.1.
6. See 2.1.3.
7. In accordance with 1.1.4 and 2.1.4.
8. In accordance with 4.2.1 a).
9. In accordance with 4.2.4.
10. In accordance with 4.2.1 b).
11. In accordance with 4.2.2.
12. In accordance with 4.2.3.
13. Used for unnamed tropical cyclones
14. In accordance with 4.2.5 and 4.2.6.
15. In accordance with 4.2.7.
16. In accordance with 4.2.8.
17. In accordance with 2.1.4.
18. In accordance with 4.2.1 c).
19. In accordance with 4.2.1 d).
20. The use of cumulonimbus, CB, and towering cumulus, TCU, is restricted to AIRMETs in accordance with 2.1.4.
21. In the case of the same phenomenon covering more than one area within the FIR, these elements can be repeated, as necessary.
22. Only for SIGMET messages for volcanic ash cloud and tropical cyclones.
23. Only for SIGMET messages for tropical cyclones.
24. Only for SIGMET messages for volcanic ash.
25. A straight line between two points drawn on a map in the Mercator projection or a straight line between two points which crosses lines of longitude at a constant angle.
26. To be used for two volcanic ash clouds or two centres of tropical cyclones simultaneously affecting the FIR concerned.
27. The number of coordinates should be kept to a minimum and should not normally exceed seven.
28. Optionally can be used in addition to Movement or Expected Movement.
29. To be used for hazardous phenomena other than volcanic ash cloud and tropical cyclones.
30. End of the message (as the SIGMET/AIRMET message is being cancelled).
31. The levels of the phenomena remain fixed throughout the forecast period.

Note: In accordance with 1.1.5 and 2.1.5, severe or moderate icing and severe or moderate turbulence (SEV ICE, MOD ICE, SEV TURB, MOD TURB) associated with thunderstorms, cumulonimbus clouds or tropical cyclones should not be included.

Table A6-2: Template for aerodrome warnings

Key: M = inclusion mandatory, part of every message;
C = inclusion conditional, included whenever applicable.

Note 1:- The ranges and resolutions for the numerical elements included in aerodrome warnings are shown in Table A6-4 of this appendix.

Note 2:- The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

Element	Detailed content	Template(s)	Example
Location indicator of the aerodrome (M)	Location indicator of the aerodrome	nnnn	YUCCI
Identification of the type of message (M)	Type of message and sequence number	AD WRNG [n]n	AD WRNG 2
Validity period (M)	Day and time of validity period in UTC	VALID nnnnnn/nnnnnn	VALID 211230/211530
IF THE AERODROME WARNING IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE.			
Phenomenon (M) ²	Description of phenomenon causing the issuance of the aerodrome warning	TC3 nnnnnnnnn or [HVY] TS or GR or [HVY] SN [nnCM]3 or [HVY] FZRA or [HVY] FZDZ or RIME4 or [HVY] SS or [HVY] DS or SA or DU or SFC WSPD nn[n] MPS MAX nn[n] (SFC WSPD nn[n]KT MAX nn[n]) or SFC WIND nnn/nn[n]MPS MAX nn[n] (SFC WIND nnn/nn[n]KT MAX nn[n]) or SQ or FROST or TSUNAMI or VA[DEPO] or TOX CHEM or Free text up to 32 characters 5	TC ANDREW HVY SN 25CM SFC WSPD 20MPS MAX 30 VA TSUNAMI
Observed or forecast phenomenon (M)	Indication whether the information is observed and expected to continue, or forecast	OBS [AT nnnnZ] or FCST	OBS AT 1200Z OBS
Changes in intensity (C)	Expected changes in intensity	INTSF or WKN or NC	WKN
OR			

Element	Detailed content	Template(s)	Example
Cancellation of aerodrome warning ⁶	Cancellation of aerodrome warning referring to its identification	CNL AD WRNG [n]n nnnnnn/nnnnnn	CNL AD WRNG 2 211230/2115306

Notes:-

1. Fictitious location.
2. One phenomenon or a combination thereof, in accordance with 5.1.3.
3. In accordance with 5.1.3.
4. Hoar frost or rime in accordance with 5.1.3.
5. In accordance with 5.1.4.
6. End of the message (as the aerodrome warning is being cancelled).

Table A6-3. Template for wind shear warnings

Key: M = inclusion mandatory, part of every message;
C = inclusion conditional, included whenever applicable.

Note 1:- The ranges and resolutions for the numerical elements included in wind shear warnings are shown in Table A6-4 of this appendix.

Note 2:- The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

Element	Detailed content	Template(s)	Example
Location indicator of the aerodrome (M)	Location indicator of the aerodrome	nnnn	YUCCI
Identification of the type of message (M)	Type of message and sequence number	WS WRNG [n]n	WS WRNG 1
Time of origin and validity period (M)	Day and time of issue and, where applicable, validity period in UTC	nnnnnn [VALID TL nnnnnn] or [VALID nnnnnn/nnnnnn]	211230 VALID TL 211330 221200VALID 221215/221315
IF THE WIND SHEAR WARNING IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE			
Phenomenon (M)	Identification of the phenomenon and its location	[MOD] or [SEV] WS IN APCH or [MOD] or [SEV] WS [APCH] RWYnnn or [MOD] or [SEV] WS IN CLIMB-OUT or [MOD] or [SEV] WS CLIMB-OUT RWYnnn or MBST IN APCH or MBST [APCH] RWYnnn or MBST IN CLIMB-OUT or	WS APCH RWY12 MOD WS RWY34 WS IN CLIMB-OUT MBST APCH RWY26 MBST IN CLIMB-OUT

Element	Detailed content	Template(s)	Example
		MBST CLIMB-OUT RWYnnn	
Observed, reported or forecast phenomenon (M)	Identification whether the phenomenon is observed or reported and expected to continue or forecast	REP AT nnnn nnnnnnnn or OBS [AT nnnn] or FCST	REP AT 1510 B747 OBS AT 1205 FCST
Details of the phenomenon (C)2	Description of phenomenon causing the issuance of the wind shear warning	SFC WIND: nnn/nnMPS(or nnn/nnKT) nnnM (nnnFT)-WIND: nnn/nnMPS (or nnn/nnKT) or nnKMH (or nnKT) LOSS nnKM (or nnNM) FNA RWYnn or nnKMH (or nnKT) GAIN nnKM (or nnNM) FNA RWYnn	SFC WIND: 320/15MPS 60M-WIND: 360/13MPS (SFC WIND: 320/10KT 200FT-WIND: 360/26KT) 60KMH LOSS 4KM FNA RWY13 (30KT LOSS 2NM FNA RWY13)
OR			
Cancellation of wind shear warning ³	Cancellation of wind shear warning referring to its identification	CNL WS WRNG [n]n nnnnnn/nnnnnn	CNL WS WRNG 1211230/2113303

Notes:-

1. Fictitious location.
2. Additional provisions in 6.2.3.
3. End of the message (as the wind shear warning is being cancelled).

Table A6-4. Ranges and resolutions for the numerical elements included in volcanic ash and tropical cyclone advisory messages, SIGMET/AIRMET messages and aerodrome and wind shear warnings

Element as specified in APPENDIX 2 and APPENDIX 6	Range	Resolution
Summit elevation: M FT	000 – 8 100 000 – 27 000	
Advisory number: for VA (index)* for TC (index)*	000 – 2 000 00 – 99	
Maximum surface wind: MPS KT	00 – 99 00 – 199	
Central pressure: hPa	850 – 1 050	
Surface wind speed: MPS KT	15 – 49 30 – 99	
Surface visibility: M M	0000 – 0750 0800 – 5 000	50 100
Cloud: height of base: M FT	000 – 300 000 – 1 000	30 100
Cloud: height of top: M M	000 – 2 970 3 000 – 20 000	30 300

	FT FT	000 – 9 900 10 000 – 60 000	100 1 000
Latitudes:	° (degrees) ' (minutes)	00 – 90 00 – 60	1 1
Longitudes:	° (degrees) ' (minutes)	000 – 180 00 – 60	1 1
Flight levels:		000 – 650	10
Movement:	KMH KT	0 – 300 0 – 150	10 5
* Non-dimensional			

Example A6-1. SIGMET and AIRMET message and the corresponding cancellations

<p>SIGMET YUDD SIGMET 2 VALID 101200/101600 YUSO – YUDD SHANLON FIR/UIR OBSC TS FCST S OF N54 TOP FL390 MOV E WKN</p>	<p>Cancellation of SIGMET YUDD SIGMET 3 VALID 01345/101600 YUSO – YUDD SHANLON FIR/UIR CNL SIGMET 2 101200/101600</p>
<p>AIRMET YUDD AIRMET 1 VALID 151520/151800 YUSO – YUDD SHANLON FIR ISOL TS OBS N OF S50 TOP ABV FL100 STNR WKN</p>	<p>Cancellation of AIRMET YUDD AIRMET 2 VALID 151650/151800 YUSO – YUDD SHANLON FIR CNL AIRMET 1 151520/151800</p>

Example A6-2. SIGMET message for tropical cyclone

<p>YUCC SIGMET 3 VALID 251600/252200 YUDO – YUCC AMSWELL FIR TC GLORIA OBS AT 1600Z N2706 W07306 CB TOP FL500 WI 150NM OF CENTRE MOV NW 10KT NC FCST 2200Z TC CENTRE N2740 W07345</p> <p><i>Meaning:</i></p> <p>The third SIGMET message issued for the AMSWELL* flight information region (identified by YUCC Amswell area control centre) by the Donlon/International* meteorological watch office (YUDO) since 0001 UTC; the message is valid from 1600 UTC to 2200 UTC on the 25th of the month; tropical cyclone Gloria was observed at 1600 UTC at 27 degrees 06 minutes north and 73 degrees 6 minutes west with cumulonimbus top at flight level 500 within 150 nautical miles of the centre; the tropical cyclone is expected to move northwestwards at 10 knots and not to undergo any changes in intensity; the forecast position of the centre of the tropical cyclone at 2200 UTC is expected to be at 27 degrees 40 minutes north and 73 degrees 45 minutes west.</p> <p>* Fictitious locations</p>

Example A6-3. SIGMET message for volcanic ash

RESERVED

Example A6-4. SIGMET message for severe turbulence

<p>YUCC SIGMET 5 VALID 221215/221600 YUDO – YUCC AMSWELL FIR SEV TURB OBS AT 1210Z AT YUSB FL250 MOV E 40KMH WKN</p> <p><i>Meaning:</i></p>

The fifth SIGMET message issued for the AMSWELL* flight information region (identified by YUCC Amswell area control centre) by the Donlon/International* meteorological watch office (YUDO) since 0001 UTC; the message is valid from 1215 UTC to 1600 UTC on the 22nd of the month; severe turbulence was observed at 1210 UTC over Siby/Bistock* aerodrome (YUSB) at flight level 250; the turbulence is expected to move eastwards at 40 kilometres per hour and to weaken in intensity.

* Fictitious locations

Example A6-5. AIRMET message for moderate mountain wave

YUCC AIRMET 2 VALID 221215/221600 YUDO –
YUCC AMSWELL FIR MOD MTW OBS AT 1205Z N48 E010 FL080 STNR NC

Meaning:

The second AIRMET message issued for the AMSWELL* flight information region (identified by YUCC Amswell area control centre) by the Donlon/International* meteorological watch office (YUDO) since 0001 UTC; the message is valid from 1215 UTC to 1600 UTC on the 22nd of the month; moderate mountain wave was observed at 1205 UTC at 48 degrees north and 10 degrees east at flight level 080; the mountain wave is expected to remain stationary and not to undergo any changes in intensity.

* Fictitious locations

Appendix 7. TECHNICAL SPECIFICATIONS RELATED TO AERONAUTICAL CLIMATOLOGICAL INFORMATION:

(See Chapter 8 of this MCAR)

I PROCESSING OF AERONAUTICAL CLIMATOLOGICAL INFORMATION:

- 1.1 Meteorological observations for regular and alternate aerodromes should be collected, processed and stored in a form suitable for the preparation of aerodrome climatological information.

2 EXCHANGE OF AERONAUTICAL CLIMATOLOGICAL INFORMATION:

- 2.1.1 Aeronautical climatological information should be exchanged on request between Meteorological Authorities. Operators and other aeronautical users desiring such information should normally apply to the meteorological authority responsible for its preparation.

3 CONTENT OF AERONAUTICAL CLIMATOLOGICAL INFORMATION:

3.1 Aerodrome climatological tables:

- 3.1.1 An aerodrome climatological table should give as applicable:
- mean values and variations therefrom, including maximum and minimum values, of meteorological elements (for example, of air temperature); and/or
 - the frequency of occurrence of present weather phenomena affecting flight operations at the aerodrome (for example, of sandstorms); and/or
 - the frequency of occurrence of specified values of one, or of a combination of two or more, elements (for example, of a combination of low visibility and low cloud).
- 3.1.2 Aerodrome climatological tables should include information required for the preparation of aerodrome climatological summaries in accordance with 3.2.

3.2 Aerodrome climatological summaries:

- 3.2.1 Aerodrome climatological summaries should cover:
- frequencies of the occurrence of runway visual range/visibility and/or height of the base of the lowest cloud layer of BKN or OVC extent below specified values at specified times;
 - frequencies of visibility below specified values at specified times;
 - frequencies of the height of the base of the lowest cloud layer of BKN or OVC extent below specified values at specified times; d) frequencies of occurrence of concurrent wind direction and speed within specified ranges;

- d. frequencies of surface temperature in specified ranges of 5°C at specified times; and
- e. mean values and variations therefrom, including maximum and minimum values of meteorological elements required for operational planning purposes, including take-off performance calculations.

Note: Models of climatological summaries related to a) to e) are given in WMO Publication No. 49, Technical Regulations, Volume II, C.3.2.

Appendix 8. TECHNICAL SPECIFICATIONS RELATED TO SERVICE FOR OPERATORS AND FLIGHT CREW MEMBERS

(See Chapter 9 of this MCAR)

Note: Specifications related to flight documentation (including the model charts and forms) are given in Appendix 1

I MEANS OF SUPPLY AND FORMAT OF METEOROLOGICAL INFORMATION:

1.1 Meteorological information shall be supplied to operators and flight crew members by one or more of the following, as agreed between the meteorological authority and operator concerned, and with the order shown below not implying priorities:

- a. written or printed material, including specified charts and forms;
- b. data in digital form;
- c. briefing;
- d. consultation;
- e. display; or
- f. in lieu of a) to e), by means of an automated pre-flight information system providing self-briefing and flight documentation facilities while retaining access by operators and aircrew members to consultation, as necessary, with the meteorological office, in accordance with 5.1.

1.2 The Maldives Meteorological Service, in consultation with the operator, shall determine:

- a. the type and format of meteorological information to be supplied; and
- b. methods and means of supplying that information.

1.3 On request by the operator, the meteorological information supplied for flight planning should include data for the determination of the lowest usable flight level.

2 SPECIFICATIONS RELATED TO INFORMATION FOR PRE-FLIGHT PLANNING AND IN-FLIGHT RE-PLANNING:

2.1 Format of upper-air gridded information:

2.1.1 Upper-air gridded information supplied by WAFCs for pre-flight and in-flight re-planning shall be in the GRIB code form.

Note:- The GRIB code form is contained in WMO Publication No. 306, Manual on Codes, Volume 1.2, Part B — Binary Codes.

2.2 Format of information on significant weather:

- 2.1.2 Information on significant weather supplied by WAFCs for pre-flight and in-flight re-planning shall be in the BUFR code form.

Note:- The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, Volume 1.2, Part B — Binary Codes. 2.3 Specific needs of helicopter operations:

- 2.1.3 Meteorological information for pre-flight planning and in-flight re-planning by operators of helicopters flying to offshore structures should include data covering the layers from sea level to flight level 100. Particular mention should be made of the expected surface visibility, the amount, type (where available), base and tops of cloud below flight level 100, sea state and sea-surface temperature, mean sea level pressure, and the occurrence and expected occurrence of turbulence and icing, as determined by regional air navigation agreement.

3 SPECIFICATIONS RELATED TO BRIEFING AND CONSULTATION:

3.1 Information required to be displayed:

- 3.1.1 The material displayed should be readily accessible to the flight crew members or other flight operations personnel concerned.

4 SPECIFICATIONS RELATED TO FLIGHT DOCUMENTATION:

4.1 Presentation of information:

- 4.1.1 The flight documentation related to forecasts of upper wind and upper-air temperature and SIGWX phenomena shall be presented in the form of charts. For low-level flights, alternatively, GAMET area forecasts shall be used.

Note:- Models of charts and forms for use in the preparation of flight documentation are given in APPENDIX 1. These models and methods for their completion are developed by the World Meteorological Organization on the basis of relevant operational requirements stated by the International Civil Aviation Organization.

- 4.1.2 METAR and SPECI (including trend forecasts as issued in accordance with regional air navigation agreement), TAF, GAMET, SIGMET, AIRMET and volcanic ash and tropical cyclone advisory information shall be presented in accordance with the templates in Appendices 1, 2,3, 5 and 6 respectively. Such meteorological information received from other meteorological offices shall be included in flight documentation without change.

Note:- Examples of the form of presentation of METAR/SPECI and TAF are given in Appendix 1.

- 4.1.3 The location indicators and the abbreviations used should be explained in the flight documentation.
- 4.1.4 The forms and the legend of charts included in flight documentation should be printed in English. Where appropriate, approved abbreviations should be used. The units employed for each element should be indicated; they should be in accordance with MCAR 5, 1.1.

4.2 Charts in flight documentation:

4.2.1 Characteristics of charts:

4.2.1.1 Charts included in flight documentation should have a high standard of clarity and legibility and should have the following physical characteristics:

- a. for convenience, the largest size of charts should be about 42 × 30 cm (standard size A3) and the smallest size should be about 21 × 30 cm (standard size A4). The choice between these sizes should depend on the route lengths and the amount of detail that needs to be given in the charts as agreed between Meteorological authorities and users;
- b. major geographical features, such as coastlines, major rivers and lakes should be depicted in a way that makes them easily recognizable;
- c. for charts prepared by computer, meteorological data should take preference over basic chart information, the former cancelling the latter wherever they overlap;
- d. major aerodromes should be shown as a dot and identified by the first letter of the name of the city the aerodrome serves as given in Table AOP of the relevant regional air navigation plan;
- e. a geographical grid should be shown with meridians and parallels represented by dotted lines at each 10° latitude and longitude; dots should be spaced one degree apart;
- f. latitude and longitude values should be indicated at various points throughout the charts (i.e. not only at the edges); and
- g. labels on the charts for flight documentation should be clear and simple and should present the name of the world area forecast centre or, for non-WAFS products, the originating centre, the type of chart, date and valid time and, if necessary, the types of units used in an unambiguous way.

4.2.1.2 Meteorological information included in flight documentation shall be represented as follows:

- a. winds on charts shall be depicted by arrows with feathers and shaded pennants on a sufficiently dense grid;
- b. temperatures shall be depicted by figures on a sufficiently dense grid;
- c. wind and temperature data selected from the data sets received from a world area forecast centre shall be depicted in a sufficiently dense latitude/longitude grid; and
- d. wind arrows shall take precedence over temperatures and either shall take precedence over chart background.

4.2.1.3 For short-haul flights, charts should be prepared covering limited areas at a scale of 1:15 × 10⁶ as required.

4.2.2 Set of charts to be provided

4.2.2.1 The minimum number of charts for flights between flight level 250 and flight level 630 shall include a high-level SIGWX chart (flight level 250 to flight level 630) and a forecast 250 hPa wind and temperature chart. The actual charts provided for pre-flight and in-flight planning and for flight documentation shall be as agreed between meteorological authorities and users concerned.

4.2.2.2 Charts to be provided shall be generated from the digital forecasts provided by the WAFCs whenever these forecasts cover the intended flight path in respect of time, altitude and geographical extent, unless otherwise agreed between the meteorological authority and the operator concerned.

4.2.3 Height indications:

4.2.3.1 In flight documentation, height indications shall be given as follows:

- a. all references to en-route meteorological conditions, such as height indications of upper winds, turbulence or bases and tops of clouds, shall preferably be expressed in flight levels; they may also be expressed in pressure, altitude or, for low-level flights, height above ground level; and
- b. all references to aerodrome meteorological conditions, such as height indications of the bases of clouds, shall be expressed in height above the aerodrome elevation.

4.3 Specifications related to low-level flights

4.3.1 In chart form:

4.3.1.1 Where the forecasts are supplied in chart form, flight documentation for low-level flights, including those in accordance with the visual flight rules, operating up to flight level 100 (or up to flight level 150 in mountainous areas or higher, where necessary), should contain the following as appropriate to the flight:

- a. information from relevant SIGMET and AIRMET messages;
- b. upper wind and upper-air temperature charts as given in Appendix 5 4.3.1; and
- c. significant weather charts as given in Appendix 5 4.3.2.

4.3.2 In abbreviated plain language:

4.3.2.1 Where the forecasts are not supplied in chart form, flight documentation for low-level flights, including those in accordance with the visual flight rules, operating up to flight level 100 (up to flight level 150 in mountainous areas or higher, where necessary), should contain the following information as appropriate to the flight:

- a. SIGMET and AIRMET information; and
- b. GAMET area forecasts.

Note:- An example of the GAMET area forecast is given in Appendix 5

5 SPECIFICATIONS RELATED TO AUTOMATED PRE-FLIGHT INFORMATION SYSTEMS FOR BRIEFING, CONSULTATION, FLIGHT PLANNING AND FLIGHT DOCUMENTATION:

5.1 Access to the systems:

5.1.1 Automated pre-flight information systems providing self-briefing facilities shall provide for access by operators and flight crew members to consultation, as necessary, with a meteorological office by telephone or other suitable telecommunications means.

5.2 Detailed specifications of the systems:

- 5.2.1 Automated pre-flight information systems for the supply of meteorological information for self briefing, pre-flight planning and flight documentation should:
- a. provide for the continuous and timely updating of the system database and monitoring of the validity and integrity of the meteorological information stored;
 - b. permit access to the system by operators and flight crew members and also by other aeronautical users concerned through suitable telecommunications means;
 - c. use access and interrogation procedures based on abbreviated plain language and, as appropriate, ICAO location indicators, and aeronautical meteorological code data-type designators prescribed by the WMO, or based on a menu-driven user interface, or other appropriate mechanisms as agreed between the meteorological authority and operators concerned; and
 - d. provide for rapid response to a user request for information. Note:- ICAO abbreviations and codes and location indicators are given respectively in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400) and Location Indicators (Doc 7910). Aeronautical meteorological code data-type designators are given in the WMO Publication No. 386, Manual on the Global Telecommunication System.

6 SPECIFICATIONS RELATED TO INFORMATION FOR AIRCRAFT IN FLIGHT:

6.1 Supply of information requested by an aircraft in flight:

- 6.1.1 If an aircraft in flight requests meteorological information, the meteorological office which receives the request should arrange to supply the information with the assistance, if necessary, of another meteorological office.

6.2 Information for in-flight planning by the operator:

- 6.2.1 Meteorological information for planning by the operator for aircraft in flight should be supplied during the period of the flight and should normally consist of any or all of the following:
- a. METAR and SPECI (including trend forecasts as issued in accordance with regional air navigation agreement);
 - b. TAF and amended TAF;
 - c. SIGMET and AIRMET information and special air-reports relevant to the flight, unless the latter have been the subject of a SIGMET message;
 - d. upper wind and upper-air temperature information;
 - e. volcanic ash and tropical cyclone advisory information relevant to the flight; and
 - f. other meteorological information in alphanumeric or graphical form as agreed between the meteorological authority and the operator concerned.

Note:- Guidance on the display of graphical information in the cockpit is provided in the Manual of Aeronautical Meteorological Practice (Doc 8896).

CHART	LATITUDE	LONGITUDE	CHART	LATITUDE	LONGITUDE
A	N7000	W12500	D	N6500	W01500
A	N7000	W02500	D	N6500	E13200
A	S5500	W02500	D	S2800	E13200
A	S5500	W12500	D	S2800	W01500
ASIA	N3600	E05300	E	N4500	E02500
ASIA	N3600	E10800	E	N4500	E18000
ASIA	0000	E10800	E	S4700	E18000
ASIA	0000	E05300	E	S4700	E02500
B	N8500	W01500	F	N4230	W11000
B	N4330	E05300	F	S4730	W11000
B	S5200	W05000	F	S4730	E10000
B	N1500	W12500	F	N4230	E10000
BI	N5000	W12800	M	S1000	E11000
BI	N6000	E01500	M	N7200	E11000
BI	S3500	E04000	M	N7200	W11000
BI	S4600	W10800	M	S1000	W11000
C	N7600	W03230	MID	N4400	E01700
C	N7600	E07000	MID	N4400	E07000
C	S4500	E07000	MID	N1000	E07000
C	S4500	W03230	MID	N1000	E01700

Figure A8-1. Fixed areas of coverage of WAFS forecasts in chart form — Mercator projection

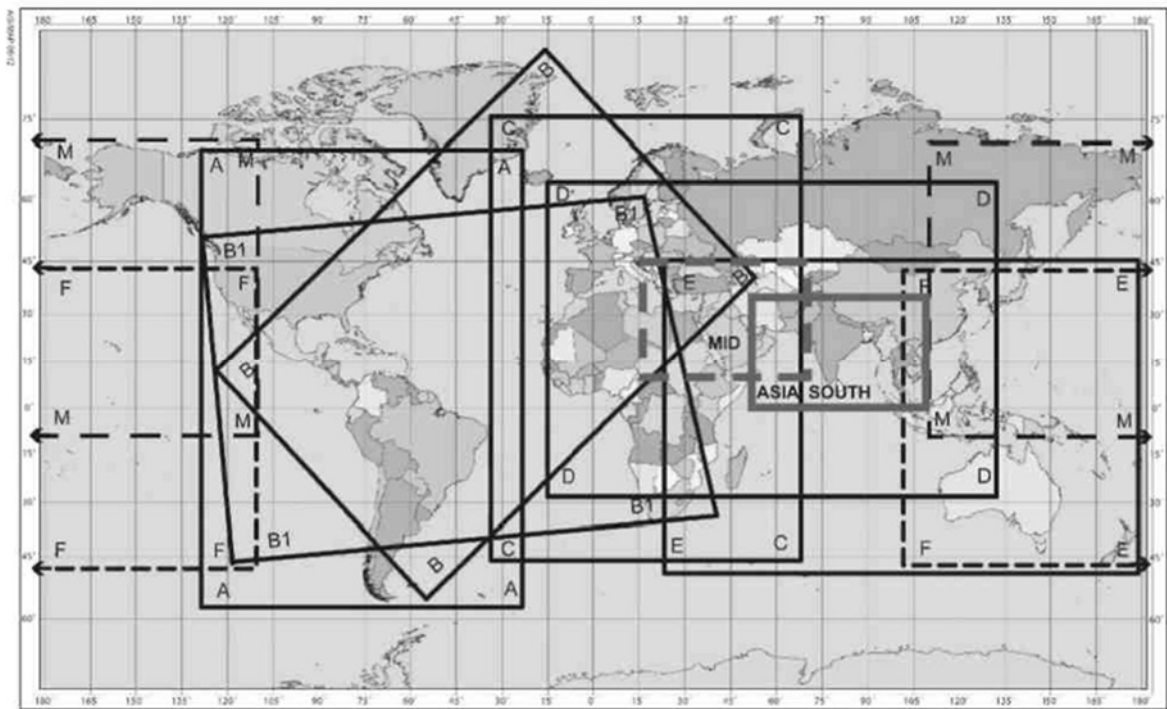


CHART	LATITUDE	LONGITUDE	CHART	LATITUDE	LONGITUDE
A	N7000	W12500	D	N6500	W01500
A	N7000	W02500	D	N6500	E13200
A	S5500	W02500	D	S2800	E13200
A	S5500	W12500	D	S2800	W01500
ASIA	N3600	E05300	E	N4500	E02500
ASIA	N3600	E10800	E	N4500	E18000
ASIA	0000	E10800	E	S4700	E18000
ASIA	0000	E05300	E	S4700	E02500
B	N8500	W01500	F	N4230	W11000
B	N4330	E05300	F	S4730	W11000
B	S5200	W05000	F	S4730	E10000
B	N1500	W12500	F	N4230	E10000
BI	N5000	W12800	M	S1000	E11000
BI	N6000	E01500	M	N7200	E11000
BI	S3500	E04000	M	N7200	W11000
BI	S4600	W10800	M	S1000	W11000
C	N7600	W03230	MID	N4400	E01700
C	N7600	E07000	MID	N4400	E07000
C	S4500	E07000	MID	N1000	E07000
C	S4500	W03230	MID	N1000	E01700

Figure A8-2. Fixed areas of coverage of WAFS forecasts in chart form — Polar stereographic projection (northern hemisphere)

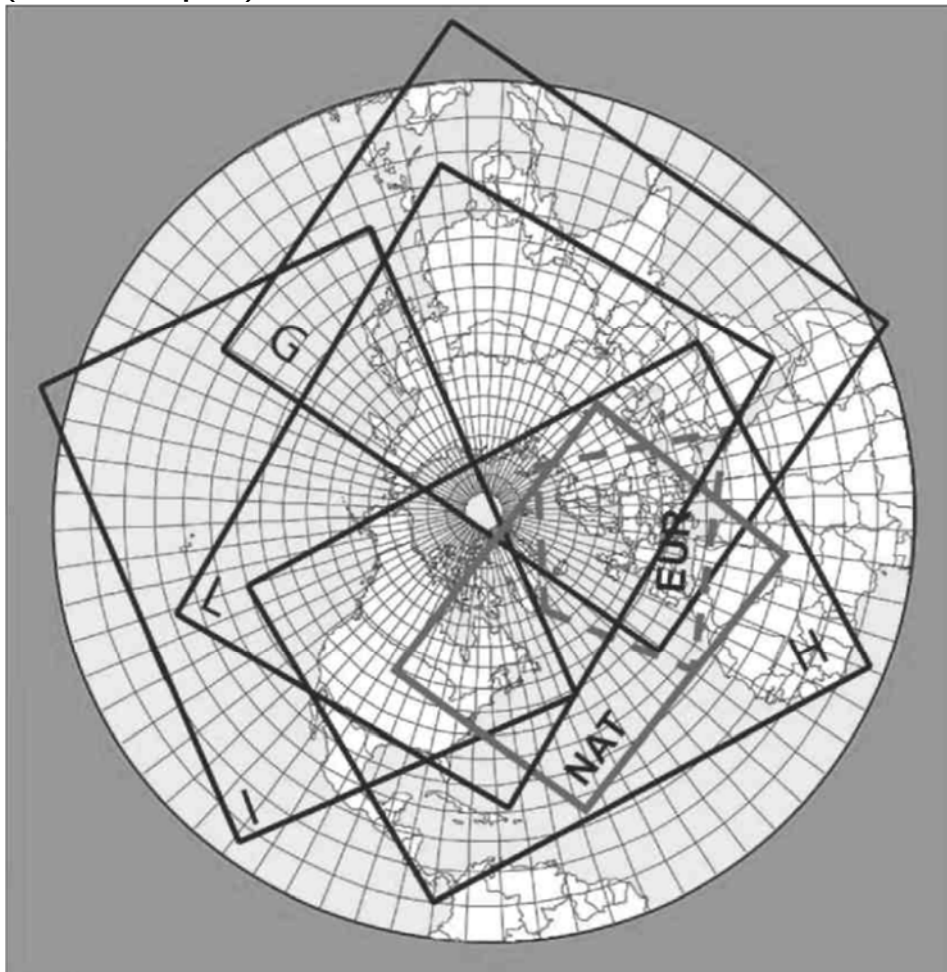


CHART	LATITUDE	LONGITUDE	CHART	LATITUDE	LONGITUDE
EUR	N5830	E06800	I	N0200	W11000
EUR	N2600	E03145	I	N4000	W03953
EUR	N2100	W02130	I	N2000	E13000
EUR	N4700	W05800	I	S0500	E18000
G	S1000	E11000	L	N1205	E11449
G	S0530	E04515	L	N1518	E4500
G	N3500	W02000	L	N2020	E6900
G	N2000	E16500	L	N1413	E14338
H	N0230	W00500	NAT	N4454	W10130
H	N2500	E05600	NAT	N1953	E00945
H	N3000	W14500 N	AT	N1721	W05354
H	N0500	W08000	NAT	N5047	E06004

Figure A8-2. Fixed areas of coverage of WAFS forecasts in chart form — Polar stereographic projection (northern hemisphere)

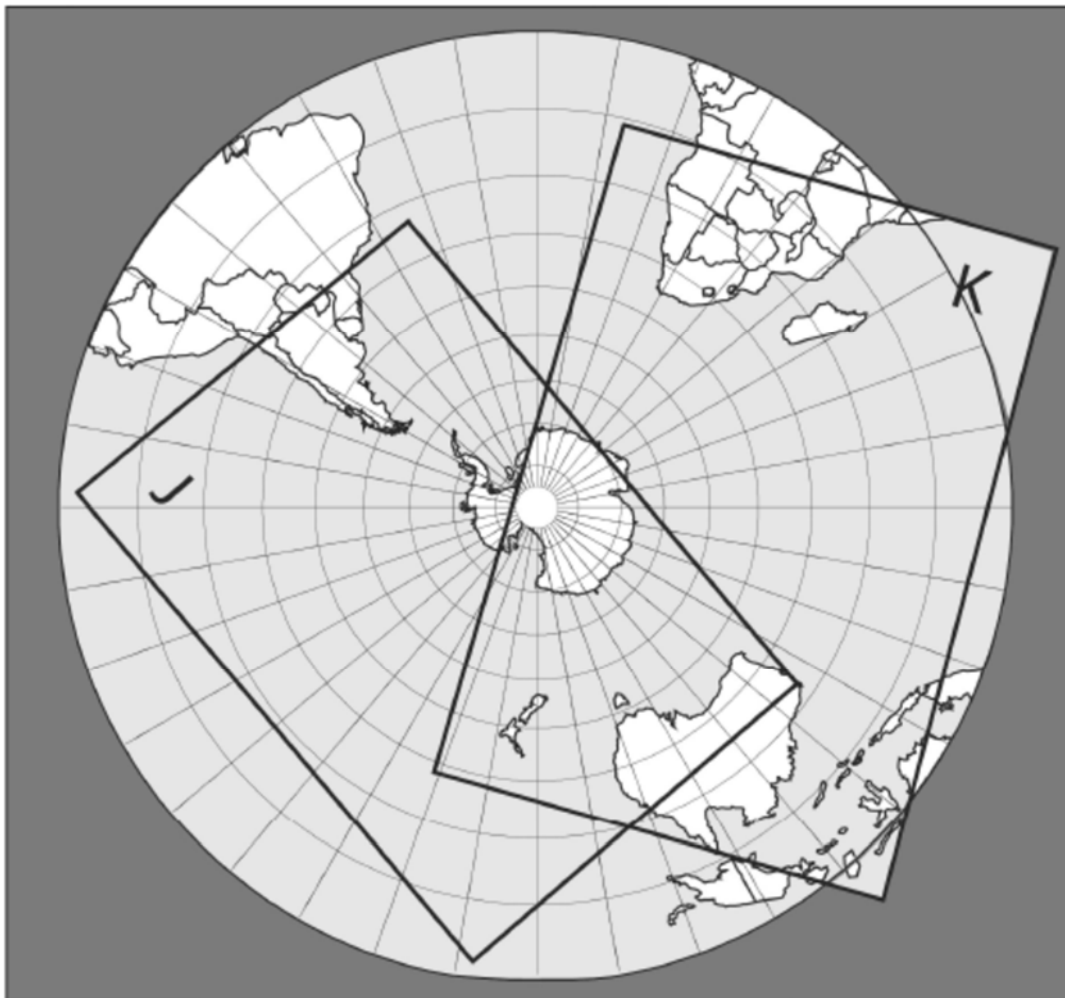


CHART	LATITUDE	LONGITUDE
J	S2305	W03700
J	S2245	E11322
J	S0616	E17245
J	S0722	W09347
K	S1000	E00500
K	S2845	W16730
K	N0500	E12800
K	N1200	E05500

Figure A8-3. Fixed areas of coverage of WAFS forecasts in chart form — Polar stereographic projection (southern hemisphere)

Appendix 9. TECHNICAL SPECIFICATIONS RELATED T INFORMATION FOR AIR TRAFFIC SERVICES, SEARCH AND RESCUE SERVICES AND AERONAUTICAL INFORMATION SERVICES:

(See Chapter 10 of this MCAR)

I INFORMATION TO BE PROVIDED FOR AIR TRAFFIC SERVICES UNITS:

I.1 List of information for the aerodrome control tower:

- I.1.1 The following meteorological information shall be supplied, as necessary, to an aerodrome control tower by its associated aerodrome meteorological office:
- a. local routine and special reports, METAR and SPECI, TAF and trend forecasts and amendments thereto, for the aerodrome concerned;
 - b. SIGMET and AIRMET information, wind shear warnings and alerts and aerodrome warnings;
 - c. any additional meteorological information agreed upon locally, such as forecasts of surface wind for the determination of possible runway changes;

I.2 List of information for the approach control unit:

- I.2.1 The following meteorological information shall be supplied, as necessary, to an approach control unit by its associated aerodrome meteorological office:
- a. local routine and special reports, METAR and SPECI, TAF and trend forecasts and amendments thereto, for the aerodrome(s) with which the approach control unit is concerned;
 - b. SIGMET and AIRMET information, wind shear warnings and alerts and appropriate special air-reports for the airspace with which the approach control unit is concerned and aerodromewarnings;
 - c. any additional meteorological information agreed upon locally;

I.3 List of information for the area control centre and flight information centre:

- I.3.1 The following meteorological information shall be supplied, as necessary, to a flight information centre or an area control centre by its associated meteorological watch office:
- a. METAR and SPECI, including current pressure data for aerodromes and other locations, TAF and trend forecasts and amendments thereto, covering the flight information region or the control area and, if required by the flight information centre or area control centre, covering aerodromes in neighbouring flight information regions, as determined by regional air navigation agreement;
 - b. forecasts of upper winds, upper-air temperatures and significant en-route weather phenomena and amendments thereto, particularly those which are likely to make operation under visual flight rules impracticable, SIGMET and AIRMET information and appropriate special air-reports for the flight information region or control area and, if determined by regional air navigation agreement and required by the flight information centre or area control centre, for neighbouring flight information regions;

- c. any other meteorological information required by the flight information centre or area control centre to meet requests from aircraft in flight; if the information requested is not available in the associated meteorological watch office, that office shall request the assistance of another meteorological office in supplying it;
- d. information received concerning the accidental release of radioactive materials into the atmosphere, as agreed between the Meteorological and ATS authorities concerned;
- e. tropical cyclone advisory information issued by a TCAC in its area of responsibility;

1.4 Supply of information to aeronautical telecommunications stations:

- 1.4.1 Where necessary for flight information purposes, current meteorological reports and forecasts shall be supplied to designated aeronautical telecommunication stations. A copy of such information shall be forwarded, if required, to the flight information centre or the area control centre.

1.5 Format of information:

- 1.5.1 Local routine and special reports, METAR and SPECI, TAF and trend forecasts, SIGMET and AIRMET information, upper wind and upper-air temperature forecasts and amendments thereto should be supplied to air traffic services units in the form in which they are prepared, disseminated to other meteorological offices or received from other meteorological offices, unless otherwise agreed locally.
- 1.5.2 When computer-processed upper-air data for grid points are made available to air traffic services units in digital form for use by air traffic services computers, the contents, format and transmission arrangements should be as agreed between the Meteorological Authority and the appropriate ATS authority. The data should normally be supplied as soon as is practicable after the processing of the forecasts has been completed.

2 INFORMATION TO BE PROVIDED FOR SEARCH AND RESCUE SERVICES UNITS

2.1 List of information:

- 2.1.1 Information to be supplied to rescue coordination centres shall include the meteorological conditions that existed in the last known position of a missing aircraft and along the intended route of that aircraft with particular reference to:
- a. significant en-route weather phenomena;
 - b. cloud amount and type, particularly cumulonimbus; height indications of bases and tops;
 - c. visibility and phenomena reducing visibility;
 - d. surface wind and upper wind;
 - e. state of ground, in particular, any snow cover or flooding;
 - f. sea-surface temperature, state of the sea, ice cover if any and ocean currents, if relevant to the search area; and
 - g. sea-level pressure data.

2.2 Information to be provided on request:

- 2.2.1 On request from the rescue coordination centre, the designated meteorological office should arrange to obtain details of the flight documentation which was supplied to the missing aircraft, together with any amendments to the forecast which were transmitted to the aircraft in flight.
- 2.2.2 To facilitate search and rescue operations the designated meteorological office should, on request, supply:
- a. complete and detailed information on the current and forecast meteorological conditions in the search area; and
 - b. current and forecast conditions en route, covering flights by search aircraft from and returning to the aerodrome from which the search is being conducted.
- 2.2.3 On request from the rescue coordination centre, the designated meteorological office should supply or arrange for the supply of meteorological information required by ships undertaking search and rescue operations.

3 INFORMATION TO BE PROVIDED FOR AERONAUTICAL INFORMATION SERVICES UNITS:

3.1 List of information:

- 3.1.1 The following information shall be supplied, as necessary, to an aeronautical information services unit:
- a. information on meteorological service for international air navigation, intended for inclusion in the aeronautical information publication(s) concerned;

Note:- Details of this information are given in AIP Part 1, GEN 3.5 and Part 3, AD 2.2, 2.11, 3.2 and 3.11.
 - b. information necessary for the preparation of NOTAM or ASHTAM including, in particular, information on:
 - l. the establishment, withdrawal and significant changes in operation of aeronautical meteorological services. This information is required to be provided to the aeronautical information services unit sufficiently in advance of the effective date to permit issuance of NOTAM in compliance with MCAR 15, Chapter 5.1.1 and 5.1.1.1;

Note:- The specific information required is given in Chapter 3.3.2 and 4.8. 3) accidental release of radioactive materials into the atmosphere, as agreed between the meteorological and appropriate civil aviation authorities concerned; and

Note:- The specific information required is given in 3.4.2 g).
 - c. information necessary for the preparation of aeronautical information circulars including, in particular, information on:

1. expected important changes in aeronautical meteorological procedures, services and facilities provided; and
2. effect of certain weather phenomena on aircraft operations.

Appendix 10. TECHNICAL SPECIFICATIONS RELATED TO REQUIREMENTS FOR AND USE OF COMMUNICATIONS

(See Chapter 11 of this MCAR)

I SPECIFIC REQUIREMENTS FOR COMMUNICATIONS:

I.1 Required transit times of meteorological information:

I.1.1 Unless otherwise determined by regional air navigation agreement, AFTN messages and bulletins containing operational meteorological information should achieve transit times of less than the following:

SIGMET and AIRMET messages, volcanic ash and tropical cyclone advisory information and special air-reports		5 minutes		
Abbreviated plain-language amendments to significant weather and upper air forecasts		5 minutes		
Amended TAF and corrections to TAF		5 minutes		
META	}	0–900 km (500 NM)	5 minutes	
Trend forecasts				
TAF				10 minutes
SPECI				

I.2 Grid point data for ATS and operators:

I.2.1 When upper-air data for grid points in digital form are made available for use by air traffic services computers, the transmission arrangements should be as agreed between the Meteorological Authority and the appropriate ATS authority.

I.2.2 When upper-air data for grid points in digital form are made available to operators for flight planning by computer, the transmission arrangements should be as agreed among the world area forecast centre concerned, the Meteorological Authority and the operators.

2 USE OF AERONAUTICAL FIXED SERVICE COMMUNICATIONS AND PUBLIC INTERNET:

2.1 Meteorological bulletins in alphanumeric format:

2.1.1 Composition of bulletins:

2.1.1.1 Whenever possible, exchanges of operational meteorological information should be made in consolidated bulletins of the same types of meteorological information.

2.1.2 Filing times of bulletins:

2.1.2.1 Meteorological bulletins required for scheduled transmissions should be filed regularly and at the prescribed scheduled times. METAR should be filed for transmission not later than 5 minutes after the actual time of observation. TAF should be filed for transmission at least one hour before the commencement of their period of validity, unless otherwise determined by regional air navigation agreement.

2.1.3 Heading of bulletins

2.1.3.1 Meteorological bulletins containing operational meteorological information to be transmitted via the aeronautical fixed service or the public internet shall contain a heading consisting of:

- a. an identifier of four letters and two figures;
- b. the ICAO four-letter location indicator corresponding to the geographical location of the meteorological office originating or compiling the meteorological bulletin;
- c. a day-time group; and
- d. if required, a three-letter indicator.

Note 1:- Detailed specifications on format and contents of the heading are given in the WMO Publication No. 386, Manual on the Global Telecommunication System, Volume I and are reproduced in the Manual of Aeronautical Meteorological Practice (Doc 8896).

Note 2:- ICAO location indicators are listed in Location Indicators (Doc 7910).

2.1.4 Structure of bulletins:

2.1.4.1 Meteorological bulletins containing operational meteorological information to be transmitted via the AFTN shall be encapsulated in the text part of the AFTN message format.

2.2 World area forecast system products:

2.2.1 Telecommunications for the supply of WAFS products:

2.2.1.1 The telecommunication facilities used for the supply of world area forecast system products should be the aeronautical fixed service or the public internet.

2.2.2 Quality requirements for charts:

2.2.2.1 Where world area forecast system products are disseminated in chart form, the quality of the charts received should be such as to permit reproduction in a sufficiently legible form for flight planning and documentation. Charts received should be legible over 95 per cent of their area.

2.2.3 Quality requirements for transmissions:

2.2.3.1 Transmissions should be such as to ensure that their interruption should not exceed 10 minutes during any period of 6 hours.

2.2.4 Heading of bulletins containing WAFS products:

- 2.2.4.1 Meteorological bulletins containing WAFS products in digital form to be transmitted via aeronautical fixed service or the public internet shall contain a heading as given in 2.1.3.

3 USE OF AERONAUTICAL MOBILE SERVICE COMMUNICATIONS

3.1 Content and format of meteorological messages:

- 3.1.1 The content and format of reports, forecasts and SIGMET information transmitted to aircraft shall be consistent with the provisions prescribed in 4, 6 and 7 of this MCAR
- 3.1.2 The content and format of air-reports transmitted by aircraft shall be consistent with the provisions prescribed in 5 of this MCAR and the Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444), Appendix I. 3.2 Content and format of meteorological bulletins:
- 3.1.3 The substance of a meteorological bulletin transmitted via the aeronautical mobile service shall remain unchanged from that contained in the bulletin as originated.

4 USE OF AERONAUTICAL DATA LINK SERVICE — D-VOLMET:

4.1 Detailed content of meteorological information available for D-VOLMET:

- 4.1.1 The aerodromes for which METAR, SPECI and TAF are to be available for uplink to aircraft in flight shall be determined by regional air navigation agreement.
- 4.1.2 The flight information regions for which SIGMET and AIRMET messages are to be available for uplink to aircraft in flight shall be determined by regional air navigation agreement.

4.2 Criteria related to information to be available for D-VOLMET:

- 4.2.1 The latest available METAR, SPECI and TAF, and valid SIGMET and AIRMET should be used for uplink to aircraft in flight.
- 4.2.2 TAF included in the D-VOLMET should be amended as necessary to ensure that a forecast, when made available for uplink to aircraft in flight, reflects the latest opinion of the meteorological office concerned.
- 4.2.3 If no SIGMET message is valid for a flight information region, an indication of “NIL SIGMET” should be included in the D-VOLMET.

4.3 Format of information to be available for D-VOLMET:

- 4.3.1 The content and format of reports, forecasts and SIGMET and AIRMET information included in D-VOLMET shall be consistent with the provisions prescribed in 4, 6 and 7 of this MCAR.

5 USE OF AERONAUTICAL BROADCASTING SERVICE — VOLMET BROADCASTS

5.1 Detailed content of meteorological information to be included in VOLMET broadcasts:

5.1.1 The aerodromes for which METAR, SPECI and TAF are to be included in VOLMET broadcasts, the sequence in which they are to be transmitted and the broadcast time shall be determined by regional air navigation agreement.

5.1.2 The flight information regions for which SIGMET messages are to be included in scheduled VOLMET broadcasts shall be determined by regional air navigation agreement. Where this is done, the SIGMET message shall be transmitted at the beginning of the broadcast or of a five-minute time block.

5.2 Criteria related to information to be included in VOLMET broadcasts:

5.2.1 When a report has not arrived from an aerodrome in time for a broadcast, the latest available report should be included in the broadcast, together with the time of observation.

5.2.2 TAF included in scheduled VOLMET broadcasts should be amended as necessary to ensure that a forecast, when transmitted, reflects the latest opinion of the meteorological office concerned.

5.2.3 Where SIGMET messages are included in scheduled VOLMET broadcasts, an indication of “NILSIGMET” should be transmitted if no SIGMET message is valid for the flight information regions concerned.

5.3 Format of information to be included in VOLMET broadcasts:

5.3.1 The content and format of reports, forecasts and SIGMET information included in VOLMET broadcasts shall be consistent with the provisions prescribed in 4, 6 and 7 of this MCAR.

5.3.2 VOLMET broadcasts should use standard radiotelephony phraseologies.

Note:- Guidance on the standard radiotelephony phraseologies to be used in VOLMET broadcasts is given in the Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services (Doc 9377), Appendix 1.

Attachment A – OPERATIONALLY DESIRABLE ACCURACY OF MEASUREMENT OR OBSERVATION

Note:- The guidance contained in this table relates to Para D 4 — Meteorological observations and reports, in particular to D4.1.9.

Element to be observed	Operationally desirable accuracy of measurement or observation*
Mean surface wind	Direction: $\pm 10^\circ$ Speed: ± 0.5 m/s (1 kt) up to 5 m/s (10 kt) $\pm 10\%$ above 5 m/s (10 kt)
Variations from the mean surface wind	± 1 m/s (2 kt), in terms of longitudinal and lateral components
Visibility	± 50 m up to 600 m $\pm 10\%$ between 600 m and 1 500 m $\pm 20\%$ above 1 500 m
Runway visual range	± 10 m up to 400 m ± 25 m between 400 m and 800 m $\pm 10\%$ above 800 m
Cloud amount	± 1 okta
Cloud height	± 10 m (33 ft) up to 100 m (330 ft) $\pm 10\%$ above 100 m (330 ft)
Air temperature and dew-point temperature	$\pm 1^\circ\text{C}$
Pressure value (QNH, QFE)	± 0.5 hPa

* The operationally desirable accuracy is not intended as an operational requirement; it is to be understood as a goal that has been expressed by the operators.

Note:- Guidance on the uncertainties of measurement or observation can be found in WMO Publication No. 8 — Guide to Meteorological Instruments and Methods of Observation.

Attachment B – OPERATIONALLY DESIRABLE ACCURACY OF FORECASTS:

Note 1:- The guidance contained in this table relates to Chapter 6 — Forecasts, in particular to 6.1.1.

Note 2:- If the accuracy of the forecasts remains within the operationally desirable range shown in the second column, for the percentage of cases indicated in the third column, the effect of forecast errors is not considered serious in comparison with the effects of navigational errors and of other operational uncertainties.

The operationally desirable accuracy of forecasts should be as prescribed in the following table:

Element to be forecast	Operationally desirable accuracy of forecasts	Minimum percentage of cases within range
TAF		
Wind direction	± 20°	80% of cases
Wind speed	± 2.5 m/s (5 kt)	80% of cases
Visibility	± 200 m up to 800 m ± 30% between 800 m and 10 km	80% of cases
Precipitation	Occurrence or non-occurrence	80% of cases
Cloud amount	One category below 450 m (1 500 ft) Occurrence or non-occurrence of BKN or OVC between 450 m (1 500 ft) and 3 000 m (10 000 ft)	
Cloud height	± 30 m (100 ft) up to 300 m (1 000 ft) ± 30% between 300 m (1 000 ft) and 3 000 m (10 000 ft)	70% of cases
Air temperature	± 1°C	70% of cases
TREND FORECAST		
Wind direction	± 20°	90% of cases
Wind speed	± 2.5 m/s (5 kt)	90% of cases
Visibility	± 200 m up to 800 m ± 30% between 800 m and 10 km	90% of cases
Precipitation	Occurrence or non-occurrence	90% of cases
Cloud amount	One category below 450 m (1 500 ft) Occurrence or non-occurrence of BKN or OVC Between 450 m (1 500 ft) and 3 000 m (10 000 ft)	90% of cases
Cloud height	± 30 m (100 ft) up to 300 m (1 000 ft) ± 30% between 300 m (1 000 ft) and 3 000 m (10 000 ft)	90% of cases
FORECAST FOR TAKE-OFF		
Wind direction	± 20°	90% of cases
Wind speed	± 2.5 m/s (5 kt) up to 12.5 m/s (25 kt)	90% of cases
Air temperature	± 1°C	90% of cases
Pressure value (QNH)	± 1 hPa	90% of cases

Element to be forecast	Operationally desirable accuracy of forecasts	Minimum percentage of cases within range
AREA, FLIGHT AND ROUTE FORECASTS		
Upper-air temperature	± 2°C (Mean for 900 km (500 NM))	90% of cases
Relative humidity	± 20%	90% of cases
Upper wind	± 5 m/s (10 kt) (Modulus of vector difference for 900 km (500 NM))	90% of cases
Significant en-route weather phenomena and cloud	Occurrence or non-occurrence	80% of cases
	Location: ± 100 km (60 NM)	70% of cases
	Vertical extent: ± 300 m (1 000 ft)	70% of cases
	Flight level of tropopause : ± 300 m (1 000 ft)	80% of cases
	Max wind level: ± 300 m (1 000 ft)	80% of cases

Attachment C – ELECTED CRITERIA APPLICABLE TO AERODROME REPORTS

(The guidance in this table relates to Chapter 4 and Appendix 3 to this MCAR)

	Surface wind		Visibility (VIS)		RVR ¹		Present weather		Cloud		Temperature	Pressure (QNH, QFE)		Supplementary information					
					A	B	C	AB	BC	Amount	Type ²								
Specifications	Directional variations ³		Directional variations ³		Past tendency ⁴		Variations ⁵		Layers reported if coverage		No criteria	Parameters reported		Updated if changes > agreed magnitude	Parameter to be included				
	≥ 60° and < 180° Mean speed < 1.5 m/s (3 kt) ≥ 1.5 m/s (3 kt)		General rule Special Minimum prevailing VIS cases Minimum VIS < 1500 m or < 0.5 x prevailing VIS VIS fluctuating and prevailing VIS cannot be determined		R5(AB) - R5(BC) Ri - Ri+1 > MAX [50 m or 20% x Ri]		No general criteria applicable to all the WX phenomena (for specific criteria, see Appendix 3, 4.4.2)		Lowest layer > Next higher layer > CB ⁶ or TCU Identification			Parameters reported Updated if changes > agreed magnitude Parameter to be included							
Local routine and special report	2 min	2 min	2 min	2 min	2 min	2 min	1 min	N/A ³		Always		2/8	4/8	Always	CB TCU	QNH QFE ⁷	Yes	All ⁸	
METAR/SPECI	10 min	10 min	10 min	10 min	10 min	10 min	10 min	1 min	Upward ("U") or downward ("D") No tendency observed ("N") No tendency or tendency is to be omitted		Always		2/8	4/8	Always	CB TCU	QNH	No	Recent WX of operational significance and wind shear ⁹
Relevant reporting scales for all messages	Direction in three figures rounded off to the nearest 10 degrees (degrees 1 – 4 down, degrees 5 – 9 up)		Speed in 1 m/s or 1 kt	Step applicable	Step applicable	Step applicable	Step applicable	N/A		Step applicable:		Base ≤ 3 000 m (10 000ft) (100 ft)		30 m	In whole hPa ¹⁰ rounding down for decimals 1 – 9		N/A		

Notes:-

1. Considered for the past 10 minutes (exception: if the 10-minute period includes a marked discontinuity (i.e. RVR changes or passes 150, 350, 600 or 800 m, lasting ≥ 2 minutes), only data after the discontinuity to be used). A simple diagrammatic convention is used to illustrate those parts of the 10-minute period prior to the observation relevant to RVR criteria, i.e. AB, BC and AC.
2. Layer composed of CB and TCU with a common base should be reported as "CB".
3. Considered for the past 10 minutes (exception: if the 10-minute period includes a marked discontinuity (i.e. the direction changes ≥ 30° with a speed ≥ 5 m/s or the speed changes ≥ 5 m/s lasting ≥ 2 minutes), only data after the discontinuity to be used).
4. If several directions, the most operationally significant direction used.
5. Let Ri = any 1-minute mean RVR value during period AC, Ri0 = 10-minute mean RVR value during period AC, R5(AB) = 5-minute mean RVR value during period AB and R5(BC) = 5-minute mean RVR value during period BC.
6. CB (cumulonimbus) and TCU (towering cumulus = cumulus congestus of great vertical extent) if not already indicated as one of the other layers.
7. Time averaging, if applicable, indicated in the upper left-hand corner.
8. According to the WMO Manual on Codes (WMO-No. 306), Volume I.1, Part A — Alphanumeric Codes, paragraph 15.5.5, "it is recommended that the wind measuring systems should be such that peak gusts should represent a three-second average".
9. N/A = not applicable.

- I0. QFE is to be included if required. Reference elevation for QFE should be aerodrome elevation except for precision approach runways, and non-precision approach runways with threshold ≥ 2 m (7 ft) below or above aerodrome elevation, where the reference level should be the relevant threshold elevation.
- I1. As listed in Appendix 3, 4.8.
- I2. Also sea-surface temperature and state of the sea from offshore structures in accordance with regional air navigation agreement.
- I3. Report if RVR and/or VIS < 1 500 m, limits for assessments 50 and 2 000 m.
- I4. For landing at aerodromes with precision approach runways and with the threshold elevation ≥ 15 m below the aerodrome elevation; the threshold elevation to be used as a reference.
- I5. Measured in 0.1 hPa.

Attachment D – CONVERSION OF INSTRUMENTED READINGS INTO RUNWAY VISUAL RANGE AND VISIBILITY

1. The conversion of instrumented readings into runway visual range and visibility is based on Koschmieder’s Law or Allard’s Law, depending on whether the pilot can be expected to obtain main visual guidance from the runway and its markings or from the runway lights. In the interest of standardization in runway visual range assessments, the following guidelines on the use and application of the main conversion factors should be used in these computations.
2. In Koschmieder’s Law one of the factors to be taken into account is the pilot contrast threshold. The agreed constant to be used for this is 0.05 (dimensionless).
3. In Allard’s Law the corresponding factor is the illumination threshold. This is not a constant, but a continuous function dependent on the background luminance. The agreed relationship to be used in instrumented systems with continuous adjustment of the illumination threshold by a background luminance sensor is shown by the curve in Figure D-I. The use of a continuous function which approximates the step function such as displayed in Figure D-I is preferred, due to its higher accuracy, to the stepped relationship described in paragraph 4.
4. In instrumented systems without continuous adjustment of the illumination threshold, the use of four equally spaced illumination threshold values with agreed corresponding back-ground luminance ranges is convenient but will reduce accuracy. The four values are shown in Figure D-I in the form of a step function; they are tabulated in Table D-I for greater clarity.

Note 1:- Information and guidance material on the runway lights to be used for assessment of runway visual range are contained in the Manual of Runway Visual Range Observing and Reporting Practices (Doc 9328).

Note 2:- In accordance with the definition of visibility for aeronautical purposes, the intensity of lights to be used for the assessment of visibility is in the vicinity of 1 000 cd.

Table D-1. Illumination threshold steps

Condition(lx)	Illumination threshold (cd/m2)	Background luminance
Night	8×10^{-7}	≤ 50
Intermediate	10^{-5}	51 – 999
Normal day	10^{-4}	1000 – 12000
Bright day (sunlit fog)	10^{-3}	>12000

Figure D-1. Relationship between the illumination threshold ET (lx) and background luminance B (cd/m2)

