Technical Regulations

Basic Documents No. 2

Volume II – Meteorological Service for International Air Navigation

2013 edition
# PUBLICATION REVISION TRACK RECORD

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EDITORIAL NOTE

The following typographical practice has been followed: standard practices and procedures have been printed in semi-bold roman. Recommended practices and procedures have been printed in light-face roman. Notes have been printed in smaller type, light-face roman, and preceded by the indication: Note.

METEOTERM, the WMO terminology database, may be consulted at http://www.wmo.int/pages/prog/lsp/meteoterm_wmo_en.html. Acronyms may also be found at http://www.wmo.int/pages/themes/acronyms/index_en.html.
GENERAL PROVISIONS

1. The WMO Technical Regulations (WMO-No. 49) are presented in four volumes:

Volume I – General meteorological standards and recommended practices
Volume II – Meteorological service for international air navigation
Volume III – Hydrology
Volume IV – Quality management

Purpose of the Technical Regulations

2. The Technical Regulations of the World Meteorological Organization are determined by Congress in accordance with Article 8 (d) of the Convention.

3. These Regulations are designed:

(a) To facilitate cooperation in meteorology and hydrology between Members;
(b) To meet, in the most effective manner, specific needs in the various fields of application of meteorology and operational hydrology in the international sphere; and
(c) To ensure adequate uniformity and standardization in the practices and procedures employed in achieving (a) and (b) above.

Types of Regulations and notes

4. The Technical Regulations comprise standard practices and procedures and recommended practices and procedures.

5. The definitions of these two types of Regulations are as follows:

The standard practices and procedures:

(a) Shall be the practices and procedures which it is necessary that Members follow or implement; and therefore
(b) Shall have the status of requirements in a technical resolution in respect of which Article 9 (b) of the Convention is applicable; and
(c) Shall invariably be distinguished by the use of the term shall in the English text, and by suitable equivalent terms in the Arabic, Chinese, French, Russian and Spanish texts.

The recommended practices and procedures:

(a) Shall be the practices and procedures which it is desirable that Members follow or implement; and therefore
(b) Shall have the status of recommendations to Members, to which Article 9 (b) of the Convention shall not be applied;
(c) Shall be distinguished by the use of the term should in the English text (except where otherwise provided by decision of Congress) and by suitable equivalent terms in the Arabic, Chinese, French, Russian and Spanish texts.

6. In accordance with the above definitions, Members shall do their utmost to implement the standard practices and procedures. In accordance with Article 9 (b) of the Convention and in conformity with the provisions of Regulation 128 of the General Regulations, Members shall formally notify the Secretary-General, in writing, of their intention to apply the standard practices and procedures of the Technical Regulations, except those for which they have lodged a specific deviation. Members shall also inform the Secretary-General, at least three months in advance, of any change in the degree of their implementation of a standard practice or procedure as previously notified and the effective date of the change.
7. Members are urged to comply with recommended practices and procedures, but it is not necessary to notify the Secretary-General of non-observance except with regard to those contained in Volume II, Parts I and II.

8. In order to clarify the status of the various Regulations, the standard practices and procedures are distinguished from the recommended practices and procedures by a difference in typographical practice, as indicated in the editorial note.

9. Certain notes (preceded by the indication Note) are included in the Technical Regulations for explanatory purposes; they may, for instance, refer to relevant WMO Guides and publications. These notes do not have the status of Technical Regulations. The WMO Guides describe practices, procedures and specifications which Members are invited to follow or implement in establishing and conducting their arrangements in compliance with the Technical Regulations and in developing meteorological and hydrological services in their respective countries.

**Status of annexes and appendices**

10. The following WMO publications, which contain regulatory material having the status of the Technical Regulations, are annexes to the Technical Regulations (Volumes I to IV):

   I  *International Cloud Atlas* (WMO-No. 407), Volume I – Manual on the Observation of Clouds and Other Meteors, Part I; Part II: paragraphs II.1.1, II.1.4, II.1.5 and II.2.3; subparagraphs 1, 2, 3 and 4 of each paragraph from II.3.1 to II.3.10; paragraphs II.8.2 and II.8.4; Part III: paragraph III.1 and the definitions (in italics) of paragraph III.2 (not attached);

   II  *Manual on Codes* (WMO-No. 306), Volume I (not attached);

   III  *Manual on the Global Telecommunication System* (WMO-No. 386), Volume I (in part) (not attached);

   IV  *Manual on the Global Data-processing and Forecasting System* (WMO-No. 485), Volume I (not attached);

   V  *Manual on the Global Observing System* (WMO-No. 544), Volume I (not attached);

   VI  *Manual on Marine Meteorological Services* (WMO-No. 558), Volume I (not attached);

   VII  *Manual on the WMO Information System* (WMO-No. 1060) (not attached);


These annexes, normally also called manuals, are established by decision of Congress and are intended to facilitate the application of Technical Regulations to specific fields. In principle, annexes may contain both standard and recommended practices and procedures.

11. Texts called appendices appearing in the Technical Regulations or in an annex to the Technical Regulations have the same status as the Regulations to which they refer.

**Updating of the Technical Regulations and their annexes (Manuals)**

12. The Technical Regulations are updated, as necessary, in the light of developments in meteorology and hydrology and meteorological and hydrological techniques, and in the applications of meteorology. Certain principles previously agreed upon by Congress and applied in the selection of material for inclusion in the Technical Regulations are reproduced below. These principles provide guidance for constituent bodies, in particular technical commissions, when dealing with matters pertaining to the Technical Regulations:

   (a) Technical commissions should not recommend that a Regulation be a standard practice unless it is supported by a strong majority;

   (b) Technical Regulations should contain appropriate instructions to Members regarding implementation of the provision in question;

   (c) No major changes should be made to the Technical Regulations without consulting the appropriate technical commissions;
Any amendments to these Technical Regulations submitted by Members or by constituent bodies should be communicated to all Members at least three months before they are submitted to Congress.

13. Amendments to the Technical Regulations – as a rule – are approved by Congress.

14. If a recommendation for an amendment is made by a session of the appropriate technical commission and if the new regulation needs to be implemented before the next session of Congress, the Executive Council may, on behalf of the Organization, approve the amendment in accordance with Article 14 (c) of the Convention. Amendments to annexes to the Technical Regulations proposed by the appropriate technical commissions are normally approved by the Executive Council.

15. If a recommendation for an amendment is made by the appropriate technical commission and the implementation of the new regulation is urgent, the President of the Organization may, on behalf of the Executive Council, take action as provided by Regulation 9 (5) of the General Regulations.

Note: A fast-track procedure can be applied for additions to certain codes and associated code tables, contained in Annex II (Manual on Codes (WMO-No. 306)). Application of the fast-track procedure is described in detail in Annex II.

16. After each session of Congress (every four years), a new edition of the Technical Regulations, including the amendments approved by Congress, is issued. With regard to the amendments to WMO-No. 49 between sessions of Congress, Volumes I, III and IV are updated, as necessary, upon approval of changes thereto by the Executive Council. The Technical Regulations updated as a result of an approved amendment by the Executive Council are considered a new update of the current edition. The material in Volume II is prepared by the World Meteorological Organization and the International Civil Aviation Organization working in close cooperation, in accordance with the Working Arrangements agreed by these Organizations. In order to ensure consistency between Volume II and Annex 3 – Meteorological Service for International Air Navigation to the Convention on International Civil Aviation, the issuance of amendments to Volume II is synchronized with the respective amendments to Annex 3 by the International Civil Aviation Organization.

Note: Editions are identified using the year of the respective session of Congress while updates are identified by the year of approval by the Executive Council, for example “Updated in 2012”.

WMO Guides

17. In addition to the Technical Regulations, appropriate guides are published by the Organization. The guides describe practices, procedures and specifications which Members are invited to follow or implement. The guides are updated, as necessary, in the light of scientific and technological developments in hydrometeorology, climatology and their applications. The WMO technical commissions are responsible for the selection of material to be included in the guides. Recommendations for amendments made by an appropriate technical commission are subject to the approval of the Executive Council.
INTRODUCTORY NOTE

The present edition of Volume II of the Technical Regulations contains Parts I and II – International standards and recommended practices and Part IV – Format and preparation of flight documentation, which aligns the WMO Technical Regulations, Volume II, Parts I and II with Amendment 76 to Annex 3 to the Convention on International Civil Aviation. The 2013 edition has an applicability date of 14 November 2013. However, the provisions regarding the criteria for issuance of local special reports and SPECI, and reporting in local routine and special reports and in METAR and SPECI, as contained in Appendix 3, paragraphs 2.3.1 (e) and 4.1.5.2 (c) (i), are applicable on 13 November 2014. Consequently, these provisions applicable in 2014 have been incorporated in the present edition.

Resolution 4 (EC-LVI) approved the restructuring of relevant parts of Volume II of the Technical Regulations into two parts. Part I contains core standards and recommended practices. Part II contains consequential changes in the appendices and attachments. The present edition of Volume II also contains Part III – Aeronautical climatology, and its attachment which arise from Recommendation 2 (CAeM-VII).
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PART I. INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES:
CORE STANDARDS AND RECOMMENDED PRACTICES

1. DEFINITIONS

Note: The designation (RR) in these definitions indicates a definition which has been extracted from the Radio Regulations of the International Telecommunication Union (ITU) (see the ICAO Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including Statement of Approved ICAO Policies (Doc 9718)).

1.1 Definitions

When the following terms are used in Parts I and II, they have the following meanings:

**Aerodrome.** A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

**Aerodrome climatological summary.** Concise summary of specified meteorological elements at an aerodrome, based on statistical data.

**Aerodrome climatological table.** Table providing statistical data on the observed occurrence of one or more meteorological elements at an aerodrome.

**Aerodrome control tower.** A unit established to provide air traffic control service to aerodrome traffic.

**Aerodrome elevation.** The elevation of the highest point of the landing area.

**Aerodrome meteorological office.** An office designated to provide meteorological service for aerodromes serving international air navigation.

**Aerodrome reference point.** The designated geographical location of an aerodrome.

**Aeronautical fixed service (AFS).** A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services.

**Aeronautical fixed telecommunication network (AFTN).** A worldwide system of aeronautical fixed circuits provided, as part of the aeronautical fixed service, for the exchange of messages and/or digital data between aeronautical fixed stations having the same or compatible communications characteristics.

**Aeronautical meteorological station.** A station designated to make observations and meteorological reports for use in international air navigation.

**Aeronautical mobile service (RR S1.32).** A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radio beacon stations may also participate in this service on designated distress and emergency frequencies.

**Aeronautical telecommunication station.** A station in the aeronautical telecommunication service.

**Aircraft.** Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the Earth’s surface.

**Aircraft observation.** The evaluation of one or more meteorological elements made from an aircraft in flight.
AIRMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of low-level aircraft operations and which was not already included in the forecast issued for low-level flights in the flight information region concerned or sub-area thereof.

Air-report. A report from an aircraft in flight prepared in conformity with requirements for position, and operational and/or meteorological reporting.

Note: Details of the AIREP form are given in the ICAO Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444).

Air traffic services unit. A generic term meaning variably, air traffic control unit, flight information centre or air traffic services reporting office.

Alternate aerodrome. An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing where the necessary services and facilities are available, where aircraft performance requirements can be met and which is operational at the expected time of use. Alternate aerodromes include the following:

Take-off alternate. An alternate aerodrome at which an aircraft would be able to land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

En-route alternate. An alternate aerodrome at which an aircraft would be able to land in the event that a diversion becomes necessary while en route.

Destination alternate. An alternate aerodrome at which an aircraft would be able to land should it become either impossible or inadvisable to land at the aerodrome of intended landing.

Note: The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.

Altitude. The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

Approach control unit. A unit established to provide air traffic control service to controlled flights arriving at, or departing from, one or more aerodromes.

Appropriate ATS authority. The relevant authority designated by the Member responsible for providing air traffic services in the airspace concerned.

Area control centre. A unit established to provide air traffic control service to controlled flights in control areas under its jurisdiction.

Area navigation (RNAV). A method of navigation which permits aircraft operations on any desired flight path within the coverage of ground- or space-based navigation aids or within the limits of the capability of self-contained aids, or a combination of these.

Note: Area navigation includes performance-based navigation as well as other operations that do not meet the definition of performance-based navigation.

Automatic dependent surveillance (ADS). A surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems, including aircraft identification, four-dimensional position and additional data as appropriate.

Briefing. Oral commentary on existing and/or expected meteorological conditions.
Cloud of operational significance. A cloud with the height of cloud base below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, or a cumulonimbus cloud or a towering cumulus cloud at any height.

Consultation. Discussion with a meteorologist or another qualified person of existing and/or expected meteorological conditions relating to flight operations; a discussion includes answers to questions.

Control area. A controlled airspace extending upwards from a specified limit above the Earth.

Cruising level. A level maintained during a significant portion of a flight.

Elevation. The vertical distance of a point or a level, on or affixed to the surface of the Earth, measured from mean sea level.

Extended-range operation. Any flight by an aeroplane with two turbine engines where the flight time at the one engine inoperative cruise speed (in ISA and still air conditions), from a point on the route to an adequate alternate aerodrome, is greater than the threshold time approved by the Member of the Operator.

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Flight documentation. Written or printed documents, including charts or forms, containing meteorological information for a flight.

Flight information centre. A unit established to provide flight information service and alerting service.

Flight information region. An airspace of defined dimensions within which flight information service and alerting service are provided.

Flight level. A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals.

Notes:
1. A pressure type altimeter calibrated in accordance with the Standard Atmosphere:
   (a) When set to a QNH altimeter setting, will indicate altitude;
   (b) When set to a QFE altimeter setting, will indicate height above the QFE reference datum;
   (c) When set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.
2. The terms “height” and “altitude”, used in Note 1, indicate altimetric rather than geometric heights and altitudes.

Forecast. A statement of expected meteorological conditions for a specified time or period, and for a specified area or portion of airspace.

GAMET area forecast. An area forecast in abbreviated plain language for low-level flights for a flight information region or sub-area thereof, prepared by the meteorological office designated by the meteorological authority concerned and exchanged with meteorological offices in adjacent flight information regions, as agreed between the meteorological authorities concerned.

Grid-point data in digital form. Computer-processed meteorological data for a set of regularly spaced points on a chart, for transmission from a meteorological computer to another computer in a code form suitable for automated use.

Note: In most cases, such data are transmitted on medium- or high-speed telecommunications channels.

Height. The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.
**Human Factors principles.** Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

**International airways volcano watch (IAVW).** International arrangements for monitoring and providing warnings to aircraft of volcanic ash in the atmosphere.

Note: The IAVW is based on the cooperation of aviation and non-aviation operational units using information derived from observing sources and networks that are provided by Members. The watch is coordinated by ICAO with the cooperation of other international organizations concerned.

**Level.** A generic term relating to the vertical position of an aircraft in flight and meaning variously height, altitude or flight level.

**Meteorological authority.** The authority providing or arranging for the provision of meteorological service for international air navigation on behalf of a Member.

**Meteorological bulletin.** A text comprising meteorological information preceded by an appropriate heading.

**Meteorological information.** Meteorological report, analysis, forecast and any other statement relating to existing or expected meteorological conditions.

**Meteorological office.** An office designated to provide meteorological service for international air navigation.

**Meteorological report.** A statement of observed meteorological conditions related to a specified time and location.

**Meteorological satellite.** An artificial Earth satellite making meteorological observations and transmitting these observations to Earth.

**Minimum sector altitude.** The lowest altitude which may be used which will provide a minimum clearance of 300 m (1 000 ft) above all objects located in an area contained within a sector of a circle of 46 km (25 NM) radius centred on a radio aid to navigation.

**Navigation specification.** A set of aircraft and flight crew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specifications:

- **Required navigation performance (RNP) specification.** A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP, for example, RNP 4, RNP APCH.

- **Area navigation (RNAV) specification.** A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV, for example, RNAV 5, RNAV 1.


**Observation (meteorological).** The evaluation of one or more meteorological elements.

**Operational control.** The exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of the flight.
Operational flight plan. The operator’s plan for the safe conduct of the flight based on considerations of aeroplane performance, other operating limitations and relevant expected conditions on the route to be followed and at the aerodromes concerned.

Operational planning. The planning of flight operations by an operator.

Operator. A person, organization or enterprise engaged in, or offering to engage in, an aircraft operation.

Performance-based navigation (PBN). Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

Note: Performance requirements are expressed in navigation specification (RNAV specification, RNP specification) in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept.

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Prevailing visibility. The greatest visibility value, observed in accordance with the definition of “visibility”, which is reached within at least half the horizon circle or within at least half of the surface of the aerodrome. These areas could comprise contiguous or non-contiguous sectors.

Note: This value may be assessed by human observation and/or instrumented systems. When instruments are installed, they are used to obtain the best estimate of the prevailing visibility.

Prognostic chart. A forecast of a specified meteorological element(s) for a specified time or period and a specified surface or portion of airspace, depicted graphically on a chart.

Quality assurance. Part of quality management focused on providing confidence that quality requirements will be fulfilled (ISO 9000*).

Quality control. Part of quality management focused on fulfilling quality requirements (ISO 9000*).

Quality management. Coordinated activities to direct and control an organization with regard to quality (ISO 9000*).

Regional air navigation agreement. Agreement approved by the Council of ICAO normally on the advice of a regional air navigation meeting.

Reporting point. A specified geographical location in relation to which the position of an aircraft can be reported.

Rescue coordination centre. A unit responsible for promoting efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region.

Runway. A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

Runway visual range (RVR). The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Search and rescue services unit. A generic term meaning, as the case may be, rescue coordination centre, rescue subcentre or alerting post.

SIGMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of aircraft operations.

Standard isobaric surface. An isobaric surface used on a worldwide basis for representing and analysing the conditions in the atmosphere.

Threshold. The beginning of that portion of the runway usable for landing.

Touchdown zone. The portion of a runway, beyond the threshold, where it is intended landing aeroplanes first contact the runway.

Tropical cyclone. Generic term for a non-frontal synoptic-scale cyclone originating over tropical or subtropical waters with organized convection and definite cyclonic surface wind circulation.

Tropical cyclone advisory centre (TCAC). A meteorological centre designated by regional air navigation agreement to provide advisory information to meteorological watch offices, world area forecast centres and international OPMET databanks regarding the position, forecast direction and speed of movement, central pressure and maximum surface wind of tropical cyclones.

Upper-air chart. A meteorological chart relating to a specified upper-air surface or layer of the atmosphere.

Visibility. Visibility for aeronautical purposes is the greater of:

(a) The greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognized when observed against a bright background;
(b) The greatest distance at which lights in the vicinity of 1 000 candelas can be seen and identified against an unlit background.

Note: The two distances have different values in air of a given extinction coefficient, and the latter (b) varies with the background illumination. The former (a) is represented by the meteorological optical range (MOR).

Volcanic ash advisory centre (VAAC). A meteorological centre designated by regional air navigation agreement to provide advisory information to meteorological watch offices, area control centres, flight information centres, world area forecast centres and international OPMET databanks regarding the lateral and vertical extent and forecast movement of volcanic ash in the atmosphere following volcanic eruptions.

VOLMET. Meteorological information for aircraft in flight.

Data link-VOLMET (D-VOLMET). Provision of current aerodrome routine meteorological reports (METAR) and aerodrome special meteorological reports (SPECI), aerodrome forecasts (TAF), SIGMET, special air-reports not covered by a SIGMET and, where available, AIRMET via data link.

VOLMET broadcast. Provision, as appropriate, of current METAR, SPECI, TAF and SIGMET by means of continuous and repetitive voice broadcasts.

World area forecast centre (WAFC). A meteorological centre designated to prepare and issue significant weather forecasts and upper-air forecasts in digital form on a global basis direct to Members by appropriate means as part of the aeronautical fixed service.

World area forecast system (WAFS). A worldwide system by which world area forecast centres provide aeronautical meteorological en-route forecasts in uniform standardized formats.
1.2 **Terms used with a limited meaning**

For the purpose of Parts I and II, 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.

2. **GENERAL PROVISIONS**

*Introductory Note 1.* It is recognized that the provisions of Parts I and II with respect to meteorological information are subject to the understanding that the obligation of a Member is for the supply of meteorological information and that the responsibility for the use made of such information is that of the user.

*Introductory Note 2.* (This note appears only in ICAO Annex 3, as it applies only to ICAO Contracting States.)

*Introductory Note 3.* (This note appears only in ICAO Annex 3, as it applies only to ICAO Contracting States.)

2.1 **Objective, determination and provision of meteorological service**

2.1.1 The objective of meteorological service for international air navigation shall be to contribute towards the safety, regularity and efficiency of international 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 air navigation with the meteorological information necessary for the performance of their respective functions.

2.1.3 Each Member shall determine the meteorological service which it will provide to meet the needs of international air navigation. This determination shall be made in accordance with the provisions of Parts I and II and with due regard to regional air navigation agreements; it shall include the determination of the meteorological service to be provided for international air navigation over international waters and other areas which lie outside the territory of the Member concerned.

2.1.4 Each Member shall designate the authority, hereinafter referred to as the meteorological authority, to provide or to arrange for the provision of meteorological service for international air navigation on its behalf. Details of the meteorological authority so designated shall be included in the State aeronautical information publication, in accordance with ICAO Annex 15, Appendix 1, GEN 1.1.

2.1.5 Each Member shall ensure that the designated meteorological authority complies with the requirements of the World Meteorological Organization in respect of qualifications and training of meteorological personnel providing service for international air navigation.

*Note:* Requirements concerning qualifications and training of meteorological personnel in aeronautical meteorology are given in the *Technical Regulations* (WMO-No. 49), Volume I – General Meteorological Standards and Recommended Practices, Part II, Chapter 4 – Education and training of meteorological personnel.
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 international air navigation.

2.2.2 Each Member shall ensure that the designated meteorological authority referred to in 2.1.4 above 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 above.

2.2.3 [Recommendation] The quality system established in accordance with 2.2.2 above 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. The details of a successful programme are to be formulated by each State and in most cases are unique to the State organization. Guidance on the establishment and implementation of a quality system is given in the Guide to the Quality Management System for the Provision of Meteorological Service to International Air Navigation (WMO-No. 1001).

2.2.4 [Recommendation] 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 3, 4, 6, 7, 8, 9 and 10 and in Part II, Appendices 2, 3, 5, 6, 7, 8 and 9, and the relevant ICAO regional air navigation plans. Guidance concerning the accuracy of measurement and observation, and accuracy of forecasts is given in Part II, Attachments A and B, respectively.

2.2.5 [Recommendation] 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 11 and in Part II, Appendix 10.

2.2.6 [Recommendation] Demonstration of compliance of the quality system applied should be by audit. If non-conformity of the system is identified, action should be initiated to determine and correct the cause. All audit observations should be evidenced and properly documented.

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

Note: Guidance material on the application of Human Factors principles can be found in the ICAO 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, the meteorological authority or the aerodrome meteorological office concerned. The minimum amount of advance notice required shall be as agreed between the meteorological authority or aerodrome meteorological office and the operator.

2.3.2 The meteorological authority 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 the meteorological authority.

2.3.3 The operator or a flight crew member shall ensure that, where required by the meteorological authority in consultation with users, the aerodrome meteorological office concerned is notified:

(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 [Recommendation] The notification to the aerodrome meteorological office 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 aerodrome 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 ICAO 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.

3. WORLD AREA FORECAST SYSTEM AND METEOROLOGICAL OFFICES

Note: Technical specifications and detailed criteria related to 3 are given in Part II, Appendix 2.

3.1 Objective of the world area forecast system

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 A Member, having accepted the responsibility for providing a WAFC within the framework of the world area forecast system, shall arrange for that centre:

(a) To 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;
   (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 Member on advice from the meteorological authority;
(d) To receive information concerning the 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: Backup 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 on the ICAO WAFSOPSG website.

3.3 **Aerodrome meteorological offices**

3.3.1 Each Member 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 of international 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 aerodrome meteorological offices; and
(h) Supply information received on pre-eruption volcanic activity, a volcanic eruption or volcanic ash cloud, to its associated air traffic services unit, aeronautical information
service unit and meteorological watch office as agreed between the meteorological, aeronautical information service and ATS authorities concerned.

3.3.3 The aerodromes for which landing forecasts are required shall be determined by regional air navigation agreement.

3.3.4 For an aerodrome without an aerodrome meteorological office located at the aerodrome:

(a) The meteorological authority concerned shall designate one or more aerodrome meteorological office(s) 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 A Member, having accepted the responsibility for providing air traffic services within a flight information region or a control area, shall establish, on the basis of regional air navigation agreement, one or more meteorological watch offices, or arrange for another Member to do so.

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 below:
   (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 area control centre/flight information centre (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 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, as agreed between the meteorological and appropriate civil aviation authorities concerned. The information shall comprise location, date and time of the release, and forecast trajectories of the radioactive materials.

Note: The information is provided by WMO regional specialized meteorological centres (RSMCs) for the provision of transport model products for radiological environmental emergency response, at the request of the delegated authority of the Member 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 of each Member. This contact point has the responsibility of redistributing the RSMC products within the Member concerned. Furthermore, the information is provided by IAEA to the RSMC co-located with VAAC London (designated as the focal point) which in turn notifies the ACCs concerned about the release.

3.4.3 [Recommendation] 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 Volcanic ash advisory centres

3.5.1 A Member having accepted, by regional air navigation agreement, the responsibility for providing a VAAC within the framework of the international airways volcano watch, shall arrange for that centre to respond to a notification that a volcano has erupted, or is expected to erupt or volcanic ash is reported in its area of responsibility, by arranging for that centre to:

(a) Monitor relevant geostationary and polar-orbiting satellite data to detect the existence and extent of volcanic ash in the atmosphere in the area concerned;

(b) Activate the volcanic ash numerical trajectory/dispersion model in order to forecast the movement of any ash “cloud” which has been detected or reported;

Note: The numerical model may be its own or, by agreement, that of another VAAC.

(c) Issue advisory information regarding the extent and forecast movement of the volcanic ash “cloud” to:

(i) Meteorological watch offices, area control centres and flight information centres serving flight information regions in its area of responsibility which may be affected;

(ii) Other VAACs whose areas of responsibility may be affected;

(iii) World area forecast centres, international OPMET databanks, international NOTAM offices, and centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems; and

(iv) Airlines requiring the advisory information through the AFTN address provided specifically for this purpose; and

Note: The AFTN address to be used by the VAACs is given in the ICAO Handbook on the International Airways Volcano Watch (IAVW) (Doc 9766) which is available on the ICAO IAVWOPSG website.

(d) Issue updated advisory information to the meteorological watch offices, area control centres, flight information centres and VAACs referred to in (c), as necessary, but at least every six hours until such time as the volcanic ash “cloud” is no longer identifiable from satellite data, no further reports of volcanic ash are received from the area, and no further eruptions of the volcano are reported.

3.5.2 Volcanic ash advisory centres shall maintain a 24-hour watch.

3.5.3 In case of interruption of the operation of a VAAC, its functions shall be carried out by another VAAC or another meteorological centre, as designated by the VAAC Provider State concerned.

Note: Backup procedures to be used in case of interruption of the operation of a VAAC are included in the ICAO Handbook on the International Airways Volcano Watch (IAVW) (Doc 9766).

3.6 Member volcano observatories

Members with active or potentially active volcanoes shall arrange that selected Member volcano observatories, as designated by regional air navigation agreement, monitor these volcanoes and when observing:

(a) Significant pre-eruption volcanic activity, or a cessation thereof;

(b) A volcanic eruption, or a cessation thereof; and/or

(c) Volcanic ash in the atmosphere;

shall send this information as quickly as practicable to their associated ACC, meteorological watch office (MWO) and VAAC.

Notes:
1. Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.
2. The ICAO Handbook on the International Airways Volcano Watch (IAVW) (Doc 9766) contains guidance material about active or potentially active volcanoes.
3.7 **Tropical cyclone advisory centres**

A Member having accepted, by regional air navigation agreement, the responsibility for providing a TCAC shall arrange for that centre to:

(a) Monitor the development of tropical cyclones in its area of responsibility, using geostationary and polar-orbiting satellite data, radar data and other meteorological information;

(b) Issue 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) Issue updated advisory information to meteorological watch offices for each tropical cyclone, as necessary, but at least every six hours.

4. **METEOROLOGICAL OBSERVATIONS AND REPORTS**

   **Note:** Technical specifications and detailed criteria related to 4 are given in Part II, Appendix 3.

4.1 **Aeronautical meteorological stations and observations**

4.1.1 Each Member shall establish, at aerodromes in its territory, 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 the meteorological authority to ensure the compliance of meteorological service for international air navigation with the provisions of Parts I and II.

4.1.2 [Recommendation] Each Member 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 Each Member 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 ICAO 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 dewpoint 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 backup procedures.

Notes:
1. Categories of precision approach and landing operations are defined in ICAO Annex 6, Part I.
2. Guidance material on the application of Human Factors principles can be found in the ICAO Human Factors Training Manual (Doc 9683).

4.1.6 [Recommendation] 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 dewpoint 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 backup procedures.

4.1.7 [Recommendation] 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 Part II, Attachment A.

4.2 Agreement between air traffic services authorities and meteorological authorities

[Recommendation] An agreement between the meteorological authority and the appropriate ATS authority should be established to cover, amongst other things:

(a) The provision in air traffic services units of displays related to integrated automatic systems;
(b) The calibration and maintenance of these displays/instruments;
(c) The use to be made of these displays/instruments by air traffic services personnel;
(d) 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;
(e) Meteorological information obtained from aircraft taking off or landing (for example, on wind shear); and
(f) 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 ICAO 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 the meteorological authority, the appropriate ATS authority 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 meteorological authority 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 ICAO Annex 11, 4.3.6.1 (g).

4.3.3 At aerodromes that are not operational throughout 24 hours in accordance with 4.3.1 above, METAR shall be issued prior to the aerodrome resuming operations in accordance with regional air navigation agreement.

4.4 **Special observations and reports**

4.4.1 A list of criteria for special observations shall be established by the meteorological authority, in consultation with the appropriate ATS authority, 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 ICAO Annex 11, 4.3.6.1 (g).

4.4.3 At aerodromes that are not operational throughout 24 hours in accordance with 4.3.1 above, 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 dewpoint 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 ICAO Location Indicators (Doc 7910).

4.5.2 [Recommendation] In addition to elements listed under 4.5.1 (a) to (k) above, local routine and special reports and METAR and SPECI should contain supplementary information to be placed after element (k) above.

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 metres per second (or knots), respectively.

4.6.1.2 [Recommendation] 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 [Recommendation] 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 1 above shall be measured or observed, and reported in metres or kilometres.

Note: Guidance on the conversion of instrument readings into visibility is given in Part II, Attachment D.

4.6.2.2 [Recommendation] 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 [Recommendation] 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 ICAO Manual of Runway Visual Range Observing and Reporting Practices (Doc 9328).
4.6.3.1 Runway visual range as defined in 1 above shall be assessed on all runways intended for Category II and III instrument approach and landing operations.

4.6.3.2 [Recommendation] Runway visual range as defined in 1 above 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 ICAO Annex 14, Volume I, Chapter 1, under “Instrument runway”.

4.6.3.3 The runway visual range, assessed in accordance with 4.6.3.1 and 4.6.3.2 above, shall be reported in metres throughout periods when either the visibility or the runway visual range is less than 1 500 m.

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 shall be observed and reported as necessary. The following present weather phenomena shall be identified, as a minimum: rain, drizzle, snow and freezing precipitation (including intensity thereof), haze, mist, fog, freezing fog and thunderstorms (including thunderstorms in the vicinity).

4.6.4.2 [Recommendation] For local routine and special reports, the present weather information should be representative of conditions at the aerodrome.

4.6.4.3 [Recommendation] For METAR and SPECI, the present weather information should be representative of conditions at the aerodrome and, for certain 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 [Recommendation] Cloud observations for local routine and special reports should be representative of the runway threshold(s) in use.

4.6.5.3 [Recommendation] Cloud observations for METAR and SPECI should be representative of the aerodrome and its vicinity.
4.6.6  
**Air temperature and dewpoint temperature**

4.6.6.1  The air temperature and the dewpoint temperature shall be measured and reported in degrees Celsius.

4.6.6.2  [Recommendation] Observations of air temperature and dewpoint temperature for local routine and special reports and METAR and SPECI should be representative of the whole runway complex.

4.6.7  
**Atmospheric pressure**

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

4.6.8  
**Supplementary information**

[Recommendation] 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  [Recommendation] METAR and SPECI from automatic observing systems should be used by Members in a position to do so during non-operational hours of the aerodrome, and during operational hours of the aerodrome as determined by the meteorological authority 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 ICAO Manual on Automatic Meteorological Observing Systems at Aerodromes (Doc 9837).

4.7.2  [Recommendation] Local routine and special reports from automatic observing systems should be used by Members in a position to do so during operational hours of the aerodrome as determined by the meteorological authority 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”.

4.8  
**Observations and reports of volcanic activity**

[Recommendation] The occurrence of pre-eruption volcanic activity, volcanic eruptions and volcanic ash cloud should be reported without delay to the associated air traffic services unit, aeronautical information services unit and meteorological watch office. The report should be made in the form of a volcanic activity report comprising the following information in the order indicated:

(a)  Message type, VOLCANIC ACTIVITY REPORT;
(b)  Station identifier, location indicator or name of station;
(c)  Date/time of message;
(d)  Location of volcano and name if known; and
(e)  Concise description of event including, as appropriate, level of intensity of volcanic activity, occurrence of an eruption and its date and time, and the existence of a volcanic ash cloud in the area together with direction of ash cloud movement and height.
Note: Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.

5. AIRCRAFT OBSERVATIONS AND REPORTS

Note: Technical specifications and detailed criteria related to 5 are given in Part II, Appendix 4.

5.1 Obligations of Members

Each Member shall arrange, according to the provisions of 5, for observations to be made by aircraft of its registry operating on international air routes and for the recording and reporting of these observations.

5.2 Types of aircraft observations

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 [Recommendation] 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 [Recommendation] 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 (for example 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 above. 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 above.

5.4 Routine aircraft observations – exemptions

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

5.5 Special aircraft observations

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

When other meteorological conditions not listed under 5.5 above, for example 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 air traffic services units

The meteorological authority concerned shall make arrangements with the appropriate ATS authority to ensure that, on receipt by the air traffic services units of:

(a) Special air-reports by voice communications, the air traffic services units relay them without delay to their associated meteorological watch office; and
(b) Routine and special air-reports by data link communications, the air traffic services units relay them without delay to their associated meteorological watch office and WAFCs.

5.9 Recording and post-flight reporting of aircraft observations of volcanic activity

Special aircraft observations of pre-eruption volcanic activity, a volcanic eruption or volcanic ash cloud shall be recorded on the special air-report of volcanic activity form. A copy of the form shall be included with the flight documentation provided to flights operating on routes which, in the opinion of the meteorological authority concerned, could be affected by volcanic ash clouds.
6. **FORECASTS**

Note: Technical specifications and detailed criteria related to 6 are given in Part II, 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 Part II, Attachment B.

6.1.2 The issue of a new forecast by an aerodrome 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 aerodrome meteorological office designated by the meteorological authority concerned.

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 not earlier than one hour prior to the beginning of its validity period 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 Aerodrome 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 ICAO Manual of Aeronautical Meteorological Practice (Doc 8896).

6.2.5 TAF that cannot be kept under continuous review shall be cancelled.

6.2.6 [Recommendation] 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, aerodrome 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 aerodrome meteorological office designated by the meteorological authority concerned 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 two 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 aerodrome meteorological office designated by the meteorological authority concerned if required by agreement between the meteorological authority and operators.

6.4.2 [Recommendation] 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 [Recommendation] A forecast for take-off should be supplied to operators and flight crew members on request within the three hours before the expected time of departure.

6.4.4 [Recommendation] Aerodrome 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 meteorological authority 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 below, 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 six hours for a period of validity of six hours and transmitted to meteorological watch offices and/or aerodrome meteorological offices concerned not later than one hour prior to the beginning of their validity period.

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

Note: Technical specifications and detailed criteria related to 7 are given in Part II, 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 four hours. In the special case of SIGMET messages for volcanic ash cloud and tropical cyclones, the period of validity shall be extended up to six hours.

7.1.4 [Recommendation] 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 four 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 six 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 the area forecast for low-level flights issued in accordance with 6.5 above 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 four hours.

7.3 Aerodrome warnings

7.3.1 Aerodrome warnings shall be issued by the aerodrome meteorological office designated by the meteorological authority concerned 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 [Recommendation] 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 ICAO 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 aerodrome meteorological office designated by the meteorological authority concerned for aerodromes where wind shear is considered a factor, in accordance with local arrangements with the appropriate air traffic services 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 [Recommendation] 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 meteorological authority, the appropriate ATS authority 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 [Recommendation] 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).
8. **AERONAUTICAL CLIMATOLOGICAL INFORMATION**

Note: Technical specifications and detailed criteria related to 8 are given in Part II, 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 the meteorological authority and those users.

Note: Climatological data required for aerodrome planning purposes are set out in ICAO Annex 14, Volume I, 3.1.4 and Attachment A.

8.1.2 [Recommendation] 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 [Recommendation] 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**

[Recommendation] Each Member 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 meteorological authority and that user.

8.3 **Aerodrome climatological summaries**

[Recommendation] 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**

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.
9. SERVICE FOR OPERATORS AND FLIGHT CREW MEMBERS

Note: Technical specifications and detailed criteria related to 9 are given in Part II, 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 replanning 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 the meteorological authority in consultation with operators concerned:

(a) Forecasts of:
   (i) Upper winds 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 take-off, en-route and destination alternate aerodromes;

(c) TAF or amended TAF for the aerodromes of departure and intended landing, and for take-off, 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) above 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.

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 Part II, Appendix 8, Figures A8-1, A8-2 and A8-3.

9.1.7 When forecasts of upper wind and upper-air temperature listed under 9.1.3 (a) (i) above are supplied in chart form, they shall be fixed time prognostic charts for flight levels as specified in Part II, Appendix 2, 1.2.2 (a). When forecasts of SIGWX phenomena listed under 9.1.3 (a) (vi) above are supplied in chart form, they shall be fixed time prognostic charts for an atmospheric layer limited by flight levels as specified in Part II, 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 replanning by the operator shall be supplied as soon as they become available, but not later than three hours before departure. Other meteorological information requested for pre-flight planning and in-flight replanning by the operator shall be supplied as soon as is practicable.

9.1.9 When necessary, the meteorological authority of the Member providing service for operators and flight crew members shall initiate coordinating action with the meteorological authorities of other Members 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 meteorological authority, after consultation with the operators and at the time to be agreed upon between the aerodrome meteorological office and the operator concerned. The service for pre-flight planning shall be confined to flights originating within the territory of the Member concerned. At an aerodrome without an aerodrome meteorological office at the aerodrome, arrangements for the supply of meteorological information shall be as agreed upon between the meteorological authority 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 below.

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 meteorological authority 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 above.

9.2.3 If the aerodrome 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 crew members 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 aerodrome 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 the meteorological authority and the operator concerned. In exceptional circumstances, such as an undue delay,
the aerodrome 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  [Recommendation] The flight crew member or other flight operations personnel for whom briefing, consultation and/or flight documentation has been requested should visit the aerodrome meteorological office at the time agreed upon between the aerodrome meteorological office and the operator concerned. Where local circumstances at an aerodrome make personal briefing or consultation impracticable, the aerodrome 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 below.

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) above. However, when agreed between the meteorological authority and operator concerned, flight documentation for flights of two hours’ duration or less, after a short stop or turnaround, 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) above.

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 replanning, the operator shall be advised immediately and, if practicable, be supplied with the revised information as agreed between the operator and the aerodrome meteorological office concerned.

9.3.3  [Recommendation] In cases where a need for amendment arises after the flight documentation has been supplied, and before take-off of the aircraft, the aerodrome 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 meteorological authority 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 meteorological authority 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 above, inclusive.

9.4.2  [Recommendation] 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 meteorological authority and the relevant civil aviation authority or the agency to which the authority to provide service has been delegated in accordance with ICAO Annex 15, 2.1.1 (c).

Note: The meteorological and aeronautical information services information concerned are specified in 9.1 to 9.3 above and Part II, Appendix 8, and in ICAO Annex 15, 8.1 and 8.2, respectively.
9.4.3 Where automated pre-flight information systems are used to provide for the harmonized, common point of access to meteorological information and aeronautical information services information by operators, flight crew members and other aeronautical personnel concerned, the meteorological authority concerned shall remain responsible for the quality control and quality management of meteorological information provided by means of such systems in accordance with 2.2.2 above.

Note: The responsibilities relating to aeronautical information services information and the quality assurance of the information are given in ICAO Annex 15, Chapters 1, 2 and 3.

9.5 Information for aircraft in flight

9.5.1 Meteorological information for use by aircraft in flight shall be supplied by an aerodrome meteorological office or meteorological watch 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 meteorological authority 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 of 10 below.

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

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

Note: Technical specifications and detailed criteria related to 10 are given in Part II, Appendix 9.

10.1 Information for air traffic services units

10.1.1 The meteorological authority shall designate an aerodrome meteorological office or meteorological watch office to be associated with each air traffic services unit. The associated aerodrome meteorological office or meteorological watch 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 [Recommendation] An aerodrome meteorological office should be associated with an aerodrome control tower or approach control unit for the provision of meteorological information.

10.1.3 A meteorological watch office shall be associated with a flight information centre or an area control centre for the provision of meteorological information.

10.1.4 [Recommendation] Where, owing to local circumstances, it is convenient for the duties of an associated aerodrome meteorological office or meteorological watch office to be shared between two or more aerodrome meteorological offices or meteorological watch offices, the division of responsibility should be determined by the meteorological authority in consultation with the appropriate ATS authority.

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

Aerodrome meteorological offices or meteorological watch offices designated by the meteorological authority 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 aerodrome meteorological office or meteorological watch 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

The meteorological authority, in coordination with the appropriate civil aviation authority, shall arrange for the supply of up-to-date meteorological information to relevant aeronautical information services units, as necessary, for the conduct of their functions.

11. REQUIREMENTS FOR AND USE OF COMMUNICATIONS

Notes:
1. Technical specifications and detailed criteria related to 11 are given in Part II, Appendix 10.
2. It is recognized that it is for each Member to decide upon its own internal organization and responsibility for implementing the telecommunications facilities referred to in 11.

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 aerodrome meteorological offices, meteorological authorities and other users.

11.1.4 Telecommunications facilities between aerodrome 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 [Recommendation] Telecommunications facilities between aerodrome meteorological offices or meteorological watch 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
Printed communications, when a record is required by the recipients; the message transit time should not exceed five minutes.

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

11.1.6 [Recommendation] The telecommunications facilities required in accordance with 11.1.4 and 11.1.5 above 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 [Recommendation] As agreed between the meteorological authority 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 [Recommendation] 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.

Notes:
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.
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

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

[Recommendation] 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

The content and format of meteorological information transmitted to aircraft and by aircraft shall be consistent with the provisions of these Technical Regulations.
11.5 Use of aeronautical data link service – contents of D-VOLMET

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.
APPENDIX 1. FLIGHT DOCUMENTATION – MODEL CHARTS AND FORMS
(SEE PART 1, 9, APPENDIX 2 AND PART IV)

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 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
### INTENSITY

“–” (light); no indicator (moderate); “+” (heavy, or a tornado/waterspout in the case of funnel cloud(s)) are used to indicate the intensity of certain phenomena.

### DESCRIPTORS

| MI – shallow | PR – partial | BL – blowing | TS – thunderstorm |
| BC – patches | DR – low drifting | SH – shower(s) | FZ – freezing (supercooled) |

### PRESENT WEATHER ABBREVIATIONS

| DZ – drizzle | BR – mist | PO – dust/sand whirls (dust devils) |
| RA – rain | FG – fog | SQ – squall |
| SN – snow | FU – smoke | FC – funnel cloud(s) (tornado or waterspout) |
| SG – snow grains | VA – volcanic ash | |
| PL – ice pellets | DU – widespread dust | SS – sandstorm |
| GR – hail | SA – sand | DS – duststorm |
| GS – small hail and/or snow pellets | HZ – haze | |

### EXAMPLES

+SHRA – heavy shower of rain
FZDZ – moderate freezing drizzle
+TSSNGR – thunderstorm with heavy snow and hail

### SELECTED ICAO LOCATION INDICATORS

| CYUL | Montreal Pierre Elliot Trudeau/Intl |
| HECA | Cairo/Intl |
| OBBI | Bahrain Intl |
| EDDF | Frankfurt/Main |
| HKJK | Nairobi/Jomo Kenyatta |
| RJTT | Tokyo 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 FEW030 BECMG 2411/2413 VRB02KT 2000 HZ FM 242200 24010KT CAVOK=
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 242200 24010KT CAVOK=
TAF ZBAA 240440Z 2406/2506 13004MPS 6000 NSC BECMG 2415/2416 2000 SN OVC040 TEMPO 2418/24211000 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 240900/241200 HECA-
HECC CAIRO FIR SEV TURB OBS N OF N27 FL 390/440 MOV E 25KMH NC.
Example 1. Arrows, feathers and pennants (Mercator projection)
Example 2. Arrows, feathers and pennants (Polar stereographic projection)
SIGNIFICANT WEATHER CHART (HIGH LEVEL)  

Example. Polar stereographic projection (showing the jet stream vertical extent)
SIGNIFICANT WEATHER CHART (MEDIUM LEVEL) MODEL SWM
SIGNIFICANT WEATHER CHART (LOW LEVEL)

ISSUED BY . . . . . . . . . . . . . . . . . . . .
FIXED TIME PROGNOSTIC CHART
SIGWX SFC – 10 000 FT
VALID . . . . UTC . . . . 20 . . . .
CB implies thunderstorm, moderate or severe turbulence, icing and hail.
Units used: knots; visibility in metres or kilometres; altitude in hectofeet above mean sea level.
FIXED TIME PROGNOSTIC CHART

VARIANT VIS SIGNIFICANT WEATHER CLOUD, TURBULENCE, ICING

AREA A ISOL BKN CU 015/XXX OVC LYR ST NS 015/XXX 050/XXX

ISOL 1000 THUNDERSTORM

OCNL 4000 HEAVY RAIN EMBD CB 008/XXX

AREA B

LCA SOUTH COT HILLS 2000 DRIZZLE OVC ST SC 003/050

AREA C

LCA NORTH 4500 RAIN OVC LYR ST NS 005/XXX 090/XXX

AREA D

LCA LAND 0500 FOG

AREA E

LCA COT HILLS 0200 FOG OVC ST SFC/015

AREA F

LCA NORTH 0500 FOG OVC ST SFC/015

AREA G

LCA NORTH 0500 FOG OVC CU SC NS 010/XXX 030/XXX

AREA J

LCA HILLS NORTH

REMKS:
EAST TO NE GALES SHETLAND TO HEBRIDES - SEVERE MOUNTAIN WAVES NW SCOTLAND - FOG PATCHES EAST ANGLIA - WDSPR FOG OVER NORTH FRANCE, BELGIUM AND THE NETHERLANDS

Notes:
1. Pressure in hPa and speeds in knots.
2. Vis in m included if less than 5 000 m. 200 m or less.
3. Altitude in hectofeet above MSL XXX = above 10 000 ft.
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.
TROPICAL CYCLONE ADVISORY INFORMATION IN
GRAPHICAL FORMAT

TROPICAL CYCLONE ADVISORY

DTG: 20050922/1200Z
TCAC: MIAMI
TC: JULIETTE
NR: 22
PSN: N2350 W08500
MOV: W 12KT
C: 945 HPA
MAX WIND: 120KT
RMK: NIL
NXT ADVISORY: 20050922/1600Z
FRQ CB
GALE FORCE WIND

20° 25°
–90° –75°–80°–85°–95°

20° 25°
–90° –75°–80°–85°
VOLCANIC ASH ADVISORY INFORMATION IN GRAPHICAL FORMAT

VOLCANIC ASH ADVISORY
DTG: 20080923/0130Z
VAAC: TOKYO
VOLCANO: KARYMSKY 1000-13
AREA: RUSSIAN FEDERATION
SUMMIT ELEV: 1536M
ADVISORY NR: 2008/4
INFO SOURCE: MTSAT-1R, KVERT KEMSD
AVIATION COLOUR CODE: RED
ERUPTION DETAILS: Erupted at 20080923/0000Z FL300 reported
RMK: LATEST REP FM KVERT (0120Z) INDICATES ERUPTION HAS CEASED
TWO DISPERSING VA CLD ARE EVIDENT ON SATELLITE IMAGERY
NXT ADVISORY: 20080923/0730Z
Note: Fictitious FIR.
SIGMET FOR VOLCANIC ASH IN GRAPHICAL FORMAT

Note: Fictitious FIR.
SIGMET FOR PHENOMENA OTHER THAN TROPICAL CYCLONE
AND VOLCANIC ASH IN GRAPHICAL FORMAT

MODEL SGE

YMMC SIGMET 1
VALID 022030/030030 YMMC
1. Symbols for significant weather

- **Cyclone**
- **Squall line**
- **Mist**
- **Hail**
- **Widespread sand or dust haze**
- **Widespread sandstorm or duststorm**
- **Widespread fog**
- **Widespread haze**
- **Widespread mist**
- **Widespread smoke**
- **Mountain obscuration**
- **Freezing precipitation**

*In-flight documentation or flights operating up to R. 10k. This symbol refers to "squall line."

**The following information should be included in a separate text box on the chart: radioactive materials in the atmosphere: latitude/longitude of release site; and if known, the name of the site of the radioactive source. In addition, the legend of SIGMA charts on which release of radiation is indicated should contain "CHECK SIGMET AND NOTAM FOR RADAR CID." The centre of the radioactive materials in the atmosphere should be placed on significant weather charts at the latitude/longitude site of the radioactive source.

***The following information should be included in a separate text box on the chart: volcanic eruption symbol; the name of the volcano (if known); and the latitude/longitude of the eruption.

In addition, the legend of SIGMA charts should indicate "CHECK SIGMET, ADVISORIES FOR TC, AND VA, AND ASHTM AND NOTAM FOR WA." The dot on the basis of the volcanic eruption symbol should be placed on significant weather charts at the latitude/longitude site of the volcanic eruption.

**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.

2. Fronts and convergence zones and other symbols used

- **Cold front at the surface**
- **Warm front at the surface**
- **Occupied front at the surface**
- **Quasi-stationary front at the surface**
- **Tropopause high**
- **Tropopause low**
- **Tropopause level**

Wind arrows indicate the maximum wind in the jet and the flight level at which it occurs. If the maximum wind speed is 60 m/s (120 kt) or more, the flight level between which winds are greater than 40 m/s (60 kt) is plotted below the maximum wind level. In the example, winds are greater than 40 m/s (60 kt) between FL 230 and FL 400. The heavy line delineating the jet axis begins at the points where z wind speed of 40 m/s (60 kt) is forecast.

Symbol used wherever the height of the jet axis changes by ±3000 ft (900 mb) or over the wind speed of 40 m/s (60 kt) is forecast.

* A conversion factor of 1 to 2 is used.

3. Abbreviations used to describe clouds

3.1 Type

<table>
<thead>
<tr>
<th>Cloud Type</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cirrus</td>
<td>CI</td>
</tr>
<tr>
<td>Cirrostratus</td>
<td>CS</td>
</tr>
<tr>
<td>Altostratus</td>
<td>AS</td>
</tr>
<tr>
<td>Stratus</td>
<td>ST</td>
</tr>
<tr>
<td>Cumulus</td>
<td>CA</td>
</tr>
<tr>
<td>Cumulonimbus</td>
<td>CB</td>
</tr>
</tbody>
</table>

3.2 Amount

Clouds except CB

<table>
<thead>
<tr>
<th>Cloud Type</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Few</td>
<td>FEW</td>
</tr>
<tr>
<td>Broken</td>
<td>BKN</td>
</tr>
<tr>
<td>Scattered</td>
<td>SCA</td>
</tr>
<tr>
<td>Overcast</td>
<td>OVC</td>
</tr>
</tbody>
</table>

CB only

<table>
<thead>
<tr>
<th>Cloud Type</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual CBs</td>
<td>ICB</td>
</tr>
<tr>
<td>Well-separated CBs</td>
<td>WCB</td>
</tr>
<tr>
<td>积云</td>
<td>A1</td>
</tr>
<tr>
<td>高积云</td>
<td>A2</td>
</tr>
<tr>
<td>深积云</td>
<td>A3</td>
</tr>
</tbody>
</table>

3.3 Heights

Heights are indicated on SWL and SVM charts in flight levels (FL), top over base. When IXX 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 altitude above mean sea level.

(b) The abbreviation F100 is used to indicate ground level.

4. Depicting of lines and symbols on specific charts

4.1 Models SWH and SVM – Significant weather chart (high and medium)

<table>
<thead>
<tr>
<th>Line Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scalloped line</td>
<td>demarcation of area of significant weather</td>
</tr>
<tr>
<td>Heavy broken line</td>
<td>delineation of area of CAT</td>
</tr>
<tr>
<td>Heavy solid line</td>
<td>position of jet stream axis with indication of wind direction, speed in kt and m/s and height in flight levels. The vertical extent of the jet stream is indicated (in flight-levels), e.g., FL 270; compared by 240/290 indicates that the jet extends from FL 240 to FL 270.</td>
</tr>
<tr>
<td>Flight levels inside small rectangles</td>
<td>height in flight levels of tropopause at spot locations, e.g., FL 300</td>
</tr>
</tbody>
</table>

4.2 Model SWL – Significant weather chart (low level)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>position of pressure centre given in hectopascals</td>
</tr>
<tr>
<td>L</td>
<td>centre of low pressure</td>
</tr>
<tr>
<td>H</td>
<td>centre of high pressure</td>
</tr>
<tr>
<td>Scalloped lines</td>
<td>demarcation of area of significant weather</td>
</tr>
<tr>
<td>Dashed lines</td>
<td>altitude of O°C isotherm in feet (feet)/meters or metres</td>
</tr>
</tbody>
</table>

Figure on arrow: speed in kt or km/h of movement of frontal systems, depressions or anticyclones

Figure inside the state of the sea symbol: total wave height in feet or metres

Figure inside the sea-water temperature symbol: sea-water temperature in °C

Wind in kt or m/s

4.3 Arrows, feathers and pennants

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

Example:

- 270°/115 kt (equivalent to 57.5 m/s)
- Pennants correspond to 59 kt or 25 m/s
- Feathers correspond to 10 kt or 3.5 m/s
- Half-feathers correspond to 5 kt or 2.5 m/s
APPENDIX 2. TECHNICAL SPECIFICATIONS RELATED TO WORLD AREA FORECAST SYSTEM AND METEOROLOGICAL OFFICES

(SEE PART I, 3)

1. WORLD AREA FORECAST SYSTEM

1.1 Formats and codes

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

1.2 Upper-air gridded forecasts

1.2.1 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.

1.2.2 The grid-point forecasts 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), 410 (175 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

Notes:
1. Layers centred at a flight level referred to in (f) and (h) have a depth of 100 hPa.
2. 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), 270 (350 hPa), 300 (300 hPa), 320 (275 hPa), 340 (250 hPa), 360 (225 hPa), 390 (200 hPa), 410 (175 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 the Manual on Codes (WMO-No. 306), Volume I.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

1.3.1.1 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.

1.3.1.2 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 the Manual on Codes (WMO-No. 306), Volume I.2, Part B – Binary Codes.

1.3.2 Types of SIGWX forecasts

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 forecasts

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 17 m/s (34 kt);
(b) Several squall lines;
(c) Moderate or severe turbulence (in cloud or clear air);
(d) Moderate or severe icing;
(e) Widespread sandstorm/duststorm;
(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, in a separate text box on the chart, the volcanic eruption symbol, the name of the volcano (if known) and the latitude/longitude of the eruption. In addition, the legend of SIGWX charts should indicate “CHECK SIGMET, ADVISORIES FOR TC AND VA, AND ASHTAM AND NOTAM FOR VA”; and
(j) Information on the location of a release of radioactive materials into the atmosphere of significance to aircraft operations, comprising: the radioactive materials in the atmosphere symbol at the location of the release and, in a separate text box on the chart, the radioactive materials in the atmosphere symbol, latitude/longitude of the site of the release, and (if known) the name of site of the radioactive source. In addition, the legend of SIGWX charts on which a release of radiation is indicated should contain “CHECK SIGMET AND NOTAM FOR RDOACT CLD”.

Notes:
1. Medium-level SIGWX forecasts include all the items above.
2. Items to be included in low-level SIGWX forecasts (i.e. flight levels below 100) are included in Appendix 5.
1.3.4 **Criteria for including items in SIGWX forecasts**

The following criteria shall be applied for SIGWX forecasts:

(a) Items (a) to (f) in 1.3.3 above 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:
   (i) Affecting an area with a maximum spatial coverage of 50 per cent or more of the area concerned;
   (ii) Along a line with little or no space between individual clouds; or
   (iii) 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 a release of radioactive materials into the atmosphere warrants the inclusion of the volcanic eruption symbol or the radioactive materials in the atmosphere 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 above, 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. **AERODROME 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 these Technical Regulations, 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**

Aerodrome 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/duststorms; and

(b) Volcanic eruptions or a release of radioactive materials into the atmosphere, of significance to aircraft operations.

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 ICAO Manual of Aeronautical Meteorological Practice (Doc 8896).

3. **VOLCANIC ASH ADVISORY CENTRES (VAAC)**

3.1 **Volcanic ash advisory information**

3.1.1 The advisory information on volcanic ash issued in abbreviated plain language, using approved ICAO abbreviations and numerical values of self-explanatory nature, shall be in accordance with the template shown in Table A2-1. When no approved ICAO abbreviations are available, English plain language text, to be kept to a minimum, shall be used.

3.1.2 The volcanic ash advisory information listed in Table A2-1, when prepared in graphical format, shall be as specified in Appendix 1 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 the Manual on Codes (WMO-No. 306), Volume I.2, Part B – Binary Codes.

4. **MEMBER VOLCANO OBSERVATORIES**

4.1 **Information from Member volcano observatories**

[Recommendation] The information required to be sent by Member volcano observatories to their associated ACCs, MWO and VAAC should comprise:

(a) For significant pre-eruption volcanic activity: the date/time (UTC) of report; name and, if known, number of the volcano; location (latitude/longitude) and; description of volcanic activity; and

(b) For volcanic eruption: the date/time (UTC) of report and time of eruption (UTC) if different from time of report; name and, if known, number of the volcano; location (latitude/longitude); and description of the eruption including whether an ash column was ejected and, if so, an estimate of height of ash column and the extent of any visible volcanic ash cloud, during and following an eruption; and

(c) For volcanic eruption cessation: the date/time (UTC) of report and time of eruption cessation (UTC); name and, if known, number of the volcano; and location (latitude/longitude).

Notes:
1. Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.
2. The Member volcano observatories may use the Volcano Observatory Notice for Aviation (VONA) format to send information to their associated ACCs, MWO and VAAC. The VONA format is included in the ICAO Handbook on the International Airways Volcano Watch (IAVW) (Doc 9766) which is available on the ICAO IAVWOPSG website.

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 Table A2-2.

5.1.3 [Recommendation] The tropical cyclone advisory information listed in Table A2-2, when prepared in graphical format, should be as specified in Appendix 1 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 the Manual on Codes (WMO-No. 306), Volume I.2, Part B – Binary Codes.

Table A2-1. Template for advisory message for volcanic ash

<table>
<thead>
<tr>
<th>Element</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identification of the type of message (M)</td>
<td>Type of message</td>
<td>VA ADVISORY</td>
</tr>
<tr>
<td>2</td>
<td>Time of origin (M)</td>
<td>Year, month, day, time in UTC</td>
<td>DTG: nnnnnnnnnnZ</td>
</tr>
<tr>
<td>3</td>
<td>Name of VAAC (M)</td>
<td>Name of VAAC</td>
<td>VAAC: nnnnnnnnnn</td>
</tr>
<tr>
<td>4</td>
<td>Name of volcano (M)</td>
<td>Name and IAVCEI number of volcano</td>
<td>VOLCANO: nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn or UNKNOWN or UNNAMED</td>
</tr>
<tr>
<td>5</td>
<td>Location of volcano (M)</td>
<td>Location of volcano in degrees and minutes</td>
<td>PSN: Nnnnn or Snnnn or Wnnnn or Ennnnn or UNKNOWN</td>
</tr>
<tr>
<td>6</td>
<td>State or region (M)</td>
<td>State, or region if ash is not reported over a State</td>
<td>AREA: nnnnnnnnnnnnn</td>
</tr>
<tr>
<td>7</td>
<td>Summit elevation (M)</td>
<td>Summit elevation in m (or ft)</td>
<td>SUMMIT ELEV: nnnnM (or nnnnFT)</td>
</tr>
<tr>
<td>8</td>
<td>Advisory number (M)</td>
<td>Advisory number: year in full and message number (separate sequence for each volcano)</td>
<td>ADVISORY NR: nnnn/nnnn</td>
</tr>
<tr>
<td>9</td>
<td>Information source (M)</td>
<td>Information source using free text</td>
<td>INFO SOURCE: Free text up to 32 characters</td>
</tr>
</tbody>
</table>

Notes:
1. The ranges and resolutions for the numerical elements included in advisory messages for volcanic ash are shown in Appendix 6, Table A6-4.
2. The explanations for the abbreviations can be found in the ICAO Procedures for Air Navigation Services – ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).
3. Inclusion of a "colon" after each element heading is mandatory.
4. The numbers 1 to 18 are included only for clarity and they are not part of the advisory message, as shown in the example.
<table>
<thead>
<tr>
<th>Element</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Colour code (O)</td>
<td>Aviation colour code</td>
<td>AVIATION COLOUR CODE:</td>
<td>RED or ORANGE or YELLOW or GREEN or UNKNOWN or NOT GIVEN or NIL</td>
</tr>
<tr>
<td>11 Eruption details (M)</td>
<td>Eruption details (including date/time of eruption(s))</td>
<td>ERUPTION DETAILS:</td>
<td>Eruption at 20080923/0000Z FL300 REPORTED</td>
</tr>
<tr>
<td>12 Time of observation (or estimation) of ash (M)</td>
<td>Day and time (in UTC) of observation (or estimation) of volcanic ash</td>
<td>OBS (or EST) VA DTG:</td>
<td>OBS VA DTG: 23/0100Z</td>
</tr>
<tr>
<td>13 Observed or estimated ash cloud (M)</td>
<td>Horizontal (in degrees and minutes) and vertical extent at the time of observation of the observed or estimated ash cloud or, if the base is unknown, the top of the observed or estimated ash cloud; Movement of the observed or estimated ash cloud</td>
<td>OBS VA CLD or EST VA CLD:</td>
<td>FCST VA CLD +6 HR: 23/0700Z</td>
</tr>
<tr>
<td>14 Forecast height and position of the ash clouds (+6 HR) (M)</td>
<td>Day and time (in UTC) (6 hours from the “Time of observation (or estimation) of ash” given in item 12 above); Forecast height and position (in degrees and minutes) for each cloud mass for that fixed valid time</td>
<td>FCST VA CLD +6 HR:</td>
<td>NOT AVBL</td>
</tr>
</tbody>
</table>

**Examples:**

<table>
<thead>
<tr>
<th>Element</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10 Colour code (O)</strong></td>
<td>Aviation colour code</td>
<td>AVIATION COLOUR CODE:</td>
<td>RED or ORANGE or YELLOW or GREEN or UNKNOWN or NOT GIVEN or NIL</td>
</tr>
<tr>
<td><strong>11 Eruption details (M)</strong></td>
<td>Eruption details (including date/time of eruption(s))</td>
<td>ERUPTION DETAILS:</td>
<td>Eruption at 20080923/0000Z FL300 REPORTED</td>
</tr>
<tr>
<td><strong>12 Time of observation (or estimation) of ash (M)</strong></td>
<td>Day and time (in UTC) of observation (or estimation) of volcanic ash</td>
<td>OBS (or EST) VA DTG:</td>
<td>OBS VA DTG: 23/0100Z</td>
</tr>
<tr>
<td><strong>13 Observed or estimated ash cloud (M)</strong></td>
<td>Horizontal (in degrees and minutes) and vertical extent at the time of observation of the observed or estimated ash cloud or, if the base is unknown, the top of the observed or estimated ash cloud; Movement of the observed or estimated ash cloud</td>
<td>OBS VA CLD or EST VA CLD:</td>
<td>FCST VA CLD +6 HR: 23/0700Z</td>
</tr>
<tr>
<td><strong>14 Forecast height and position of the ash clouds (+6 HR) (M)</strong></td>
<td>Day and time (in UTC) (6 hours from the “Time of observation (or estimation) of ash” given in item 12 above); Forecast height and position (in degrees and minutes) for each cloud mass for that fixed valid time</td>
<td>FCST VA CLD +6 HR:</td>
<td>NOT AVBL</td>
</tr>
</tbody>
</table>

**Examples:**

<table>
<thead>
<tr>
<th>Element</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10 Colour code (O)</strong></td>
<td>Aviation colour code</td>
<td>AVIATION COLOUR CODE:</td>
<td>RED or ORANGE or YELLOW or GREEN or UNKNOWN or NOT GIVEN or NIL</td>
</tr>
<tr>
<td><strong>11 Eruption details (M)</strong></td>
<td>Eruption details (including date/time of eruption(s))</td>
<td>ERUPTION DETAILS:</td>
<td>Eruption at 20080923/0000Z FL300 REPORTED</td>
</tr>
<tr>
<td><strong>12 Time of observation (or estimation) of ash (M)</strong></td>
<td>Day and time (in UTC) of observation (or estimation) of volcanic ash</td>
<td>OBS (or EST) VA DTG:</td>
<td>OBS VA DTG: 23/0100Z</td>
</tr>
<tr>
<td><strong>13 Observed or estimated ash cloud (M)</strong></td>
<td>Horizontal (in degrees and minutes) and vertical extent at the time of observation of the observed or estimated ash cloud or, if the base is unknown, the top of the observed or estimated ash cloud; Movement of the observed or estimated ash cloud</td>
<td>OBS VA CLD or EST VA CLD:</td>
<td>FCST VA CLD +6 HR: 23/0700Z</td>
</tr>
<tr>
<td><strong>14 Forecast height and position of the ash clouds (+6 HR) (M)</strong></td>
<td>Day and time (in UTC) (6 hours from the “Time of observation (or estimation) of ash” given in item 12 above); Forecast height and position (in degrees and minutes) for each cloud mass for that fixed valid time</td>
<td>FCST VA CLD +6 HR:</td>
<td>NOT AVBL</td>
</tr>
</tbody>
</table>

**Examples:**
<table>
<thead>
<tr>
<th>Element</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Remarks (M)</td>
<td>Remarks, as necessary</td>
<td>RMK: Free text up to 256 characters or NIL</td>
</tr>
<tr>
<td>18</td>
<td>Next advisory (M)</td>
<td>Year, month, day and time in UTC</td>
<td>NXT ADVISORY: nnnnnnn/nnnnZ or NO LATER THAN nnnnnnn/nnnnZ or NO FURTHER ADVISORIES or WILL BE ISSUED BY nnnnnnn/nnnnZ</td>
</tr>
</tbody>
</table>

Notes:
1. International Association of Volcanology and Chemistry of the Earth’s Interior (IAVCEI).
2. 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.
3. Up to 4 selected layers.
4. If ash reported (e.g. AIREP) but not identifiable from satellite data.
Example A2-1. Advisory message for volcanic ash

<table>
<thead>
<tr>
<th>FVFE01 RJTD 230130 VA ADVISORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTG: 20080923/0130Z</td>
</tr>
<tr>
<td>VAAC: TOKYO</td>
</tr>
<tr>
<td>VOLCANO: KARYMSKY 1000-13</td>
</tr>
<tr>
<td>PSN: N5403 E15927</td>
</tr>
<tr>
<td>AREA: RUSSIAN FEDERATION</td>
</tr>
<tr>
<td>SUMMIT ELEV: 1536M</td>
</tr>
<tr>
<td>ADVISORY NR: 2008/4</td>
</tr>
<tr>
<td>INFO SOURCE: MTSAT-1R KVERT KEMSD</td>
</tr>
<tr>
<td>AVIATION COLOUR CODE: RED</td>
</tr>
<tr>
<td>ERUPTION DETAILS: ERUPTION AT 20080923/0000Z FL300 REPORTED</td>
</tr>
<tr>
<td>OBS VA DTG: 23/0100Z</td>
</tr>
<tr>
<td>FCST VA CLD +12 HR: 23/1300Z SFC/FL270 N4830 E16130 – N4830 E16600 – N5300 E16600 – N5300 E16130</td>
</tr>
<tr>
<td>FCST VA CLD +18 HR: 23/1900Z NO VA EXP</td>
</tr>
<tr>
<td>RMK: LATEST REP FM KVERT (0120Z) INDICATES ERUPTION HAS CEASED. TWO DISPERSING VA CLD ARE EVIDENT ON SATELLITE IMAGERY</td>
</tr>
<tr>
<td>NXT ADVISORY: 20080923/0730Z</td>
</tr>
</tbody>
</table>

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.

Notes:
1. The ranges and resolutions for the numerical elements included in advisory messages for tropical cyclones are shown in Appendix 6, Table A6-4.
2. The explanations for the abbreviations can be found in the ICAO Procedures for Air Navigation Services – ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).
3. All the elements are mandatory.
4. Inclusion of a “colon” after each element heading is mandatory.
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.

<table>
<thead>
<tr>
<th>Element</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Identification of the type of message</td>
<td>Type of message</td>
<td>TC ADVISORY</td>
<td>TC ADVISORY</td>
</tr>
<tr>
<td>2 Time of origin</td>
<td>Year, month, day and time in UTC of issue</td>
<td>DTG: nnnnnnnnnnnZ</td>
<td>DTG: 20040925/1600Z</td>
</tr>
<tr>
<td>3 Name of TCAC</td>
<td>Name of TCAC (location indicator or full name)</td>
<td>TCAC: nnnnnnnnnnnn</td>
<td>TCAC: YUFO1 TCAC: MIAMI</td>
</tr>
<tr>
<td>Element</td>
<td>Detailed content</td>
<td>Template(s)</td>
<td>Examples</td>
</tr>
<tr>
<td>---------</td>
<td>------------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>4</td>
<td>Name of tropical cyclone</td>
<td>TC: nnnnnnnnnnn or NN TC: GLORIA</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Advisory number</td>
<td>NR nn</td>
<td>NR 01</td>
</tr>
<tr>
<td>7</td>
<td>Direction and speed of movement</td>
<td>MOV: N nnKMH (or KT) or NNE nnKMH (or KT) or NE nnKMH (or KT) or E nnKMH (or KT) or ENE 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 STNR</td>
<td>MOV: NW 20KMH</td>
</tr>
<tr>
<td>8</td>
<td>Central pressure</td>
<td>C: nnnHPA</td>
<td>C: 965HPA</td>
</tr>
<tr>
<td>9</td>
<td>Maximum surface wind</td>
<td>MAX WIND: nn[n]MPS (or nn[n]KT)</td>
<td>MAX WIND: 22MPS</td>
</tr>
<tr>
<td>11</td>
<td>Forecast of maximum surface wind (+6 HR)</td>
<td>FCST MAX WIND +6 HR: nn[n]MPS (or nn[n]KT)</td>
<td>FCST MAX WIND +6 HR: 22MPS</td>
</tr>
<tr>
<td>13</td>
<td>Forecast of maximum surface wind (+12 HR)</td>
<td>FCST MAX WIND +12 HR: nn[n]MPS (or nn[n]KT)</td>
<td>FCST MAX WIND +12 HR: 22MPS</td>
</tr>
<tr>
<td>14</td>
<td>Forecast of centre position (+18 HR)</td>
<td>FCST PSN +18 HR: nn/nnnnZ Nnn[nn] or Snn[nn] or Wnnn[nn] or Ennn[nn]</td>
<td>FCST PSN +18 HR: 26/1000Z N2852 W07500</td>
</tr>
<tr>
<td>Element</td>
<td>Detailed content</td>
<td>Template(s)</td>
<td>Examples</td>
</tr>
<tr>
<td>---------</td>
<td>------------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>15</td>
<td>Forecast of maximum surface wind (+18 HR)</td>
<td>FCST MAX WIND +18 HR: nn[n]MPS (or nn[n]KT)</td>
<td>FCST MAX WIND +18 HR: 21MPS</td>
</tr>
<tr>
<td>16</td>
<td>Forecast of centre position (+24 HR)</td>
<td>FCST PSN +24 HR: nn/nmnZ or Sn[n] or Wnn[n]</td>
<td>FCST PSN +24 HR: 26/1600Z N2912 W07330</td>
</tr>
<tr>
<td>17</td>
<td>Forecast of maximum surface wind (+24 HR)</td>
<td>FCST MAX WIND +24 HR: nn[n]MPS (or nn[n]KT)</td>
<td>FCST MAX WIND +24 HR: 20MPS</td>
</tr>
<tr>
<td>18</td>
<td>Remarks</td>
<td>RMK: free text up to 256 characters or NIL</td>
<td>RMK: NIL</td>
</tr>
<tr>
<td>19</td>
<td>Expected time of issuance of next advisory</td>
<td>NXT MSG: [BFR] nnmnnnnn/nnnZ or NO MSG EXP</td>
<td>NXT MSG: 20040925/2000Z</td>
</tr>
</tbody>
</table>

Note:
1 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
(SEE Part 1, 4)

1. GENERAL PROVISIONS RELATED TO METEOROLOGICAL OBSERVATIONS

1.1 [Recommendation] 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 of equipment and installations on operational areas, aimed at reducing the hazard to aircraft to a minimum, are contained in ICAO Annex 14, Volume I, Chapter 9.

1.2 [Recommendation] 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 [Recommendation] 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 [Recommendation] Where automated equipment forms part of an integrated semi-automated observing system, displays of data which are made available to the local air traffic services 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 the Manual on Codes (WMO-No. 306), Volume I.1, Part A – Alphanumeric Codes.

2.1.3 [Recommendation] METAR and SPECI should be disseminated, under bilateral agreements between Members in a position to do so, in digital form, in addition to the dissemination of the METAR and SPECI in accordance with 2.1.2 above.

2.1.4 METAR and SPECI if disseminated in digital form shall be formatted in accordance with a globally interoperable information exchange model and shall use extensible markup language (XML)/geography markup language (GML).

2.1.5 METAR and SPECI if disseminated in digital form shall be accompanied by the appropriate metadata.

2.2 **Use of CAVOK**

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

(a) **Visibility**, 10 km or more, and the lowest visibility is not reported;

Notes:
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 below; in METAR and SPECI, visibility refers to the value(s) to be reported in accordance with 4.2.4.4 below.
2. The lowest visibility is reported in accordance with 4.2.4.4 (a) below.

(b) **No cloud of operational significance**;

(c) No weather of significance to aviation as given in 4.4.2.3, 4.4.2.5 and 4.4.2.6 below;

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;

(e) From 13 November 2014, when noise abatement procedures are applied in accordance with the ICAO Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444), 7.2.7 and the variation from the mean surface wind speed (gusts) has changed by 2.5 m/s (5 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; and

(f) Those values which constitute criteria for SPECI.

2.3.2 Where required in accordance with Part I, 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 changed 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:
   (i) Freezing precipitation;
   (ii) Moderate or heavy precipitation (including showers thereof);
   (iii) Thunderstorm (with precipitation);

(e) When the onset or cessation of any of the following weather phenomena occurs:
   (i) Freezing fog;
   (ii) Thunderstorm (without precipitation);

(f) When the amount of a cloud layer below 450 m (1 500 ft) changes:
   (i) From SCT or less to BKN or OVC; or
   (ii) From BKN or OVC to SCT or less.
2.3.3 [Recommendation] Where required in accordance with Part I, 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:
   (i) Require a change in runway(s) in use;
   (ii) 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:
   (i) 800, 1,500 or 3,000 m;
   (ii) 5,000 m, in cases where significant numbers of flights are operated in accordance with the visual flight rules;

Notes:
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 below; in SPECI, visibility refers to the value(s) to be reported in accordance with 4.2.4.4 below.
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) below.

(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: 50, 175, 300, 550 or 800 m;

(d) When the onset, cessation or change in intensity of any of the following weather phenomena occurs:
   (i) Duststorm;
   (ii) Sandstorm;
   (iii) Funnel cloud (tornado or waterspout);

(e) When the onset or cessation of any of the following weather phenomena occurs:
   (i) Low drifting dust, sand or snow;
   (ii) Blowing dust, sand or snow;
   (iii) 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:
   (i) 30, 60, 150 or 300 m (100, 200, 500 or 1000 ft);
   (ii) 450 m (1500 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 1000 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 Appendix 5, 1.3.2 (j).

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 [Recommendation] 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:

(a) 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

(b) 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

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

4.1 Surface wind

4.1.1 Siting

4.1.1.1 [Recommendation] Surface wind should be observed at a height of 10 ± 1 m (30 ± 3 ft) above the ground.

4.1.1.2 [Recommendation] 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 above, the displays shall be clearly marked to identify the runway and section of runway monitored by each sensor.

4.1.2.2 [Recommendation] 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) Two minutes for local routine and special reports and for wind displays in air traffic services units; and

(b) Ten 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 5 m/s (10 kt) before or after the change, or a change in wind speed of 5 m/s (10 kt) or more, lasting at least two minutes.

4.1.3.2 [Recommendation] The averaging period for measuring variations from the mean wind speed (gusts) reported in accordance with 4.1.5.2 (c) below should be three 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

[Recommendation] 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:
   (i) 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;
   (ii) 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
   (iii) 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:
   (i) From 13 November 2014, 2.5 m/s (5 kt) or more in local routine and special reports when noise abatement procedures are applied in accordance with the ICAO Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444), 7.2.7; or
   (ii) 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 (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 above.

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) (ii) above, the two extreme directions between which the surface wind has varied shall be reported; and
(d) When variations from the mean speed (gusts) are reported in accordance with 4.1.5.2 (c) above, 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) above, the maximum value of the wind speed attained shall be reported.

4.2 Visibility

4.2.1 Siting

4.2.1.1 [Recommendation] 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 [Recommendation] 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

[Recommendation] 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 above, 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

[Recommendation] 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) One minute for local routine and special reports and for visibility displays in air traffic services units; and
(b) Ten 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 two minutes, which reaches or passes through criteria for the issuance of SPECI reports given in 2.3 above.

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 above.

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 [Recommendation] 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 Part I, 4.6.2.2, 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 [Recommendation] In METAR and SPECI, visibility should be reported as prevailing visibility, as defined in Part I, 1. 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 [Recommendation] Runway visual range should be assessed at a height of approximately 2.5 m (7.5 ft) above the runway for instrumented systems or assessed at a height of approximately 5 m (15 ft) above the runway by a human observer.

4.3.1.2 [Recommendation] 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 runway visual range. 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 runway visual range systems is given in the ICAO 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 [Recommendation] Instrumented systems based on transmissometers 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 above, the displays shall be clearly marked to identify the runway and section of runway monitored by each sensor.

4.3.3.2 [Recommendation] 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) above apply). The transmission of such reports should normally be completed within 15 seconds after the termination of the observation.

4.3.4  Averaging

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) One minute for local routine and special reports and for runway visual range displays in air traffic services units; and
(b) Ten 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 two minutes, which reaches or passes through the values 800, 550, 300 and 175 m.

4.3.5  Runway light intensity

[Recommendation] When instrumented systems are used for the assessment of runway visual range, computations should be made separately for each available runway. Runway visual range 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.

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 in 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 [Recommendation] Fifty metres should be considered the lower limit and 2000 m 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 2000 m.

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 [Recommendation] 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 [Recommendation] 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 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. 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.

4.4 Present weather

4.4.1 Siting

[Recommendation] When instrumented systems are used for observing present weather phenomena listed under 4.4.2.3, 4.4.2.5 and 4.4.2.6 below, 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  [Recommendation] 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 SN
   - Snow grains SG
   - Ice pellets PL
   - Hail GR
     - Reported when diameter of largest hailstones is 5 mm or more
     - Reported when diameter of largest hailstones is less than 5 mm
   - Small hail and/or snow pellets GS

(b) Obscurations (hydrometeors)
   - Fog FG
     - Reported when visibility is less than 1,000 m, except when qualified by “MI”, “BC”, “PR” or “VC” (see 4.4.2.6 and 4.4.2.7 below)
   - 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 4.4.2.6 below) 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  [Recommendation] In automated local routine and special reports and METAR and SPECI, in addition to the precipitation types listed under 4.4.2.3 (a) above, 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:

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.

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 ICAO Manual on Automatic Meteorological Observing Systems at Aerodromes (Doc 9837).

4.4.2.6 [Recommendation] 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:

Shower
– 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 below) should be reported as “VCSH” without qualification regarding type or intensity of precipitation.

Blowing
– 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 2 m (6 ft) or more above the ground.

Low drifting
– 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.

Shallow
– Less than 2 m (6 ft) above ground level.

Patches
– Fog patches randomly covering the aerodrome.

Partial
– A substantial part of the aerodrome covered by fog while the remainder is clear.

4.4.2.7 [Recommendation] 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:

<table>
<thead>
<tr>
<th>(local routine and special reports)</th>
<th>(METAR and SPECI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>FBL</td>
</tr>
<tr>
<td>Moderate</td>
<td>MOD</td>
</tr>
<tr>
<td>Heavy</td>
<td>HVY</td>
</tr>
</tbody>
</table>

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
– 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 4.4.2.5 and 4.4.2.6 above.

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, 4.4.2.5 and 4.4.2.6 above 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.

4.4.2.9 [Recommendation] In automated local routine and special reports and METAR and SPECI, the present weather should be replaced by “/” when the present weather cannot be observed by the automatic observing system due to a temporary failure of the system/sensor.

4.5 Clouds

4.5.1 Siting

[Recommendation] 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 1200 m (3000 to 4000 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 ICAO Annex 10, Volume I, Chapter 3 and Attachment C, Table C-5.

4.5.2 Display

[Recommendation] 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 above, the displays should clearly identify the area monitored by each sensor.

4.5.3 Reference level

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 3000 m (10000 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 [Recommendation] 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 should be rounded down to the nearest lower step in the scale.

4.5.4.3 [Recommendation] 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:
   (i) The lowest layer or mass, regardless of amount to be reported as FEW, SCT, BKN or OVC as appropriate;
   (ii) The next layer or mass, covering more than 2/8 to be reported as SCT, BKN or OVC as appropriate;
   (iii) The next higher layer or mass, covering more than 4/8 to be reported as BKN or OVC as appropriate;
   (iv) Cumulonimbus and/or towering cumulus clouds, whenever observed and not reported in (i) to (iii) above;
(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 [Recommendation] 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”;
(c) When cumulonimbus clouds or towering cumulus clouds are detected by the automatic observing system and the cloud amount and/or the height of cloud base cannot be
observed, the cloud amount and/or the height of cloud base should be replaced by “///”; and
(d) The vertical visibility should be replaced by “///” when the sky is obscured and the value of
the vertical visibility cannot be determined by the automatic observing system due to a
temporary failure of the system/sensor.

4.6  **Air temperature and dewpoint temperature**

4.6.1  **Display**

[Recommendation] When automated equipment is used for the measurement of air temperature
and dewpoint temperature, air temperature and dewpoint 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 dewpoint 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**

When automated equipment is used for the measurement of atmospheric pressure, QNH and, if
required in accordance with 4.7.3.2 (b) below, 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) below, the displays shall be clearly marked to identify the runway to which the QFE
value displayed refers.

4.7.2  **Reference level**

[Recommendation] 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 [Recommendation] 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:

- Freezing precipitation
- Moderate or heavy precipitation (including showers thereof)
- Blowing snow
- Duststorm, sandstorm
- Thunderstorm
- Funnel cloud (tornado or waterspout)
- Volcanic ash

Note: The meteorological authority, in consultation with users, may agree not to provide recent weather information where SPECI are issued.

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

- Cumulonimbus clouds CB
- Thunderstorm TS
- Moderate or severe turbulence MOD TURB, SEV TURB
- Wind shear WS
- Hail GR
- Severe squall line SEV SQL
- Moderate or severe icing MOD ICE, SEV ICE
- Freezing precipitation FZDZ, FZRA
- Severe mountain waves SEV MTW
- Duststorm, sandstorm DS, SS
- Blowing snow BLSN
- Funnel cloud (tornado or waterspout) FC

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

4.8.1.3 [Recommendation] In automated local routine and special reports and METAR and SPECI, in addition to the recent weather phenomena listed under 4.8.1.1 above, 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.

Note: The meteorological authority, in consultation with users, may agree not to provide recent weather
information where SPECI are issued.

4.8.1.4 [Recommendation] 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 above 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 [Recommendation] 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 or the significant wave
height 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.

Notes:
1. The state of the sea is specified in the Manual on Codes (WMO-No. 306), Volume I.1, Part A – Alphanumeric Codes,
   Code table 3700.
2. The state of the runway is specified in the Manual on Codes (WMO-No. 306), Volume I.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

<table>
<thead>
<tr>
<th>Element as specified in Part I, 4</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of the type of report (M)</td>
<td>Type of report</td>
<td>MET REPORT or SPECIAL</td>
<td>MET REPORT SPECIAL</td>
</tr>
<tr>
<td>Location indicator (M)</td>
<td>ICAO location indicator (M)</td>
<td>nnnn</td>
<td>YUDO^1</td>
</tr>
<tr>
<td>Time of the observation (M)</td>
<td>Day and actual time of the observation in UTC</td>
<td>nnnnnnZ</td>
<td>221630Z</td>
</tr>
<tr>
<td>Identification of an automated report (C)</td>
<td>Automated report identifier (C)</td>
<td>AUTO</td>
<td>AUTO</td>
</tr>
</tbody>
</table>

Notes:
1. The ranges and resolutions for the numerical elements included in the local routine and special reports are shown in
   Table A3-4 of this appendix.
2. The explanations for the abbreviations can be found in the ICAO Procedures for Air Navigation Services – ICAO Abbreviations
   and Codes (PANS-ABC, Doc 8400).
<table>
<thead>
<tr>
<th>Element as specified in Part I, 4</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surface wind (M)</strong></td>
<td>Name of the element (M)</td>
<td>WIND</td>
<td>WIND 240/4MPS (WIND 240/8KT)</td>
</tr>
<tr>
<td>Runway (O)¹</td>
<td>RWY nn[L] or RWY nn[C] or RWY nn[R]</td>
<td></td>
<td>WIND RWY 18 TDZ 190/6MPS (WIND RWY 18 TDZ 190/12KT)</td>
</tr>
<tr>
<td>Runway section (O)³</td>
<td>TDZ</td>
<td></td>
<td>WIND VRB1MPS (WIND VRB2KT)</td>
</tr>
<tr>
<td>Wind direction (M)</td>
<td>nnn/</td>
<td>VRB BTN nnn/ AND nnn/ or VRB</td>
<td>WIND VRB BTN 350/ AND 050/1MPS (WIND VRB BTN 350/ AND 050/2KT)</td>
</tr>
<tr>
<td>Wind speed (M)</td>
<td>[ABV][n][n][n]MPS (or [ABV][n][n]KT)</td>
<td>MAX[ABV][n][n][n] MNNM[n]</td>
<td>WIND 270/[ABV]949MPS</td>
</tr>
<tr>
<td>Significant speed variations (C)⁴</td>
<td></td>
<td></td>
<td>WIND 120/3MPS MAX9 MNNM2 (WIND 120/6KT MAX18 MNNM4)</td>
</tr>
<tr>
<td>Significant directional variations (C)⁵</td>
<td>VRB BTN nnn/ AND nnn/</td>
<td></td>
<td>WIND 020/5MPS VRB BTN 350/ AND 070/</td>
</tr>
<tr>
<td>Runway section (O)³</td>
<td>MID</td>
<td></td>
<td>WIND RWY 14R MID 140/6MPS (WIND RWY 14R MID 140/12KT)</td>
</tr>
<tr>
<td>Wind direction (O)³</td>
<td>nnn/</td>
<td>VRB BTN nnn/ AND nnn/ or VRB</td>
<td>WIND RWY 27 TDZ 240/8MPS MAX14 MNNM5 END 250/7MPS</td>
</tr>
<tr>
<td>Wind speed (O)³</td>
<td>[ABV][n][n][n]MPS (or [ABV][n][n]KT)</td>
<td>MAX[ABV][n][n][n] MNNM[n]</td>
<td>WIND RWY 27 TDZ 240/16KT MAX28 MNNM10 END 250/14KT</td>
</tr>
<tr>
<td>Significant speed variations (C)⁴</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significant directional variations (C)⁵</td>
<td>VRB BTN nnn/ AND nnn/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Runway section (O)³</td>
<td>END</td>
<td></td>
<td>WIND RWY 27 TDZ 240/8MPS MAX14 MNNM5 END 250/7MPS (WIND RWY 27 TDZ 240/16KT MAX28 MNNM10 END 250/14KT)</td>
</tr>
<tr>
<td>Wind direction (O)³</td>
<td>nnn/</td>
<td>VRB BTN nnn/ AND nnn/ or VRB</td>
<td>WIND RWY 27 TDZ 240/16KT MAX28 MNNM10 END 250/14KT</td>
</tr>
<tr>
<td>Wind speed (O)³</td>
<td>[ABV][n][n][n]MPS (or [ABV][n][n]KT)</td>
<td>MAX[ABV][n][n][n] MNNM[n]</td>
<td>WIND RWY 27 TDZ 240/16KT MAX28 MNNM10 END 250/14KT</td>
</tr>
<tr>
<td>Significant speed variations (C)⁴</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significant directional variations (C)⁵</td>
<td>VRB BTN nnn/ AND nnn/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visibility (M)</td>
<td>Name of the element (M)</td>
<td>VIS</td>
<td>VIS 350M</td>
</tr>
<tr>
<td>Runway (O)²</td>
<td>RWY nn[L] or RWY nn[C] or RWY nn[R]</td>
<td>CAVOK</td>
<td>VIS 7KM</td>
</tr>
<tr>
<td>Runway section (O)³</td>
<td>TDZ</td>
<td></td>
<td>VIS 10KM</td>
</tr>
<tr>
<td>Visibility (M)</td>
<td>n[n][n][n]M or n[n]KM</td>
<td>CAVOK</td>
<td>VIS RWY 09 TDZ 800M END 1200M</td>
</tr>
<tr>
<td>Runway section (O)³</td>
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<td></td>
<td>VIS RWY 18 TDZ 6KM R WY 27 TDZ 4000M</td>
</tr>
<tr>
<td>Element as specified in Part I, 4</td>
<td>Detailed content</td>
<td>Template(s)</td>
<td>Examples</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
</tbody>
</table>
| Runway visual range (C)6         | Name of the element (M) | RVR         | RVR RWY 32 400M  
RVR RWY 20 1600M |
| Runway (C)7                      | RVR nn[L] or RVR nn[C] or RVR nn[R] |             | 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 |
| Runway section (C)8              | RVR RWY 20 1600M  |
| Runway visual range (M)          | [ABV or BLW] nn[n][n]M |             | RVR RWY 16 TDZ 600M MID 500M  
END 400M  
RVR RWY 26 500M RWY 20 800M |
| Runway visual range (C)8         | RVR RWY 12 TDZ 1100M MID ABV 1400M |
| Runway section (C)8              | RVR RWY 12 TDZ 1100M MID ABV 1400M |
| Runway visual range (C)8         | RVR RWY 16 TDZ 600M MID 500M  
END 400M  
RVR RWY 26 500M RWY 20 800M |
| Runway section (C)8              | RVR RWY 16 TDZ 600M MID 500M  
END 400M  
RVR RWY 26 500M RWY 20 800M |
| Present weather (C)9, 10         | Intensity of present weather (C)9 | FBL or MOD or HVY | MOD RA  
HYV TSRA  
HYV DZ  
FBL SNG  
HZ  
FG  
VA  
MIFG  
HYV TSRASN  
FBL SRNA  
FBL DZ FG  
HYV SHSN BLSN  
HYV 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 FZUP or PC or FZRA or SHGR or SHRA or SHSN or SHUP or TSGR or TSOS or TSRA or TSNN or TSUP or UP | FG or BR or SA or DU or HZ or FU or VA or SQ or PO or FC or TS or BCF or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or MIFG or PRFG or /// | MOD RA  
HYV TSRA  
HYV DZ  
FBL SNG  
HZ  
FG  
VA  
MIFG  
HYV TSRASN  
FBL SRNA  
FBL DZ FG  
HYV SHSN BLSN  
HYV TSUP |
| Cloud (M)14                      | Name of the element (M) | CLD         | CLD NCS  
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 ///M (CLD /// CB ///FT)  
CLD /// CB 400M (CLD /// CB 1200FT)  
CLD NCD |
| Runway (O)2                      | RYR nn[L] or RYR nn[C] or RYR nn[R] |             | CLD NCS  
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 ///M (CLD /// CB ///FT)  
CLD /// CB 400M (CLD /// CB 1200FT)  
CLD NCD |
| Cloud amount (M) or vertical visibility (O)9 | FEW or SCT or BKN or OVC or /// | OBSC  
NSC or NCD12 | CLD NCS  
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 ///M (CLD /// CB ///FT)  
CLD /// CB 400M (CLD /// CB 1200FT)  
CLD NCD |
| Cloud type (C)3                   | CB or TCU or /// | – | CLD NCS  
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 ///M (CLD /// CB ///FT)  
CLD /// CB 400M (CLD /// CB 1200FT)  
CLD NCD |
| Height of cloud base or the value of vertical visibility (C)3 | n(n)[n][n]M or n[n][n][n]FT or /// | [VER VIS n[n][n]M or (VER VIS n[n][n][n]FT)] or VER VIS /// or (VER VIS ///FT)12 | CLD NCS  
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 ///M (CLD /// CB ///FT)  
CLD /// CB 400M (CLD /// CB 1200FT)  
CLD NCD |
<table>
<thead>
<tr>
<th>Element as specified in Part I, 4</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air temperature (M)</td>
<td>Name of the element (M)</td>
<td>T</td>
<td>T17 TMS08</td>
</tr>
<tr>
<td></td>
<td>Air temperature (M)</td>
<td>[MS]nn</td>
<td></td>
</tr>
<tr>
<td>Dewpoint temperature (M)</td>
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<td>DP</td>
<td>DP15 DPMS18</td>
</tr>
<tr>
<td></td>
<td>Dewpoint temperature (M)</td>
<td>[MS]nn</td>
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</tr>
<tr>
<td>Pressure values (M)</td>
<td>Name of the element (M)</td>
<td>QNH</td>
<td>QNH 0995HPA QNH 1009HPA QNH 1022HPA QFE 1001HPA QNH 0987HPA QFE RWY 18 0956HPA RWY 24 0955HPA</td>
</tr>
<tr>
<td></td>
<td>QNH (M)</td>
<td>nnnnHPA</td>
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</tr>
<tr>
<td></td>
<td>Name of the element (O)</td>
<td>QFE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>QFE (O)</td>
<td>[RWY nn[L] or RWY nn[C] or RWY nn[R]) nnnnHPA [RWY nn[L] or RWY nn[C] or RWY nn[R]) nnnnHPA]</td>
<td></td>
</tr>
<tr>
<td>Supplementary information (C)</td>
<td>Significant meteorological phenomena (C)</td>
<td>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 FC</td>
<td>FC IN APCH WS IN APCH 60M-WIND 360/13MPS WS RWY 12</td>
</tr>
<tr>
<td></td>
<td>Location of the phenomena (C)</td>
<td>IN APCH [n[n][n][n][M-WIND nnn/n[n]MPS] or IN CLIMB-OUT [n[n][n][M-WIND nnn/n[n] MPS] (IN APCH [n[n][n][n][FT-WIND nnn/n[n] KT] or IN CLIMB-OUT [n[n][n][n][FT-WIND nnn/n[n]KT] or RWY nn[L] or RWY nn[C] or RWY nn[R])</td>
<td>REFZRA CB IN CLIMB-OUT RETSRA</td>
</tr>
<tr>
<td>Recent weather (C)</td>
<td>REFZDZ or REFZRA or REDZ or RE[SH]JRA or RERASN or RE[SH]SN or RESG or RESHGR or RESHJ or RIBLESN or RESS or REDS or RETSRA or RETSSN or RETSGR or RETS or REC or REPL or REUP or REFZU or RERAZ or RESG or RESGU or RESV or RETSRA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trend forecast (O)</td>
<td>Name of the element (M)</td>
<td>TREND</td>
<td>TREND NOSIG TREND BECMG FEW 600M (TREND BECMG FEW 2000FT)</td>
</tr>
<tr>
<td></td>
<td>Change indicator (M)</td>
<td>NOSIG</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Period of change (C)</td>
<td>FMnnnn and/or TLnnnn or ATnnnn</td>
<td>TREND TEMPO 250/18MPS MAX25 (TREND TEMPO 250/36KT MAX50)</td>
</tr>
<tr>
<td></td>
<td>Wind (C)</td>
<td>nnn/[ABV][n[n][n]MPS [MAX[ABV][n[n]] (or nnn/[ABV][n[n]KT [MAX[ABV] nn])</td>
<td></td>
</tr>
<tr>
<td>Element as specified in Part I, 4</td>
<td>Detailed content</td>
<td>Template(s)</td>
<td>Examples</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------------</td>
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<td>----------</td>
</tr>
</tbody>
</table>
| Visibility (C)^9                   | VIS n[n][n][n]M or VIS n[n]KM | C A V O K | TREND BECMG AT1800 VIS 10KM NSW 
TREND BECMG TL1700 VIS 800M FG 
TREND BECMG FM1030 TL1130 CAVOK |
| Weather phenomenon: intensity (C)^9 | FBL or MOD or HLV | - NSW | TREND TEMPO TL1200 VIS 600M 
BECMG AT1230 VIS 8KM NSW CLD NSC |
| 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 | FG or BR or SA or DU or HZ or FU or VA or SQ or PO or FC or BS or TD or BCF or BLD or BLS or BLSN or DRS or DRSN or FZFG or MIFG or PRFG | TREND TEMPO FM0300 TL0430 MOD FZRA 
TREND BECMG FM1900 VIS 500M HVY SNRA 
TREND BECMG FM1100 MOD SN TEMPO FM1130 BLSN |
| Name of the element (C)^9          | CLD            |           | TREND BECMG AT1130 CLD OVC 300M 
(TREND BECMG AT1130 CLD OVC 1000FT) |
| Cloud amount and vertical visibility (C)^9, 14 | FEW or SCT or BKN or OVC | OBS | NSC |
| Cloud type (C)^9, 14               | CB or TCU      | -         | TREND TEMPO TL1530 HVY SNRA CLD BKN CB 360M 
(TREND TEMPO TL1530 HVY SNRA CLD BKN CB 1200FT) |
| Height of cloud base or the value of vertical visibility (C)^9, 14 | n[n][n][n]M (or n[n][n][n]FT) | [VER VIS n[n][n]M (or VER VIS n[n][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) in this appendix.
5. To be included in accordance with 4.1.5.2 (b) (i) in this appendix.
6. To be included if visibility or runway visual range < 1 500 m.
7. To be included in accordance with 4.3.6.4 (d) in this appendix.
8. To be included in accordance with 4.3.6.4 (c) in this appendix.
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) and 4.8.1.1 in this appendix, and with Appendix 5, 2.2.4.3.
11. Precipitation types listed under 4.4.2.3 (a) in this appendix may be combined in accordance with 4.4.2.8 (c) in this appendix and with 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) in this appendix.
15. Abbreviated plain language may be used in accordance with 4.8.1.2 in this appendix.
16. To be included in accordance with Part I, 6.3.2.
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

<table>
<thead>
<tr>
<th>Element as specified in Part I, 4</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of the type of report (M)</td>
<td>Type of report (M)</td>
<td>METAR, METAR COR, SPECI or SPECI COR</td>
<td>METAR METAR COR SPECI</td>
</tr>
<tr>
<td>Location indicator (M)</td>
<td>ICAO location indicator (M)</td>
<td>nnnn</td>
<td>YUDO¹</td>
</tr>
<tr>
<td>Time of the observation (M)</td>
<td>Day and actual time of the observation in UTC (M)</td>
<td>nnnnnnZ</td>
<td>221630Z</td>
</tr>
<tr>
<td>Identification of an automated or missing report identifier (C)²</td>
<td>Automated or missing report identifier (C)</td>
<td>AUTO or NIL</td>
<td>AUTO NIL</td>
</tr>
<tr>
<td><strong>END OF METAR IF THE REPORT IS MISSING.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface wind (M)</td>
<td>Wind direction (M)</td>
<td>nnn</td>
<td>VRB</td>
</tr>
<tr>
<td></td>
<td>Wind speed (M)</td>
<td>[P]nn[n]</td>
<td>19006MPS (19012KT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>00000MPS (00000KT)</td>
</tr>
<tr>
<td></td>
<td>Significant speed variations (C)³</td>
<td>C[P]nn[n]</td>
<td>140P149MPS (140P99KT)</td>
</tr>
<tr>
<td></td>
<td>Units of measurement (M)</td>
<td>MPS (or KT)</td>
<td>12003G09MPS (12006G18KT)</td>
</tr>
<tr>
<td></td>
<td>Significant directional variations (C)⁴</td>
<td>nnnVnnn</td>
<td>24008G14MPS (24016G28KT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>02005MPS 350V070 (02010KT 350V070)</td>
</tr>
</tbody>
</table>

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

**Notes:**
1. The ranges and resolutions for the numerical elements included in METAR and SPECI are shown in Table A3-5 of this appendix.
2. The explanations for the abbreviations can be found in the ICAO Procedures for Air Navigation Services – ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).
<table>
<thead>
<tr>
<th>Element as specified in Part I, 4</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visibility (M)</strong></td>
<td>Prevailing or minimum visibility (M)⁵</td>
<td>nnnn</td>
<td>C 0350 CAVOK</td>
</tr>
<tr>
<td></td>
<td>Minimum visibility and direction of the minimum visibility (C)⁶</td>
<td>nnnn[N] or nnnn[NE] or nnnn[E] or nnnn[SE] or nnnn[S] or nnnn[SW] or nnnn[W] or nnnn[NW]</td>
<td>A 7000 9999 0800</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>V 2000 1200NW</td>
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<td></td>
<td></td>
<td></td>
<td>O 6000 2800E</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>K 6000 2800</td>
</tr>
<tr>
<td><strong>Runway visual range (C)⁷</strong></td>
<td>Name of the element (M) R</td>
<td>R32/0400 R12/L1700 R10/M0050 R14/L/02000</td>
<td>R32/0400 R12/L1700 R10/M0050 R14/L/02000</td>
</tr>
<tr>
<td></td>
<td>Runway (M)</td>
<td>nL or nC or nR</td>
<td>R16/L/0650 R16/C/0500 R16/R/0450 R17/L/0450 R12/1100U R26/0550N R20/0800D R12/0700</td>
</tr>
<tr>
<td></td>
<td>Runway visual range (M)</td>
<td>[P or M]nnnn</td>
<td></td>
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<tr>
<td></td>
<td>Runway visual range past tendency (C)⁹</td>
<td>U, D or N</td>
<td></td>
</tr>
<tr>
<td><strong>Present weather (C)², ⁹</strong></td>
<td>Intensity or proximity of present weather (C)⁴</td>
<td>– or +</td>
<td>VC</td>
</tr>
<tr>
<td></td>
<td>Characteristics and type of present weather (M)¹¹</td>
<td>DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZRA or FZUP¹² or FC¹³ or SHGR or SHGS or SHRA or SHSN or SHUP¹² or TSCR or TSGS or TSRA or TSSN or TSUP¹² or UP¹²</td>
<td>FZ or FEW or SCT or SBK or BVN or VV or NSC or NCD²</td>
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<td></td>
<td></td>
<td>FG or FR or BR or BR or SA or DU or SZ or SQ or PO or TS or BCFG or BLDU or BLSN or SEL or DRL or FZSN</td>
<td>FZ or FEW or SCT or SBK or BVN or VV or NSC or NCD²</td>
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<td>or VV or MIFG or PRF or FC</td>
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<td>or BLDU</td>
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<td>or VA</td>
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<td>or SN</td>
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<td>or SG</td>
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<td>or BLSA</td>
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<td>or BLDU</td>
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<td></td>
<td></td>
<td>or VA</td>
<td></td>
</tr>
<tr>
<td><strong>Cloud (M)¹⁴</strong></td>
<td>Cloud amount and height of cloud base or vertical visibility (M)</td>
<td>FEWnnn or SCTnnn or BKNnnn or OVCnnn or FEW///¹² or SCT///¹² or BKN///¹² or OVC///¹² ///n//¹² or ///n//¹²</td>
<td>FEW015 VV005 NSC OVC030 VV:///</td>
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<td></td>
<td></td>
<td></td>
<td>SCT010 OVC020</td>
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<td></td>
<td>BKN/// 015</td>
</tr>
<tr>
<td></td>
<td>Cloud type (C)²</td>
<td>CB or TCU or ///¹²</td>
<td>BKN009TCU NCD SCT008 BKN025CB BKN025///</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>///CB</td>
</tr>
<tr>
<td><strong>Air and dewpoint temperature (M)</strong></td>
<td>Air and dewpoint temperature (M)</td>
<td>[M]nnn/[M]nn</td>
<td>17/10 02/M08 M01/M10</td>
</tr>
<tr>
<td><strong>Pressure values (M)</strong></td>
<td>Name of the element (M) Q</td>
<td>Q0995 Q1009 Q1022 Q0987</td>
<td></td>
</tr>
<tr>
<td>Element as specified in Part I, 4</td>
<td>Detailed content</td>
<td>Template(s)</td>
<td>Examples</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>Supplementary information (C)</td>
<td>Recent weather (C)²⁻⁹</td>
<td>REFZDZ or REFRZA or REDZ or RE[SH]RA or [RE]ASN or RE[SH]S or RESC or RESHGR or RESHGS or REBLSN or RES or REDS or RETSRA or RETSSN or RETSGR or RETSGS or RETS or REFC or REVA or REPL or REUP¹² or REFZUP¹² or RETSUP¹² or RE[SH]N or RE[SH]GR or RE[SH]GS or RESG or REM or REUP12 or REFC02 or REFZU02 or RETSUP12 or R18C</td>
<td>REFZRA \nRETSRA</td>
</tr>
<tr>
<td>Wind shear (C)²</td>
<td>WS Rnn[L] or WS Rnn[C] or WS Rnn[R] or WS ALL RWY</td>
<td>WS R03 \nWS ALL RWY \nWS R18C</td>
<td></td>
</tr>
<tr>
<td>Sea-surface temperature and state of the sea or significant wave height (C)¹⁵</td>
<td>W[M]nn/Sn or W[M]nn/Hn[n][n]</td>
<td>W15/S2 \nW12/H75</td>
<td></td>
</tr>
<tr>
<td>State of the runway (C)¹⁶</td>
<td>Runway designator (M)</td>
<td>Rnn[L] or Rnn[C] or Rnn[R]</td>
<td>R/SNOCLO \nR99/421594 \nR/SNOCLO \nR14L/CLRD//</td>
</tr>
<tr>
<td>Runway deposits (M)</td>
<td>n or /</td>
<td>CLRD//</td>
<td></td>
</tr>
<tr>
<td>Extent of runway contamination (M)</td>
<td>n or /</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth of deposit (M)</td>
<td>nn or //</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friction coefficient or braking action (M)</td>
<td>nn or //</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trend forecast (O)¹⁷</td>
<td>Change indicator (M)¹⁸</td>
<td>NOSIG</td>
<td>BECMG or TEMPO</td>
</tr>
<tr>
<td>Period of change (C)²</td>
<td>Fnnnnn and/or TLnnnn or ATnnnn</td>
<td>TEMPO 25018G25MPS \n(TEMPO 25036G50KT)</td>
<td>BECMG FM1030 TL1130 CAVOK \nBECMG TL1700 0800 FG \nBECMG AT1800 9000 NSW \nBECMG FM1900 0500 +SNRA \nBECMG FM1100 SN TEMPO FM1130 BLSN \nTEMPO FM0330 TL0430 FZRA</td>
</tr>
<tr>
<td>Wind (C)²</td>
<td>nnnn[P]nn[n][G][P][nn][n]MPS \n(or nnnn[P]nn[n][G][P]nn[KT])</td>
<td>CAVOK</td>
<td></td>
</tr>
<tr>
<td>Prevailing visibility (C)²</td>
<td>nnnn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weather phenomenon: intensity (C)¹⁰</td>
<td>– or +</td>
<td>– \nN \nS \nW</td>
<td></td>
</tr>
<tr>
<td>Element as specified in Part I, 4</td>
<td>Detailed content</td>
<td>Template(s)</td>
<td>Examples</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>Weather phenomenon: characteristics and type (C)^2. 9, 11</td>
<td>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</td>
<td>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 PRFG</td>
<td></td>
</tr>
<tr>
<td>Cloud amount and height of cloud base or vertical visibility (C)^2. 14</td>
<td>FEWnnn or SCTnmm or BKNnmm or OVCnmm</td>
<td>Vnnn or VV///</td>
<td>TEMPO TL1200 0600 BECMG AT1200 8000 NSW NSC BECMG AT1130 OVC010</td>
</tr>
<tr>
<td>Cloud type (C)^2. 14</td>
<td>CB or TCU</td>
<td>–</td>
<td>TEMPO TL1330 +SHRA BKN012CB</td>
</tr>
</tbody>
</table>

Notes:
1. Fictitious location.
2. To be included whenever applicable.
3. To be included in accordance with 4.1.5.2 (c) in this appendix.
4. To be included in accordance with 4.1.5.2 (b) (i) in this appendix.
5. To be included in accordance with 4.2.4.4 (b) in this appendix.
6. To be included in accordance with 4.2.4.4 (a) in this appendix.
7. To be included if visibility or runway visual range < 1500 m; for up to a maximum of four runways in accordance with 4.3.6.5 (b) in this appendix.
8. To be included in accordance with 4.3.6.6 in this appendix.
9. One or more, up to a maximum of three groups, in accordance with 4.4.2.8 (a) and 4.8.1.1 and with Appendix 5, 2.2.4.1.
10. To be included whenever applicable; no qualifier for moderate intensity in accordance with 4.4.2.7 in this appendix.
11. Precipitation types listed under 4.4.2.3 (a) in this appendix may be combined in accordance with 4.4.2.8 (c) in this appendix and with 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 (no qualifier) to indicate funnel cloud not reaching the ground.
14. Up to four cloud layers in accordance with 4.5.4.3 (e) in this appendix.
15. To be included in accordance with 4.8.1.5 (a) in this appendix.
16. To be included in accordance with 4.8.1.5 (b) in this appendix.
17. To be included in accordance with Part I, 6.3.2.
18. 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

<table>
<thead>
<tr>
<th>Change indicator</th>
<th>Time indicator and period</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOSIG</td>
<td>-</td>
<td>No significant changes are forecast</td>
</tr>
<tr>
<td>BECMG</td>
<td>FM\textsubscript{n1}n\textsubscript{n1}n\textsubscript{n1} TLn\textsubscript{n2}n\textsubscript{n2}n\textsubscript{n2}</td>
<td>The change is forecast to Commence at n\textsubscript{n1}n\textsubscript{n1}n\textsubscript{n1} UTC and be completed by n\textsubscript{n2}n\textsubscript{n2}n\textsubscript{n2} UTC</td>
</tr>
<tr>
<td></td>
<td>TL\textit{nnnn}</td>
<td>Commence at the beginning of the trend forecast period and be completed by \textit{nnnn} UTC</td>
</tr>
<tr>
<td></td>
<td>FM\textit{nnnn}</td>
<td>Commence at \textit{nnnn} UTC and be completed by the end of the trend forecast period</td>
</tr>
<tr>
<td></td>
<td>AT\textit{nnnn}</td>
<td>Occur at \textit{nnnn} UTC (specified time)</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>(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</td>
</tr>
<tr>
<td>TEMPO</td>
<td>FM\textsubscript{n1}n\textsubscript{n1}n\textsubscript{n1} TLn\textsubscript{n2}n\textsubscript{n2}n\textsubscript{n2}</td>
<td>Temporary fluctuations are forecast to Commence at n\textsubscript{n1}n\textsubscript{n1}n\textsubscript{n1} UTC and cease by n\textsubscript{n2}n\textsubscript{n2}n\textsubscript{n2} UTC</td>
</tr>
<tr>
<td></td>
<td>TL\textit{nnnn}</td>
<td>Commence at the beginning of the trend forecast period and cease by \textit{nnnn} UTC</td>
</tr>
<tr>
<td></td>
<td>FM\textit{nnnn}</td>
<td>Commence at \textit{nnnn} UTC and cease by the end of the trend forecast period</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>Commence at the beginning of the trend forecast period and cease by the end of the trend forecast period</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Element as specified in Part I, 4</th>
<th>Range</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway: (no units)</td>
<td>01 – 36</td>
<td>1</td>
</tr>
<tr>
<td>Wind direction: °true</td>
<td>010 – 360</td>
<td>10</td>
</tr>
<tr>
<td>Wind speed:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPS</td>
<td>1 – 99*</td>
<td>1</td>
</tr>
<tr>
<td>KT</td>
<td>1 – 199*</td>
<td>1</td>
</tr>
<tr>
<td>Visibility:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0 – 750</td>
<td>50</td>
</tr>
<tr>
<td>M</td>
<td>800 – 4 900</td>
<td>100</td>
</tr>
<tr>
<td>KM</td>
<td>5 – 9</td>
<td>1</td>
</tr>
<tr>
<td>KM</td>
<td>10 –</td>
<td>0 (fixed value: 10 KM)</td>
</tr>
<tr>
<td>Runway visual range:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0 – 375</td>
<td>25</td>
</tr>
<tr>
<td>M</td>
<td>400 – 750</td>
<td>50</td>
</tr>
<tr>
<td>M</td>
<td>800 – 2 000</td>
<td>100</td>
</tr>
<tr>
<td>Vertical visibility:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0 – 75**</td>
<td>15</td>
</tr>
<tr>
<td>M</td>
<td>90 – 600</td>
<td>30</td>
</tr>
<tr>
<td>FT</td>
<td>0 – 250**</td>
<td>50</td>
</tr>
<tr>
<td>FT</td>
<td>300 – 2 000</td>
<td>100</td>
</tr>
<tr>
<td>Clouds: height of cloud base:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0 – 75**</td>
<td>15</td>
</tr>
<tr>
<td>M</td>
<td>90 – 3 000</td>
<td>30</td>
</tr>
<tr>
<td>FT</td>
<td>0 – 250**</td>
<td>50</td>
</tr>
<tr>
<td>FT</td>
<td>300 – 10 000</td>
<td>100</td>
</tr>
<tr>
<td>Air temperature; dewpoint temperature: °C</td>
<td>–80 – +60</td>
<td>1</td>
</tr>
<tr>
<td>QNH; QFE:</td>
<td>hPa</td>
<td></td>
</tr>
<tr>
<td>0500 – 1 100</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
* 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.

** Under circumstances as specified in 4.5.4.3 in this appendix; 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

<table>
<thead>
<tr>
<th>Element as specified in Part I, 4</th>
<th>Range</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway:</td>
<td>(no units) 01 – 36</td>
<td>1</td>
</tr>
<tr>
<td>Wind direction:</td>
<td>°true 000 – 360</td>
<td>10</td>
</tr>
<tr>
<td>Wind speed:</td>
<td>MPS 00 – 99*</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>KT 00 – 199*</td>
<td>1</td>
</tr>
<tr>
<td>Visibility:</td>
<td>M 0000 – 0750</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>M 0800 – 4900</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>M 5000 – 9000</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>M 10000 –</td>
<td>0 (fixed value: 9999)</td>
</tr>
<tr>
<td>Runway visual range:</td>
<td>M 0000 – 0375</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>M 0400 – 0750</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>M 0800 – 2000</td>
<td>100</td>
</tr>
<tr>
<td>Vertical visibility:</td>
<td>30’s M (100’s FT)</td>
<td>00 – 020</td>
</tr>
<tr>
<td>Clouds: height of cloud base:</td>
<td>30’s M (100’s FT)</td>
<td>00 – 100</td>
</tr>
<tr>
<td>Air temperature; dewpoint</td>
<td>°C –80 – +60</td>
<td>1</td>
</tr>
<tr>
<td>temperature:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QNH:</td>
<td>hPa 0850 – 1100</td>
<td>1</td>
</tr>
<tr>
<td>Sea-surface temperature:</td>
<td>°C –10 – +40</td>
<td>1</td>
</tr>
<tr>
<td>State of the sea:</td>
<td>(no units) 0 – 9</td>
<td>1</td>
</tr>
<tr>
<td>Significant wave height:</td>
<td>M 0 – 999</td>
<td>0.1</td>
</tr>
<tr>
<td>Runway designator:</td>
<td>(no units) 01 – 36</td>
<td>1</td>
</tr>
<tr>
<td>Runway deposits:</td>
<td>(no units) 0 – 9</td>
<td>1</td>
</tr>
<tr>
<td>Extent of runway contamination:</td>
<td>(no units) 1; 2; 5</td>
<td>–</td>
</tr>
<tr>
<td>Depth of deposit:</td>
<td>(no units) 00 – 90</td>
<td>1</td>
</tr>
<tr>
<td>Friction coefficient/braking</td>
<td>(no units) 00 – 95</td>
<td>1</td>
</tr>
<tr>
<td>action:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 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 metres 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 (runway visual range 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; dewpoint 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.

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

* Fictitious location

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 1008HPA TREND TEMPO TL1200 VIS 8000 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); runway visual range above 1 800 metres on runway 05 (runway visual range 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; dewpoint temperature 22 degrees Celsius; QNH 1 008 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.

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 ICAO Annex 5, the corresponding primary units “metre per second” and “metre” may be used instead.

* Fictitious location
Example A3-3. Volcanic activity report

VOLCANIC ACTIVITY REPORT YUSB* 231500 MT TROJEEN* VOLCANO NS60S W12652 Erupted 231445
LARGE ASH CLOUD EXTENDING TO APPROX 30000 FEET MOVING SW

Meaning:

Volcanic activity report issued by Siby/Bistock meteorological station at 1500 UTC on the 23rd of the month. Mt Trojeen volcano 56 degrees 5 minutes north 126 degrees 52 minutes west erupted at 1445 UTC on the 23rd; a large ash cloud was observed extending to approximately 30000 feet and moving in a south-westerly direction.

* Fictitious location
APPENDIX 4. TECHNICAL SPECIFICATIONS RELATED TO AIRCRAFT OBSERVATIONS AND REPORTS
(SEE PART I, 5)

1. CONTENTS OF AIR-REPORTS

1.1 Routine air-reports by air-ground data link

1.1.1 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

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)

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 ICAO Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444), 4.11.4 and Chapter 13 and the SSR Mode S message format is specified in ICAO Annex 10, Volume III, Part I – Digital Data Communication Systems, Chapter 5.

1.1.2 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 ICAO Manual of Air Traffic Services Data Link Applications (Doc 9694) and in ICAO Annex 10, Volume III, Part I.

1.2 Special air-reports by air-ground data link

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 A4-1).

Notes:
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 the ICAO Manual of Air Traffic Services Data Link Applications (Doc 9694).
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 below.

1.3 Special air-reports by voice communications

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.
Notes:
1. Air-reports are considered routine by default. The message type designator for special air-reports is specified in the ICAO Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444), Appendix 1.
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 below.

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 metres 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 A4-2. 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

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

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 one-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.

2.7 Humidity

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 Appendix 6, 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

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

[Recommendation] 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

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 [Recommendation] 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 [Recommendation] 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 Post-flight reporting of volcanic activity

Note: The detailed instructions for recording and reporting volcanic activity observations are given in the ICAO Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444), Appendix 1.

4.2.1 On arrival of a flight at an aerodrome, the completed report of volcanic activity shall be delivered by the operator or a flight crew member, without delay, to the aerodrome meteorological office, or if such office is not easily accessible to arriving flight crew members, the completed form shall be dealt with in accordance with local arrangements made by the meteorological authority and the operator.

4.2.2 The completed report of volcanic activity received by an aerodrome meteorological office shall be transmitted without delay to the meteorological watch office responsible for the provision of meteorological watch for the flight information region in which the volcanic activity was observed.
### 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 in this appendix).

<table>
<thead>
<tr>
<th>Element as specified in Part I, 5</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message type designator (M)</td>
<td>Type of air-report (M)</td>
<td>ARS</td>
<td>ARS</td>
</tr>
<tr>
<td>Aircraft identification (M)</td>
<td>Aircraft radiotelephony call sign (M)</td>
<td>nnnnnn</td>
<td>VA812</td>
</tr>
</tbody>
</table>

**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 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 metres per second (or knots) (M) | nnnMPS (or nnnKT) | 40MPS (80KT) |
| 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$^{2/3}$ s$^{-1}$ and the time of occurrence of the peak value (C)$^1$ | 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 GR$^3$ or TS$^5$ or HVY SS$^1$ or VA CLD [FL nnn/nnn] or VA$^5$ [MT nnnnnnnn] 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 A4-2.
2. The turbulence to be reported in accordance with 2.6.3 in this appendix.
3. Obscured, embedded or widespread thunderstorms or thunderstorms in squall lines.
4. Duststorm or sandstorm.
5. Pre-eruption volcanic activity or a volcanic eruption.
**Table A4-2. Time of occurrence of the peak value to be reported**

<table>
<thead>
<tr>
<th>Peak value of turbulence occurring during the one-minute period</th>
<th>Value to be reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>…… minutes prior to the observation</td>
<td></td>
</tr>
<tr>
<td>0 – 1</td>
<td>0</td>
</tr>
<tr>
<td>1 – 2</td>
<td>1</td>
</tr>
<tr>
<td>2 – 3</td>
<td>2</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>13 – 14</td>
<td>13</td>
</tr>
<tr>
<td>14 – 15</td>
<td>14</td>
</tr>
<tr>
<td>No timing information available</td>
<td>15</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Element as specified in Part I, S</th>
<th>Range</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind direction: °true</td>
<td>000 – 360</td>
<td>1</td>
</tr>
<tr>
<td>Wind speed: MPS</td>
<td>00 – 125</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>00 – 250</td>
<td>1</td>
</tr>
<tr>
<td>Wind quality flag: (index)*</td>
<td>0 – 1</td>
<td>1</td>
</tr>
<tr>
<td>Air temperature: °C</td>
<td>–80 – +60</td>
<td>0.1</td>
</tr>
<tr>
<td>Turbulence: routine air-report:</td>
<td>m(^{2/3}) s(^{-1})</td>
<td>0 – 2</td>
</tr>
<tr>
<td>(time of occurrence)*</td>
<td>0 – 15</td>
<td>0.01</td>
</tr>
<tr>
<td>Turbulence: special air-report:</td>
<td>m(^{2/3}) s(^{-1})</td>
<td>0 – 2</td>
</tr>
<tr>
<td>Humidity: %</td>
<td>0 – 100</td>
<td>1</td>
</tr>
</tbody>
</table>

* Non-dimensional
APPENDIX 5. TECHNICAL SPECIFICATIONS RELATED TO FORECASTS
(SEE PART I, 6)

1. CRITERIA RELATED TO TAF

1.1 TAF format

1.1.1 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 the Manual on Codes (WMO-No. 306), Volume I.1, Part A – Alphanumeric Codes.

1.1.2 [Recommendation] TAF should be disseminated, under bilateral agreements between Members in a position to do so, in digital form, in addition to the dissemination of the TAF in accordance with 1.1.1 above.

1.1.3 TAF if disseminated in digital form shall be formatted in accordance with a globally interoperable information exchange model and shall use extensible markup language (XML)/geography markup language (GML).

1.1.4 TAF if disseminated in digital form shall be accompanied by the appropriate metadata.


1.2 Inclusion of meteorological elements in TAF

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

1.2.1 Surface wind

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).

1.2.2 Visibility

[Recommendation] 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.
1.2.3  **Weather phenomena**

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:

- Freezing precipitation;
- Freezing fog;
- Moderate or heavy precipitation (including showers thereof);
- Low drifting dust, sand or snow;
- Blowing dust, sand or snow;
- Duststorm;
- Sandstorm;
- Thunderstorm (with or without precipitation);
- Squall;
- Funnel cloud (tornado or waterspout);
- Other weather phenomena given in Appendix 3, 4.4.2.3, as agreed by the meteorological authority with the ATS authority and operators concerned.

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

1.2.4  **Cloud**

[Recommendation] 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.

1.2.5  **Temperature**

[Recommendation] 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.

1.3  **Use of change groups**

Note: Guidance on the use of change and time indicators in TAF is given in Table A5-2.
PART II. INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES: APPENDICES AND ATTACHMENTS

1.3.1 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:

- Freezing fog;
- Freezing precipitation;
- Moderate or heavy precipitation (including showers thereof);
- Thunderstorm;
- Duststorm;
- Sandstorm.

1.3.2 [Recommendation] 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 change 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:
   (i) Require a change in runway(s) in use; and
   (ii) 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:
   (i) 150, 350, 600, 800, 1 500 or 3 000 m; or
   (ii) 5 000 m in cases where significant numbers of flights are operated in accordance with the visual flight rules;
(f) When any of the following weather phenomena or combinations thereof are forecast to begin or end:
   (i) Low drifting dust, sand or snow;
   (ii) Blowing dust, sand or snow;
   (iii) Squall;
   (iv) 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:
   (i) 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft); or
   (ii) 450 m (1 500 ft) in cases where significant numbers of flights are operated in accordance with the visual flight rules;
(h) When the amount of a layer or mass of cloud below 450 m (1 500 ft) is forecast to change:
   (i) From NSC, FEW or SCT to BKN or OVC; or
   (ii) 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  [Recommendation] When a change in any of the elements given in Part I, 6.2.3 is required to be indicated in accordance with the criteria given in 1.3.2 above, 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  [Recommendation] 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 two hours but in any case should not exceed four hours.

1.3.5  [Recommendation] 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 above or the validity period should be subdivided in accordance with 1.3.6 below.

1.3.6  [Recommendation] 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 six-figure time group in days, 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

[Recommendation] 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

[Recommendation] 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**

TAF and amendments thereto 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. **CRITERIA RELATED TO TREND FORECASTS**

2.1 **Format of trend forecasts**

Trend forecasts shall be issued in accordance with the templates shown in Appendix 3, Tables 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**

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**

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:

(i) Require a change in runway(s) in use; and

(ii) 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**

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, 1 500 or 3 000 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 5 000 m.
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:

- Freezing precipitation;
- Moderate or heavy precipitation (including showers thereof);
- Thunderstorm (with precipitation);
- Duststorm;
- Sandstorm;
- Other weather phenomena given in Appendix 3, 4.4.2.3, 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:

- Freezing fog;
- Low drifting dust, sand or snow;
- Blowing dust, sand or snow;
- Thunderstorm (without precipitation);
- Squall;
- 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 above 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**

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**

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 300 m (100, 200, 500 or 1 000 ft), the trend forecast shall indicate the change.
2.2.7 Additional criteria

Criteria for the indication of changes based on local aerodrome operating minima, additional to those specified in 2.2.2 to 2.2.6 above, shall be used as agreed between the meteorological authority and the operator 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 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 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**

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**

[Recommendation] 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**

[Recommendation] The criteria for the issuance of amendments to 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**

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**

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 A5-3 except elements concerning:
   (i) Upper winds and temperatures; and
   (ii) 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

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

Table A5-1. Template for TAF

<table>
<thead>
<tr>
<th>Element as specified in Part I, 6</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of the type of forecast (M)</td>
<td>Type of forecast (M)</td>
<td>TAF or TAF AMD or TAF COR</td>
<td>TAF TAF AMD</td>
</tr>
<tr>
<td>Location indicator (M)</td>
<td>ICAO location indicator (M)</td>
<td>nnnn</td>
<td>YUDO1</td>
</tr>
<tr>
<td>Time of issue of forecast (M)</td>
<td>Day and time of issue of the forecast in UTC (M)</td>
<td>nnnnnnnZ</td>
<td>160000Z</td>
</tr>
<tr>
<td>Identification of a missing forecast (C)</td>
<td>Missing forecast identifier (C)</td>
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<td>NIL</td>
</tr>
<tr>
<td>Days and period of validity of forecast (M)</td>
<td>Days and period of the validity of the forecast in UTC (M)</td>
<td>nnnn/nnnn</td>
<td>1606/1624 0812/0918</td>
</tr>
<tr>
<td>Identification of a cancelled forecast (C)</td>
<td>Cancelled forecast identifier (C)</td>
<td>CNL</td>
<td>CNL</td>
</tr>
</tbody>
</table>

Notes:
1. The ranges and resolutions for the numerical elements included in TAF are shown in Table A5-4 of this appendix.
2. The explanations for the abbreviations can be found in the ICAO Procedures for Air Navigation Services – ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).
<table>
<thead>
<tr>
<th>Element as specified in Part I, 6</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface wind (M)</td>
<td>Wind direction (M)</td>
<td>nnn or VRB$^2$</td>
<td>24004MPS; VRB01MPS (24008KT); (VRB002KT) 19005MPS (19010KT)</td>
</tr>
<tr>
<td></td>
<td>Wind speed (M)</td>
<td>[P]nn[n]</td>
<td>00000MPS (00000KT) 140P49MPS (140P999KT)</td>
</tr>
<tr>
<td></td>
<td>Significant speed variations (C)$^3$</td>
<td>G(P)[nn][n]</td>
<td>12003G09MPS (12006G18KT) 24008G14MPS (24016G28KT)</td>
</tr>
<tr>
<td></td>
<td>Units of measurement (M)</td>
<td>MPS (or KT)</td>
<td></td>
</tr>
<tr>
<td>Visibility (M)</td>
<td>Prevailing visibility (M)</td>
<td>nnnn</td>
<td>CAVOK 0350 CAVOK</td>
</tr>
<tr>
<td>Weather (C)$^4$, $^5$</td>
<td>Intensity of weather phenomena (C)$^6$</td>
<td>– or +</td>
<td>RA HZ +TSRA FG</td>
</tr>
<tr>
<td></td>
<td>Characteristics and type of weather phenomena (C)$^7$</td>
<td>DG 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 TSCR or TSGS or TSA or TSNN</td>
<td>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 DBSA or BLSN or DRDU or DRSA or DRSN or FZFG or PRFG</td>
</tr>
<tr>
<td></td>
<td>Cloud (M)$^8$</td>
<td>FEWnnn or SCTnnn or BKNNnn or OVCnnn</td>
<td>VWNnn or VN/// NSC FEW010 VV005 OVC020 VV/// NSC SCT005 BKN012</td>
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<tr>
<td></td>
<td>Cloud type (C)$^4$</td>
<td>CB or TCU</td>
<td>SICT008 BKN025CB</td>
</tr>
<tr>
<td>Temperature (O)$^9$</td>
<td>Name of the element (M)</td>
<td>TX</td>
<td>TX2S/1013Z TN09/1005Z TX05/2112Z TNM02/2103Z</td>
</tr>
<tr>
<td></td>
<td>Maximum temperature (M)</td>
<td>[M]nn/n</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Day and time of occurrence of the maximum temperature (M)</td>
<td>nnnnZ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Name of the element (M)</td>
<td>TN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimum temperature (M)</td>
<td>[M]nn/n</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Day and time of occurrence of the minimum temperature (M)</td>
<td>nnnnZ</td>
<td></td>
</tr>
<tr>
<td>Expected significant changes to one or more of the above elements during the period of validity (C)$^4$, $^10$</td>
<td>Change or probability indicator (M)</td>
<td>PROB830 [TEMPO] or PROB40 [TEMPO] or BECMG or TEMPO or FM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Period of occurrence or change (M)</td>
<td>nnnn/nnn or nnnn/nnn</td>
<td></td>
</tr>
<tr>
<td>Element as specified in Part I, 6</td>
<td>Detailed content</td>
<td>Template(s)</td>
<td>Examples</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>Wind (C)⁴</td>
<td>nnn[P][nn][n][G][nn]MPS or VRBnnMPS (or nnn[P][nn][G][nn]KT or VRBnnKT)</td>
<td>TEMPO 0815/0818 25017G25MPS (TEMPO 0815/0818 25034G50KT) TEMPO 2212/2214 17006G13MPS 1000 TSRA SCT010CB BKN020 (TEMPO 2212/2214 17012G26KT 1000 TSRA SCT010CB BKN020)</td>
<td></td>
</tr>
<tr>
<td>Prevailing visibility (C)⁴</td>
<td>nnnn</td>
<td>CAVOK</td>
<td>BECMG 3010/3011 00000MPS 2400 OVC010 (BECMG 3010/3011 00000KT 2400 OVC010) PROB30 1412/1414 0800 FG</td>
</tr>
<tr>
<td>Weather phenomenon: intensity (C)⁶</td>
<td>– or +</td>
<td>–</td>
<td>NSW</td>
</tr>
<tr>
<td>Weather phenomenon: characteristics and type (C)⁴, ⁷</td>
<td>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 TSNG or TSRA or TSSN</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>Cloud amount and height of base or vertical visibility (C)⁴</td>
<td>FEWnnn or SCTnnn or BKNnnn or OVCnnn</td>
<td>VVnnn or VV///</td>
<td>NSC</td>
</tr>
<tr>
<td>Cloud type (C)⁴</td>
<td>CB or TCU</td>
<td>–</td>
<td>BECMG 1618/1620 8000 NSW NSC</td>
</tr>
</tbody>
</table>

Notes:
1. Fictitious location.
2. To be used in accordance with 1.2.1 in this appendix.
3. To be included in accordance with 1.2.1 in this appendix.
4. To be included whenever applicable.
5. One or more, up to a maximum of three, groups in accordance with 1.2.3 in this appendix.
6. To be included whenever applicable in accordance with 1.2.3 in this appendix. No qualifier for moderate intensity.
7. Weather phenomena to be included in accordance with 1.2.3 in this appendix.
8. Up to four cloud layers in accordance with 1.2.4 in this appendix.
9. To be included in accordance with 1.2.5 in this appendix, consisting of up to a maximum of four temperatures (two maximum temperatures and two minimum temperatures).
10. To be included in accordance with 1.3, 1.4, and 1.5 in this appendix.
11. To be used with FM only.
Table A5-2. Use of change and time indicators in TAF

<table>
<thead>
<tr>
<th>Change or time indicator</th>
<th>Time period</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM</td>
<td>(n_1n_2n_3n_4n_5n_6)</td>
<td>Used to indicate a significant change in most weather elements occurring at (n_1) day, (n_2) hours and (n_3) 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)</td>
</tr>
<tr>
<td>BECMG</td>
<td>(n_{1a}n_{2a}n_{3a}n_{4a}n_{5a}n_{6a}n_{2b}n_{3b}n_{4b})</td>
<td>The change is forecast to commence at (n_{1a}) day and (n_{2a}) hours (UTC) and be completed by (n_{2b}) day and (n_{3b}) hours (UTC); Only those elements for which a change is forecast are to be given following “BECMG”; The time period (n_{1a}n_{2a}n_{3a}n_{4a}n_{5a}n_{6a}n_{2b}n_{3b}n_{4b}) should normally be less than 2 hours and in any case should not exceed 4 hours</td>
</tr>
<tr>
<td>TEMPO</td>
<td>(n_{1a}n_{2a}n_{3a}n_{4a}n_{5a}n_{6a}n_{2b}n_{3b}n_{4b})</td>
<td>Temporary fluctuations are forecast to commence at (n_{1a}) day and (n_{2a}) hours (UTC) and cease by (n_{2b}) day and (n_{3b}) 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 (n_{1a}n_{2a}n_{3a}n_{4a}n_{5a}n_{6a}n_{2b}n_{3b}n_{4b})</td>
</tr>
<tr>
<td>PROBnn</td>
<td>(n_{1a}n_{2a}n_{3a}n_{4a}n_{5a}n_{6a}n_{2b}n_{3b}n_{4b})</td>
<td>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</td>
</tr>
</tbody>
</table>

Table A5-3. Template for GAMET

<table>
<thead>
<tr>
<th>Element</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location indicator of FIR/CTA (M)</td>
<td>ICAO location indicator of the ATS unit serving the FIR or CTA to which the GAMET refers (M)</td>
<td>nnnn</td>
<td>YUCC1</td>
</tr>
<tr>
<td>Identification (M)</td>
<td>Message identification (M)</td>
<td>GAMET</td>
<td>GAMET</td>
</tr>
<tr>
<td>Validity period (M)</td>
<td>Day-time groups indicating the period of validity in UTC (M)</td>
<td>VALID nnnnn/nnnnnn</td>
<td>VALID 220600/221200</td>
</tr>
<tr>
<td>Location indicator of aerodrome meteorological office or meteorological watch office (M)</td>
<td>Location indicator of aerodrome meteorological office or meteorological watch office originating the message with a separating hyphen (M)</td>
<td>nnn–</td>
<td>YUDO–1</td>
</tr>
<tr>
<td>Name of the FIR/CTA or part thereof (M)</td>
<td>Location indicator and name of the FIR/CTA, or part thereof for which the GAMET is issued (M)</td>
<td>nnn nnnnnnnnnnnn FIR/CTA</td>
<td>YUCC AMSWELL FIR/2 BLW FL120</td>
</tr>
<tr>
<td></td>
<td>or nnn nnnnnnnnnn FIR/CTA</td>
<td>YUCC AMSWELL CTA</td>
<td>YUCC AMSWELL CTA</td>
</tr>
</tbody>
</table>

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.
<table>
<thead>
<tr>
<th>Element</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator for the beginning of Section I (M)</td>
<td>Indicator to identify the beginning of Section I (M)</td>
<td>SECN I</td>
<td>SECN I</td>
</tr>
<tr>
<td>Surface wind (C)</td>
<td>Widespread surface wind exceeding 15 m/s (30 kt)</td>
<td>SFC WSPD: [nn/nn] MPS (or [nnn KT])</td>
<td>SFC WSPD: 10/12 16 MPS SFC WSPD: 40 KT E OF W110</td>
</tr>
<tr>
<td>Surface visibility (C)</td>
<td>Widespread surface visibility below 5 000 m including the weather phenomena causing the reduction in visibility</td>
<td>SFC VIS: [nn/nn] 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 FC or GR or GS or SQ or DS</td>
<td>SFC VIS: 06/08 3000 M BR N of NS1</td>
</tr>
<tr>
<td>Significant weather (C)</td>
<td>Significant weather conditions encompassing thunderstorms and heavy sandstorm and duststorm</td>
<td>SIGWX: [nn/nn] ISOL TS or OCNL TS or FRQ TS or OBSC TS or EMBD TS or HLY DS or HLY SS or SQL TS or ISOL TSGR or OCNL TSGR or FRQ TSGR or OBSC TSGR or EMBD TSGR or SQL TSGR or VA</td>
<td>SIGWX: 11/12 ISOL TS SIGWX: 12/14 SS S OF N35</td>
</tr>
<tr>
<td>Mountain obscuration (C)</td>
<td>Mountain obscuration</td>
<td>MT OBSC: [nn/nn]</td>
<td>MT OBSC: MT PASSES S OF N48</td>
</tr>
<tr>
<td>Cloud (C)</td>
<td>Widespread areas of broken or overcast 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</td>
<td>SIG CLD: [nn/nn] BKN or OVC or [nnn] M (or [nn] FT) or [nn] FT) AGL or AMSL ISOL or OCNL or FRQ or OBSC or EMBD CB or TCU [nnn] M (or [nn] FT) AGL or AMSL</td>
<td>SIG CLD: 06/09 OVC 800/1100 FT AGL N OF NS1 10/12 ISOL TCU 1200/8000 FT AGL</td>
</tr>
<tr>
<td>Icing (C)</td>
<td>Icing (except for that occurring in convective clouds and for severe icing for which a SIGMET message has already been issued)</td>
<td>ICE: [nn/nn] MOD FLnnn or MOD ABV FLnnn or SEV FLnnn or SEV ABV FLnnn</td>
<td>ICE: MOD FL050/080</td>
</tr>
<tr>
<td>Element</td>
<td>Detailed content</td>
<td>Template(s)</td>
<td>Examples</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Turbulence (C)</td>
<td>Turbulence (except for that occurring in convective clouds and for severe turbulence for which a SIGMET message has already been issued)</td>
<td>TURB: [nn/nn]</td>
<td>MOD FLnnn/nnn or MOD ABV FLnnn or SEV FLnnn/nnn or SEV ABV FLnnn</td>
</tr>
<tr>
<td>Mountain wave (C)</td>
<td>Mountain wave (except for severe mountain wave for which a SIGMET message has already been issued)</td>
<td>MTW: [nn/nn]</td>
<td>MOD FLnnn/nnn or MOD ABV FLnnn or SEV FLnnn/nnn or SEV ABV FLnnn</td>
</tr>
<tr>
<td>SIGMET (C)</td>
<td>SIGMET messages applicable to the FIR/CTA concerned or a sub-area thereof, for which the area forecast is valid</td>
<td>SIGMET APPLICABLE: [nn/nn]</td>
<td></td>
</tr>
<tr>
<td>Indicator for the beginning of Section II (M)</td>
<td>Indicator to identify the beginning of Section II (M)</td>
<td>SECN II</td>
<td>SECN II</td>
</tr>
<tr>
<td>Pressure centres and fronts (M)</td>
<td>Pressure centres and fronts and their expected movements and developments</td>
<td>PSYS: [nn]</td>
<td>L [n]nnn HPA or H [n]nnn HPA or FRONT or NIL</td>
</tr>
<tr>
<td>Upper winds and temperatures (M)</td>
<td>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)</td>
<td>WIND/T: [n]nnn M (or [n]nnn FT) nnn/[n]nnn MPS (or nnn/[n]nnn KT)</td>
<td>Nnnnn or Snnnn Wnnnnn or Ennnnn or Nnnnn or Snnnn Wnnnnnn or Ennnnn TO Nnnnn or Snnnn Wnnnnn or Ennnnn</td>
</tr>
<tr>
<td>Cloud (M)</td>
<td>Cloud information not included in Section I giving type, height of base and top above ground level (AGL) or above mean sea level (AMSL)</td>
<td>CLD: [nn/nn]</td>
<td>FEBW 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</td>
</tr>
</tbody>
</table>
### Table A5-4. Ranges and resolutions for the numerical elements included in TAF

<table>
<thead>
<tr>
<th>Element as specified in Part I, 6</th>
<th>Range</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind direction: °true</td>
<td>000 – 360</td>
<td>10</td>
</tr>
<tr>
<td>Wind speed:</td>
<td>00 – 99*</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>00 – 199*</td>
<td>1</td>
</tr>
<tr>
<td>Visibility:</td>
<td>0000 – 0750</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>0800 – 4 900</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>5 000 – 9 000</td>
<td>1 000</td>
</tr>
<tr>
<td></td>
<td>10 000 – 0</td>
<td>0 (fixed value: 9 999)</td>
</tr>
<tr>
<td>Vertical visibility: 30's M (100's FT)</td>
<td>000 – 020</td>
<td>1</td>
</tr>
<tr>
<td>Cloud: height of cloud base:</td>
<td>000 – 100</td>
<td>1</td>
</tr>
<tr>
<td>Air temperature (maximum and minimum): °C</td>
<td>–80 – +60</td>
<td>1</td>
</tr>
</tbody>
</table>

* 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 metres 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 metres per second gusting to 12 metres 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 metres per second; visibility 10 kilometres or more; and broken cloud at 600 metres.

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

* Fictitious location

Example A5-2. Cancellation of TAF

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

TAF AMD YUDO 161500Z 160624 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. GEMET 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 NS1 |
| SIGWX: | 11/12 ISOL TS |
| SIG CLD: | 06/09 OVC 800/1100 FT AGL N OF NS1 10/12 ISOL TCU 1200/8000 FT AGL |
| ICE: | MOD FL050/080 |
| TURB: | MOD ABV FL090 |
| SIGMET APPLICABLE: | 3,5 |
| **SECN II** |  |
| PSYS: | 06 L 1004 HPA NS130 E01000 MOV NE 25KT 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 5 M |
| VA: | NIL |

**Meaning:** An area forecast for low-level flights (GAMET) issued for sub-area two of the Amswell* flight information region (identified by YUCC Amswell area control centre) for below flight level 120 by the Donlon/International* aerodrome 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 metres 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 metres per second, temperature plus 3 degrees Celsius; at 5 000 feet above ground level wind direction 250 degrees; wind speed 20 metres per second, temperature minus 2 degrees Celsius; at 10 000 feet above ground level wind direction 240 degrees; wind speed 22 metres 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 PART I, 7)

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

1. SPECIFICATIONS RELATED TO SIGMET INFORMATION

1.1 Format of SIGMET messages

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

1.1.2 Messages containing SIGMET information shall be identified as “SIGMET”.

1.1.3 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 their area of responsibility.

1.1.4 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:

At cruising levels (irrespective of altitude):

Thunderstorm
– Obscured OBSC TS
– Embedded EMBD TS
– Frequent FRQ TS
– Squall line SQL TS
– Obscured with hail OBSC TSGR
– Embedded with hail EMBD TSGR
– Frequent, with hail FRQ TSGR
– Squall line with hail SQL TSGR

Tropical cyclone
– Tropical cyclone with 10-minute mean surface wind speed of 17 m/s (34 kt) or more TC (+ cyclone name)

Turbulence
– Severe turbulence SEV TURB

Icing
– Severe icing SEV ICE
– Severe icing due to freezing rain SEV ICE (FZRA)

Mountain wave
– Severe mountain wave SEV MTW

Duststorm
– Heavy duststorm HVY DS
Sandstorm
- Heavy sandstorm HVY SS

Volcanic ash
- Volcanic ash VA (+ volcano name, if known)

Radioactive cloud
- Radioactive cloud RDOACT 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 above shall be included. SIGMET information concerning thunderstorms or a tropical cyclone shall not include references to associated turbulence and icing.

1.1.6 [Recommendation] Meteorological watch offices in a position to do so should issue SIGMET information in digital form, in addition to the issuance of this SIGMET information in abbreviated plain language in accordance with 1.1.1 above.

1.1.7 SIGMET if disseminated in digital form shall be formatted in accordance with a globally interoperable information exchange model and shall use extensible markup language (XML)/geography markup language (GML).

1.1.8 SIGMET if disseminated in digital form shall be accompanied by the appropriate metadata.


1.1.9 [Recommendation] SIGMET, when issued in graphical format, should be as specified in Appendix 1.

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 their area of responsibility.

2.1.3 The flight information region shall be divided in sub-areas, as necessary.

2.1.4 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:

At cruising levels below flight level 100 (or below flight level 150 in mountainous areas, or higher, where necessary):

<table>
<thead>
<tr>
<th>Phenomenon</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface wind speed</td>
<td>SFC WSPD (+ wind speed and units)</td>
</tr>
<tr>
<td>Surface visibility</td>
<td>SFC VIS (+ visibility) (+ one of the following weather phenomenon or combinations thereof: BR, DS, DU, DZ, FC, FG, FU, GR, GS, HZ, PL, PO, RA, SA, SG, SN, SQ, SS or VA)</td>
</tr>
<tr>
<td>Thunderstorms</td>
<td></td>
</tr>
<tr>
<td>- Isolated thunderstorms without hail</td>
<td>ISOL TS</td>
</tr>
<tr>
<td>- Occasional thunderstorms without hail</td>
<td>OCNL TS</td>
</tr>
<tr>
<td>- Isolated thunderstorms with hail</td>
<td>ISOL TSGR</td>
</tr>
<tr>
<td>- Occasional thunderstorms with hail</td>
<td>OCNL TSGR</td>
</tr>
<tr>
<td>Mountain obscuration</td>
<td>MT OBSC</td>
</tr>
<tr>
<td>Cloud</td>
<td></td>
</tr>
<tr>
<td>- Widespread areas of broken or overcast cloud with height of base less than 300 m (1 000 ft) above ground level:</td>
<td></td>
</tr>
<tr>
<td>- Broken</td>
<td>BKN CLD (+ height of the base and top and units)</td>
</tr>
<tr>
<td>- Overcast</td>
<td>OVC CLD (+ height of the base and top and units)</td>
</tr>
<tr>
<td>- Cumulonimbus clouds which are:</td>
<td></td>
</tr>
<tr>
<td>- Isolated</td>
<td>ISOL CB</td>
</tr>
<tr>
<td>- Occasional</td>
<td>OCNL CB</td>
</tr>
<tr>
<td>- Frequent</td>
<td>FRQ CB</td>
</tr>
<tr>
<td>- Towering cumulus clouds which are:</td>
<td></td>
</tr>
<tr>
<td>- Isolated</td>
<td>ISOL TCU</td>
</tr>
<tr>
<td>- Occasional</td>
<td>OCNL TCU</td>
</tr>
<tr>
<td>- Frequent</td>
<td>FRQ TCU</td>
</tr>
<tr>
<td>Icing</td>
<td>MOD ICE</td>
</tr>
<tr>
<td>Turbulence</td>
<td>MOD TURB</td>
</tr>
<tr>
<td>Mountain wave</td>
<td>MOD MTW</td>
</tr>
</tbody>
</table>
2.1.5 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 above 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 above.

2.2 Dissemination of AIRMET messages

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

2.2.2 [Recommendation] 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 in Appendix 4.

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

3.2 [Recommendation] 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

[Recommendation] 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 [Recommendation] An area of thunderstorms and cumulonimbus clouds should be considered:

(a) Obscured (OBSC) if it is obscured by haze or smoke or cannot be readily seen due to darkness;
(b) Embedded (EMBD) if it is embedded within cloud layers and cannot be readily recognized;
4.2.2 [Recommendation] 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 [Recommendation] Squall line (SQL) should indicate a thunderstorm along a line with little or no space between individual clouds.

4.2.4 [Recommendation] Hail (GR) should be used as a further description of the thunderstorm, as necessary.

4.2.5 [Recommendation] 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:

(a) Severe whenever the peak value of the cube root of EDR exceeds 0.7; and
(b) 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 [Recommendation] 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 [Recommendation] 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.

4.2.9 [Recommendation] Sandstorm/duststorm should be considered:

(a) Heavy whenever the visibility is below 200 m and the sky is obscured; and
(b) Moderate whenever the visibility is:
   (i) Below 200 m and the sky is not obscured; or
   (ii) Between 200 m and 600 m.

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 [Recommendation] 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:

- 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);
- Thunderstorm;
- Hail;
- Snow (including the expected or observed snow accumulation);
- Freezing precipitation;
- Hoar frost or rime;
- Sandstorm;
- Duststorm;
- Rising sand or dust;
- Strong surface wind and gusts;
- Squall;
- Frost;
- Volcanic ash;
- Tsunami;
- Volcanic ash deposition;
- Toxic chemicals;
- Other phenomena as agreed locally.

5.1.4 [Recommendation] 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

[Recommendation] 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 aerodrome meteorological office and the users of the warnings.

6. SPECIFICATIONS RELATED TO WIND SHEAR WARNINGS

6.1 Detection of wind shear

[Recommendation] 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 Part I, 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:
- Thunderstorms, microbursts, funnel cloud (tornado or waterspout) and gust fronts;
- Frontal surfaces;
- Strong surface winds coupled with local topography;
- Sea breeze fronts;
- Mountain waves (including low-level rotors in the terminal area);
- 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 [Recommendation] 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 [Recommendation] 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.

Notes:
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.
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 [Recommendation] Where microbursts 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)

<table>
<thead>
<tr>
<th>Element as specified in Part I, S and Appendix 6</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location indicator of FIR/CTA (M)²</td>
<td>ICAO location indicator of the ATS unit serving the FIR or CTA to which the SIGMET/AIRMET refers (M)</td>
<td>nnnn</td>
<td>SIGMET AIRMET ARS SPECIAL AIR-REPORT¹</td>
</tr>
<tr>
<td>Identification (M)</td>
<td>Message identification and sequence number⁴ (M)</td>
<td>SIGMET [nn]n AIRMET [nn]n ARS</td>
<td>SIGMET 5 AIRMET 3 ARS</td>
</tr>
<tr>
<td>Validity period (M)</td>
<td>Day-time groups indicating the period of validity in UTC (M)</td>
<td>VALID nnnnn/nnnnn</td>
<td>VALID 211215/221600 VALID 101520/101800 VALID 251600/252200</td>
</tr>
<tr>
<td>Location indicator of MWO (M)</td>
<td>Location indicator of MWO originating the message with a separating hyphen (M)</td>
<td>nnnn–</td>
<td>YUDO–³ YUSO–³</td>
</tr>
<tr>
<td>Name of the FIR/CTA or aircraft identification (M)</td>
<td>Location indicator and name of the FIR/CTA⁵ for which the SIGMET/AIRMET is issued or aircraft radiotelephony call sign (M)</td>
<td>nnnn nnnnnnnn FIR[UIR] or nnnn nnnnnnnn CTA</td>
<td>nnnn nnnnnnnnn FIR[n] nnnnn</td>
</tr>
</tbody>
</table>

IF THE SIGMET IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE.

Key:  
M = inclusion mandatory, part of every message;  
C = inclusion conditional, included whenever applicable;  
e = 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 of this appendix.
<table>
<thead>
<tr>
<th>Element as specified in Part I, 5 and Appendix 6</th>
<th>Detailed content</th>
<th>SIGMET</th>
<th>AIRMET</th>
<th>SPECIAL AIR-REPORT</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenomenon (M)²</td>
<td>Description of phenomenon causing the issuance of SIGMET/AIRMET (C)</td>
<td>OBSC⁸ T(S)[GR⁹] EMBD¹⁰ T[S][GR] FRO¹¹ T(S)[GR] SQL¹² T[S][GR] TC nnnnnnnnnn or NN¹³ SEV TURB¹⁴ SEV ICE¹⁵ SEV ICE (FZRA)¹⁵ SEV MTW¹⁶ HVY DS HVY SS [VA ERUPTION] [MT] [nnnnnnnnnnn] [PSN] Nnn[n] or Snn[n] Enn[n] or Wnn[n] VA CLD RDOACT CLD</td>
<td>SFC WSPD nn[n]MPS (or SFC WSPD nn[n]KT) SFC VIS nnnnnM (nn)n¹⁷ ISOL¹⁸ T[S][GR⁹] OCNL¹⁹ T[S][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) ISOL¹⁸ CB²⁰ OCNL¹⁹ CB FRO¹¹ CB ISOL¹⁸ TCL²⁰ OCNL¹⁹ TCL²⁰ FRO¹¹ TCU MOD TURB¹⁴ MOD ICE¹⁵ MOD MTW¹⁶</td>
<td>TS TSGR SEV TURB SEV ICE SEV MTW HVY SS VA CLD [FL nnn/n] VA [MT nnnnnnnnnn] MOD TURB MOD ICE</td>
<td>SEV TURB FRO TS OBSC TSGR EMBD TSGR TC GLORIA TC NN 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</td>
</tr>
<tr>
<td>Observed or forecast phenomenon (M)</td>
<td>Indication whether the information is observed and expected to continue, or forecast (M)</td>
<td>OBS [AT nnnnZ] FCST [AT nnnnZ]</td>
<td></td>
<td>OBS AT nnnnZ</td>
<td>OBS AT 1210Z OBS FCST AT 1815Z</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ENTIRE CTA²³</td>
</tr>
<tr>
<td>Element as specified in Part I, 5 and Appendix 6</td>
<td>Detailed content</td>
<td>Template(s)</td>
<td>Examples</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Level (C)</strong>&lt;sup&gt;21&lt;/sup&gt;</td>
<td>Flight level or altitude and extent (C)&lt;sup&gt;24&lt;/sup&gt;</td>
<td>[SFC]/FLnnn or [SFC]/nnnnM (or [SFC]/nnnnFT) or FLnnn/nnnn or [TOP] FLnnn or [TOP] ABV FLnnn or CB TOP [ABV] FLnnn WI nnnnNM OF CENTRE (or CB TOP [ABV] FLnnn WI nnnnNM OF CENTRE) or CB TOP [BLW] FLnnn WI nnnnNM OF CENTRE (or CB TOP [BLW] FLnnn WI nnnnNM OF CENTRE) or FLnnn/nnnn [APRX nnnnNM BY nnnnNM] [Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] – Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] or Ennn[nn]</td>
<td>FLnnn or nnnnM (or nnnnFT)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Changes in intensity (C)</strong>&lt;sup&gt;21&lt;/sup&gt;</td>
<td>Expected changes in intensity (C)</td>
<td>INTSF or WKN or NC</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Forecast position (C)</strong>&lt;sup&gt;21, 24, 27&lt;/sup&gt;</td>
<td>Forecast position of volcanic ash cloud or the centre of the TC or other hazardous phenomena&lt;sup&gt;28&lt;/sup&gt; at the end of the validity period of the SIGMET message (C)</td>
<td>FCST nnnnZ TC CENTRE Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]</td>
<td>FCST 2200Z TC CENTRE N2740 W07345</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

<sup>1</sup> AIR-REPORT: Template(s)
<sup>2</sup> SIGMET: Template(s)
<sup>3</sup> Examples
<sup>4</sup> Movement or expected movement (C)
<table>
<thead>
<tr>
<th>Element as specified in Part I, 5 and Appendix 6</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Examples</th>
</tr>
</thead>
</table>

**OR**

| Cancellation of SIGMET/AIRMET (C)\[^{31}\] | Cancellation of SIGMET/AIRMET referring to its identification | CNL SIGMET [nn]n nnnnn/nmmmm or CNL SIGMET [nn]n nnnnn/nmmmm [VA MOV TO nnnn FIR]\[^{23}\] | CNL AIRMET [nn]n nnnnn/nmmmm | — |

| — | CNL SIGMET 2 101200/101600\[^{31}\] CNL SIGMET 3 251030/251430 VA MOV TO YUDO FIR\[^{31}\] CNL AIRMET 151520/151800\[^{31}\] |

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

Note: In accordance with 1.1.5 and 2.1.5 in this appendix, 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

<table>
<thead>
<tr>
<th>Element</th>
<th>Detailed content</th>
<th>Templates</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location indicator of the aerodrome (M)</td>
<td>Location indicator of the aerodrome</td>
<td>nnnn</td>
<td>YUCC1</td>
</tr>
<tr>
<td>Identification of the type of message (M)</td>
<td>Type of message and sequence number</td>
<td>AD WRNG [n]n</td>
<td>AD WRNG 2</td>
</tr>
<tr>
<td>Validity period (M)</td>
<td>Day and time of validity period in UTC</td>
<td>VALID nnnnnn/nnnnnn</td>
<td>VALID 211230/211530</td>
</tr>
</tbody>
</table>

IF THE AERODROME WARNING IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE.
<table>
<thead>
<tr>
<th>Element</th>
<th>Detailed content</th>
<th>Templates</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenomenon (M)²</td>
<td>Description of phenomenon causing the issuance of the aerodrome warning</td>
<td>TC³ nnnnnnnnn or [HVY] TS or GR or [HVY] SN [nnCM]¹ 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 characters¹</td>
<td>TC ANDREW HVY SN 25CM SFC WSPD 20MPS MAX 30 VA TSUNAMI</td>
</tr>
<tr>
<td>Observed or forecast phenomenon (M)</td>
<td>Indication whether the information is observed and expected to continue, or forecast</td>
<td>OBS [AT nnnnZ] or FCST</td>
<td>OBS AT 1200Z OBS</td>
</tr>
<tr>
<td>Changes in intensity (C)</td>
<td>Expected changes in intensity</td>
<td>INTSF or WKN or NC</td>
<td>WKN</td>
</tr>
<tr>
<td>OR</td>
<td>Cancellation of aerodrome warning referring to its identification</td>
<td>CNL AD WRNG [n]nnnnnn/nnnnnn</td>
<td>CNL AD WRNG 2 211230/211530⁶</td>
</tr>
</tbody>
</table>

Notes:
1. Fictitious location.
2. One phenomenon or a combination thereof, in accordance with 5.1.3 in this appendix.
3. In accordance with 5.1.3 in this appendix.
4. Hoar frost or rime in accordance with 5.1.3 in this appendix.
5. In accordance with 5.1.4 in this appendix.
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.

Notes:
1. The ranges and resolutions for the numerical elements included in aerodrome warnings are shown in Table A6-4 of this appendix.
2. The explanations for the abbreviations can be found in the ICAO Procedures for Air Navigation Services – ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

<table>
<thead>
<tr>
<th>Element</th>
<th>Detailed content</th>
<th>Template(s)</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location indicator of the aerodrome (M)</td>
<td>Location indicator of the aerodrome</td>
<td>nnnn</td>
<td>YUCC(^1)</td>
</tr>
<tr>
<td>Identification of the type of message (M)</td>
<td>Type of message and sequence number</td>
<td>WS WRNG ([n])n</td>
<td>WS WRNG 1</td>
</tr>
</tbody>
</table>
| Time of origin and validity period (M) | Day and time of issue and, where applicable, validity period in UTC | nnnnn [VALID TL nnnnnn] or [VALID nnnnnn/nnnnnn] | 211230 VALID TL 211330  
221200 VALID 221215/221315 |

IF THE WIND SHEAR WARNING IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE.

<table>
<thead>
<tr>
<th>Phenomenon (M)</th>
<th>Identification of the phenomenon and its location</th>
<th>Template(s)</th>
<th>Example</th>
</tr>
</thead>
</table>
| [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 MBST CLIMB-OUT RWYnnn | [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 MBST CLIMB-OUT RWYnnn | WS APCH RWY12  
MOD WS RWY34  
WS IN CLIMB-OUT  
MBST APCH RWY26 |

<table>
<thead>
<tr>
<th>Observed, reported or forecast phenomenon (M)</th>
<th>Identification whether the phenomenon is observed or reported and expected to continue or forecast</th>
<th>Template(s)</th>
<th>Example</th>
</tr>
</thead>
</table>
| REP AT nnnn nnnnnnnn or OBS [AT nnnn] or FCST |                                                                                                  | REP AT 1510 B747  
OBS AT 1205 FCST |

<table>
<thead>
<tr>
<th>Details of the phenomenon (C)(^2)</th>
<th>Description of phenomenon causing the issuance of the wind shear warning</th>
<th>Template(s)</th>
<th>Example</th>
</tr>
</thead>
</table>
| SFC WIND: nnn/nnMPS (or nnn/nnKT) nnnM (nnnFT)-WIND: nnn/nnMPS (or nnn/nnKT) or nnnKMH (or nnKT) LOSS nnnKM (or nnnNM) or nnnKMH (or nnKT) GAIN nnnKM (or nnnNM) | SFC WIND: 320/5MPS  
60M-WIND: 360/13MPS (SFC WIND: 320/10KT  
200FT-WIND: 360/26KT)  
60KMH LOSS 4KM FNA RWY13 (30KT LOSS 2NM FNA RWY13) | SFC WIND: 320/5MPS  
60M-WIND: 360/13MPS (SFC WIND: 320/10KT  
200FT-WIND: 360/26KT)  
60KMH LOSS 4KM FNA RWY13 (30KT LOSS 2NM FNA RWY13) |

OR

<table>
<thead>
<tr>
<th>Cancellation of wind shear warning(^3)</th>
<th>Cancellation of wind shear warning referring to its identification</th>
<th>Template(s)</th>
<th>Example</th>
</tr>
</thead>
</table>
| CNL WS WRNG [n]n nnnnnn/nnnnnn         | CNL WS WRNG 1  
211230/211330\(^3\)                                                | CNL WS WRNG 1  
211230/211330\(^3\) |

Notes:
1. Fictitious location.
2. Additional provisions in 6.2.3 in this appendix.
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

<table>
<thead>
<tr>
<th>Element as specified in Appendices 2 and 6</th>
<th>Range</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summit elevation:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>000 – 8 100</td>
<td>1</td>
</tr>
<tr>
<td>FT</td>
<td>000 – 27 000</td>
<td>1</td>
</tr>
<tr>
<td>Advisory number:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for VA (index)*</td>
<td>000 – 2 000</td>
<td>1</td>
</tr>
<tr>
<td>for TC (index)*</td>
<td>00 – 99</td>
<td>1</td>
</tr>
<tr>
<td>Maximum surface wind:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPS</td>
<td>00 – 99</td>
<td>1</td>
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<tr>
<td>KT</td>
<td>00 – 199</td>
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<td>Central pressure:</td>
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<td>hPa</td>
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<tr>
<td>Surface wind speed:</td>
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<tr>
<td>MPS</td>
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<td>1</td>
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<tr>
<td>KT</td>
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<td>Surface visibility:</td>
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<td>0000 – 0750</td>
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<tr>
<td>M</td>
<td>0800 – 5 000</td>
<td>100</td>
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<tr>
<td>Cloud: height of base:</td>
<td></td>
<td></td>
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<tr>
<td>M</td>
<td>000 – 300</td>
<td>30</td>
</tr>
<tr>
<td>M</td>
<td>000 – 1 000</td>
<td>100</td>
</tr>
<tr>
<td>Cloud: height of top:</td>
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<td></td>
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<tr>
<td>M</td>
<td>000 – 2 970</td>
<td>30</td>
</tr>
<tr>
<td>M</td>
<td>3 000 – 20 000</td>
<td>300</td>
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<td>M</td>
<td>000 – 9 900</td>
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<td>10 000 – 60 000</td>
<td>1 000</td>
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<td>Latitudes:</td>
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<td>° (degrees)</td>
<td>00 – 90</td>
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<tr>
<td>‘ (minutes)</td>
<td>00 – 60</td>
<td>1</td>
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<td>Longitudes:</td>
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<td>° (degrees)</td>
<td>000 – 180</td>
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<td>‘ (minutes)</td>
<td>00 – 60</td>
<td>1</td>
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<td>KMH</td>
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<td>KT</td>
<td>0 – 150</td>
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* Non-dimensional

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

<table>
<thead>
<tr>
<th>SIGMET</th>
<th>Cancellation of SIGMET</th>
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</thead>
<tbody>
<tr>
<td>YUDD SIGMET 2 VALID 101200/101600 YUSO –</td>
<td>YUDD SIGMET 3 VALID 101345/101600 YUSO –</td>
</tr>
<tr>
<td>YUDD SHANLON FIR/UIR OBSC TS FCST</td>
<td>YUDD SHANLON FIR/UIR CNL SIGMET 2</td>
</tr>
<tr>
<td>S OF N54 AND E OF W012 TOP FL390 MOV E WKN</td>
<td>101200/101600</td>
</tr>
<tr>
<td>FCST 1600Z S OF N54 AND E OF W010</td>
<td></td>
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<td>AIRMET</td>
<td>Cancellation of AIRMET</td>
</tr>
<tr>
<td>YUDD AIRMET 1 VALID 151520/151800 YUSO –</td>
<td>YUDD AIRMET 2 VALID 151650/151800 YUSO –</td>
</tr>
<tr>
<td>YUDD SHANLON FIR ISOL TS OBS</td>
<td>YUDD SHANLON FIR CNL AIRMET 1</td>
</tr>
<tr>
<td>N OF S50 TOP ABV FL100 STNR WKN</td>
<td>151520/151800</td>
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</tbody>
</table>
Example A6-2. SIGMET message for tropical cyclone

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

Meaning:
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 6 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.

* Fictitious location

Example A6-3. SIGMET message for volcanic ash

YUDD SIGMET 2 VALID 211100/211700 YUSO –
YUDD SHANLON FIR/JUR VA ERUPTION MT ASHVAL PSN S1500 E07348 VA CLD OBS AT 1100Z APRX
220KM BY 35KM S1500 E07348 – S1530 E07642 FL310/450 MOV SE 65KMH FCST 1700Z VA CLD
S1506 E07500 – S1518 E08112 – S1712 E08330 – S1824 E07836

Meaning:
The second SIGMET message issued for the SHANLON* flight information region (identified by YUDD
Shanlon area control centre/upper flight information region) by the Shanlon/International* meteorological
watch office (YUSO) since 0001 UTC; the message is valid from 1100 UTC to 1700 UTC on the 21st of the
month; volcanic ash eruption of Mount Ashval* located at 15 degrees south and 73 degrees 48 minutes
east; volcanic ash cloud observed at 1100 UTC in an approximate area of 220 km by 35 km between
15 degrees south and 73 degrees 48 minutes east, and 15 degrees 30 minutes south and 76 degrees
42 minutes east; between flight levels 310 and 450, the volcanic ash cloud is expected to move
southeastwards at 65 kilometres per hour; at 1700 UTC the volcanic ash cloud is forecast to be located
approximately in an area bounded by the following points: 15 degrees 6 minutes south and 75 degrees
east, 15 degrees 18 minutes south and 81 degrees 12 minutes east, 17 degrees 12 minutes south and
83 degrees 30 minutes east, and 18 degrees 24 minutes south and 78 degrees 36 minutes east.

* Fictitious location

Example A6-4. SIGMET message for radioactive cloud

YUCC SIGMET 2 VALID 201200/201600 YUDO –
YUCC AMSWELL FIR RDOACT CLD OBS AT 1155Z WI S5000 W14000 – S5000 W13800 – S5200 W13800
– S5200 W14000 – S5000 W14000 SFC/FL100 STNR WKN

Meaning:
The second 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 1200 UTC to 1600 UTC on the 20th of the month; radioactive
cloud was observed at 1155 UTC within an area bounded by 50 degrees 0 minutes south 140 degrees
0 minutes west to 50 degrees 0 minutes south 138 degrees 0 minutes west to 52 degrees 0 minutes
south 138 degrees 0 minutes west to 52 degrees 0 minutes south 140 degrees 0 minutes west to
50 degrees 0 minutes south 140 degrees 0 minutes west and between the surface and flight level 100;
the radioactive cloud is expected to remain stationary and to weaken in intensity.

* Fictitious location
Example A6-5. SIGMET message for severe turbulence

<table>
<thead>
<tr>
<th>YUCC SIGMET 5 VALID 221215/221600 YUDO –</th>
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</thead>
<tbody>
<tr>
<td>YUCC AMSWELL FIR SEV TURB OBS AT 1210Z N2020 W07005 FL250 MOV E 40KM H WKN FCST 1600Z S</td>
</tr>
<tr>
<td>OF N2020 E OF W06950</td>
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</tbody>
</table>

**Meaning:**
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 20 degrees 20 minutes north and 70 degrees 5 minutes west at flight level 250; the turbulence is expected to move eastwards at 40 kilometres per hour and to weaken in intensity; forecast position at 1600 UTC south of 20 degrees 20 minutes north and east of 69 degrees 50 minutes west.

* Fictitious location

Example A6-6. AIRMET message for moderate mountain wave

<table>
<thead>
<tr>
<th>YUCC AIRMET 2 VALID 221215/221600 YUDO –</th>
</tr>
</thead>
<tbody>
<tr>
<td>YUCC AMSWELL FIR MOD MTW OBS AT 1205Z N48 E010 FL080 STNR NC</td>
</tr>
</tbody>
</table>

**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 location
APPENDIX 7. TECHNICAL SPECIFICATIONS RELATED TO AERONAUTICAL CLIMATOLOGICAL INFORMATION
(SEE PART I, 8)

1. PROCESSING OF AERONAUTICAL CLIMATOLOGICAL INFORMATION

[Recommendation] 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

[Recommendation] 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 [Recommendation] An aerodrome climatological table should give as applicable:

(a) Mean values and variations therefrom, including maximum and minimum values, of meteorological elements (for example, of air temperature); and/or
(b) The frequency of occurrence of present weather phenomena affecting flight operations at the aerodrome (for example, of sandstorms); and/or
(c) 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 [Recommendation] Aerodrome climatological tables should include information required for the preparation of aerodrome climatological summaries in accordance with 3.2 below.

3.2 Aerodrome climatological summaries

[Recommendation] Aerodrome climatological summaries should cover:

(a) 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;
(b) Frequencies of visibility below specified values at specified times;
(c) 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;
(e) Frequencies of surface temperature in specified ranges of 5°C at specified times; and
(f) 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) above are given in Part III.
APPENDIX 8. TECHNICAL SPECIFICATIONS RELATED TO SERVICE FOR OPERATORS AND FLIGHT CREW MEMBERS
(SEE PART I, 9)

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

1. 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 aerodrome meteorological office, in accordance with 5.1 below.

1.2 The meteorological authority, 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 [Recommendation] 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 REPLANNING

2.1 Format of upper-air gridded information

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

Note: The GRIB code form is contained in the Manual on Codes (WMO-No. 306), Volume I.2, Part B – Binary Codes.

2.2 Format of information on significant weather

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

Note: The BUFR code form is contained in the Manual on Codes (WMO-No. 306), Volume I.2, Part B – Binary Codes.

2.3 Specific needs of helicopter operations

[Recommendation] Meteorological information for pre-flight planning and in-flight replanning 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**

[Recommendation] 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 [Recommendation] The flight documentation related to concatenated route-specific upper wind and upper-air temperature forecasts should be provided when agreed between the meteorological authority and operator concerned.

Note: Guidance on the design, formulation and use of concatenated charts is given in the ICAO Manual of Aeronautical Meteorological Practice (Doc 8896).

4.1.3 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.

4.1.4 [Recommendation] The location indicators and the abbreviations used should be explained in the flight documentation.

4.1.5 [Recommendation] The forms and the legend of charts included in flight documentation should be printed in English, French, Russian or Spanish. Where appropriate, approved abbreviations should be used. The units employed for each element should be indicated; they should be in accordance with ICAO Annex 5.
4.2  Charts in flight documentation

4.2.1  Characteristics of charts

4.2.1.1  [Recommendation] 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 x 30 cm (standard size A3) and the smallest size should be about 21 x 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 ICAO 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-WAF 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  [Recommendation] For short-haul flights, charts should be prepared covering limited areas at a scale of 1:15 x 10^6 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**

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**

[Recommendation] 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**

[Recommendation] 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**

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

5.2 **Detailed specifications of the systems**

[Recommendation] 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 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 ICAO Procedures for Air Navigation Services – ICAO Abbreviations and Codes (PANS-ABC, Doc 8400) and ICAO Location Indicators (Doc 7910). Aeronautical meteorological code data type designators are given in the Manual on the Global Telecommunication System (WMO-No 386).

6. SPECIFICATIONS RELATED TO INFORMATION FOR AIRCRAFT IN FLIGHT

6.1 Supply of information requested by an aircraft in flight

[Recommendation] If an aircraft in flight requests meteorological information, the aerodrome meteorological office or meteorological watch office which receives the request should arrange to supply the information with the assistance, if necessary, of another aerodrome meteorological office or meteorological watch office.

6.2 Information for in-flight planning by the operator

[Recommendation] 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 ICAO Manual of Aeronautical Meteorological Practice (Doc 8896).
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Figure A8-1. Fixed areas of coverage of WAFS forecasts in chart form – Mercator projection
**Figure A8-2.** Fixed areas of coverage of WAFS forecasts in chart form – Polar stereographic projection (northern hemisphere)

<table>
<thead>
<tr>
<th>Chart</th>
<th>Latitude (°N)</th>
<th>Longitude (°W)</th>
<th>Chart</th>
<th>Latitude (°N)</th>
<th>Longitude (°E)</th>
</tr>
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<tbody>
<tr>
<td>EUR</td>
<td>N4633</td>
<td>W05634</td>
<td>I</td>
<td>N1912</td>
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<td>E06824</td>
<td>I</td>
<td>N3330</td>
<td>W06012</td>
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<td>N2621</td>
<td>E03325</td>
<td>I</td>
<td>N0126</td>
<td>W12327</td>
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<td>W02136</td>
<td>I</td>
<td>S0647</td>
<td>E16601</td>
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<td>G</td>
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<td>E11449</td>
</tr>
<tr>
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<td>E15711</td>
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<td>G</td>
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<td>G</td>
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<td>E03447</td>
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<td>N1413</td>
<td>W14338</td>
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<td>H</td>
<td>N3127</td>
<td>W14836</td>
<td>NAT</td>
<td>N4439</td>
<td>W10143</td>
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<td>H</td>
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<td>H</td>
<td>N0133</td>
<td>W07902</td>
<td>NAT</td>
<td>N1711</td>
<td>W05406</td>
</tr>
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<td>Chart</td>
<td>Latitude</td>
<td>Longitude</td>
<td></td>
<td></td>
<td></td>
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<td>W17812</td>
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<td>S2000</td>
<td>W03400</td>
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<td>J</td>
<td>S2806</td>
<td>E10717</td>
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<td>K</td>
<td>N0642</td>
<td>E12905</td>
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<tr>
<td>K</td>
<td>S2744</td>
<td>W16841</td>
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<td>K</td>
<td>S1105</td>
<td>E00317</td>
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</tr>
</tbody>
</table>

Figure A8-3. Fixed areas of coverage of WAFS forecasts in chart form – Polar stereographic projection (southern hemisphere)
APPENDIX 9. TECHNICAL SPECIFICATIONS RELATED TO INFORMATION FOR AIR TRAFFIC SERVICES, SEARCH AND RESCUE SERVICES AND AERONAUTICAL INFORMATION SERVICES
(SEE PART I, 10)

1. INFORMATION TO BE PROVIDED FOR AIR TRAFFIC SERVICES UNITS

1.1 List of information for the aerodrome control tower

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;
(d) Information received on volcanic ash cloud, for which a SIGMET has not already been issued, as agreed between the meteorological and ATS authorities concerned; and
(e) Information received on pre-eruption volcanic activity and/or a volcanic eruption as agreed between the meteorological and ATS authorities concerned.

1.2 List of information for the approach control unit

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 aerodrome warnings;
(c) Any additional meteorological information agreed upon locally;
(d) Information received on volcanic ash cloud, for which a SIGMET has not already been issued, as agreed between the meteorological and ATS authorities concerned; and
(e) Information received on pre-eruption volcanic activity and/or a volcanic eruption as agreed between the meteorological and ATS authorities concerned.

1.3 List of information for the area control centre and flight information centre

The following meteorological information shall be supplied, as necessary, to an area control centre or a flight information 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 on volcanic ash cloud, for which a SIGMET has not already been issued, as agreed between the meteorological and ATS authorities concerned;
(e) Information received concerning the release of radioactive material into the atmosphere, as agreed between the meteorological and ATS authorities concerned;
(f) Tropical cyclone advisory information issued by a TCAC in its area of responsibility;
(g) Volcanic ash advisory information issued by a VAAC in its area of responsibility; and
(h) Information received on pre-eruption volcanic activity and/or a volcanic eruption as agreed between the meteorological and ATS authorities concerned.

1.4 Supply of information to aeronautical telecommunications stations

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 [Recommendation] 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 aerodrome meteorological offices or meteorological watch offices, or received from other aerodrome meteorological offices or meteorological watch offices, unless otherwise agreed locally.

1.5.2 [Recommendation] 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

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  [Recommendation] On request from the rescue coordination centre, the designated aerodrome meteorological office or meteorological watch 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  [Recommendation] To facilitate search and rescue operations, the designated aerodrome meteorological office or meteorological watch 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  [Recommendation] On request from the rescue coordination centre, the designated aerodrome meteorological office or meteorological watch 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**

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 ICAO Annex 15, Appendix 1, 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:
    (i)  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 ICAO Annex 15, 5.1.1 and 5.1.1.1;
    Note:  The specific information required is given in Part I, 3.3.2 and 4.8.
    (ii)  The occurrence of volcanic activity; and
    (iii)  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 Part I, 3.4.2 (g).

(c)  Information necessary for the preparation of aeronautical information circulars including, in particular, information on:
    (i)  Expected important changes in aeronautical meteorological procedures, services and facilities provided; and
    (ii)  Effect of certain weather phenomena on aircraft operations.
1. SPECIFIC REQUIREMENTS FOR COMMUNICATIONS

1.1 Required transit times of meteorological information

[Recommendation] 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
- METAR 0–900 km (500 NM) .............................................. 5 minutes
- Trend forecasts more than 900 km (500 NM) ................................. 10 minutes
- SPECI

1.2 Grid-point data for ATS and operators

1.2.1 [Recommendation] 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.

1.2.2 [Recommendation] 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 THE PUBLIC INTERNET

2.1 Meteorological bulletins in alphanumeric format

2.1.1 Composition of bulletins

[Recommendation] 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**

[Recommendation] 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 five minutes after the actual time of observation. TAF should be filed for transmission not earlier than one hour prior to the beginning of their validity period.

2.1.3 **Heading of bulletins**

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.

Notes:
2. ICAO location indicators are listed in ICAO *Location Indicators* (Doc 7910).

2.1.4 **Structure of bulletins**

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**

[Recommendation] The telecommunications 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**

[Recommendation] 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**

[Recommendation] Transmissions should be such as to ensure that their interruption should not exceed 10 minutes during any period of six hours.
2.2.4 *Heading of bulletins containing WAFS products*

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 above.

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 of Part I, 4, 6 and 7.

3.1.2 The content and format of air-reports transmitted by aircraft shall be consistent with the provisions of Part I, 5 and of the ICAO *Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM, Doc 4444), Appendix 1.

3.2 *Content and format of meteorological bulletins*

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 [Recommendation] The latest available METAR, SPECI and TAF, and valid SIGMET and AIRMET, should be used for uplink to aircraft in flight.

4.2.2 [Recommendation] 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 aerodrome meteorological office concerned.

4.2.3 [Recommendation] 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*

The content and format of reports, forecasts and SIGMET and AIRMET information included in D-VOLMET shall be consistent with the provisions of Part I, 4, 6 and 7.
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 [Recommendation] 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 [Recommendation] TAF included in scheduled VOLMET broadcasts should be amended as necessary to ensure that a forecast, when transmitted, reflects the latest opinion of the aerodrome meteorological office concerned.

5.2.3 [Recommendation] Where SIGMET messages are included in scheduled VOLMET broadcasts, an indication of “NIL SIGMET” 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 of Part I, 4, 6 and 7.

5.3.2 [Recommendation] VOLMET broadcasts should use standard radiotelephony phraseologies.

Note: Guidance on the standard radiotelephony phraseologies to be used in VOLMET broadcasts is given in the ICAO *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 Part I, 4, in particular to 4.1.9.

<table>
<thead>
<tr>
<th>Element to be observed</th>
<th>Operationally desirable accuracy of measurement or observation*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean surface wind</td>
<td>Direction: ± 10°</td>
</tr>
<tr>
<td></td>
<td>Speed: ± 0.5 m/s (1 kt) up to 5 m/s (10 kt)</td>
</tr>
<tr>
<td></td>
<td>± 10% above 5 m/s (10 kt)</td>
</tr>
<tr>
<td>Variations from the mean surface wind</td>
<td>± 1 m/s (2 kt), in terms of longitudinal and lateral components</td>
</tr>
<tr>
<td>Visibility</td>
<td>± 50 m up to 600 m</td>
</tr>
<tr>
<td></td>
<td>± 10% between 600 m and 1500 m</td>
</tr>
<tr>
<td></td>
<td>± 20% above 1500 m</td>
</tr>
<tr>
<td>Runway visual range</td>
<td>± 10 m up to 400 m</td>
</tr>
<tr>
<td></td>
<td>± 25 m between 400 m and 800 m</td>
</tr>
<tr>
<td></td>
<td>± 10% above 800 m</td>
</tr>
<tr>
<td>Cloud amount</td>
<td>± 1 okta</td>
</tr>
<tr>
<td>Cloud height</td>
<td>± 10 m (33 ft) up to 100 m (330 ft)</td>
</tr>
<tr>
<td></td>
<td>± 10% above 100 m (330 ft)</td>
</tr>
<tr>
<td>Air temperature and dewpoint temperature</td>
<td>± 1°C</td>
</tr>
<tr>
<td>Pressure value (QNH, QFE)</td>
<td>± 0.5 hPa</td>
</tr>
</tbody>
</table>

* 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 the *Guide to Meteorological Instruments and Methods of Observation* (WMO-No. 8).
### ATTACHMENT B. OPERATIONALLY DESIRABLE ACCURACY OF FORECASTS

**Notes:**
1. The guidance contained in this table relates to Part I, 6, in particular to 6.1.1.
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.

<table>
<thead>
<tr>
<th>Element to be forecast</th>
<th>Operationally desirable accuracy of forecasts</th>
<th>Minimum percentage of cases within range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TAF</strong></td>
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<td></td>
</tr>
<tr>
<td>Wind direction</td>
<td>± 20°</td>
<td>80% of cases</td>
</tr>
<tr>
<td>Wind speed</td>
<td>± 2.5 m/s (5 kt)</td>
<td>80% of cases</td>
</tr>
<tr>
<td>Visibility</td>
<td>± 200 m up to 800 m</td>
<td>80% of cases</td>
</tr>
<tr>
<td></td>
<td>± 30% between 800 m and 10 km</td>
<td></td>
</tr>
<tr>
<td>Precipitation</td>
<td>Occurrence or non-occurrence</td>
<td>80% of cases</td>
</tr>
<tr>
<td>Cloud amount</td>
<td>One category below 450 m (1 500 ft)</td>
<td>70% of cases</td>
</tr>
<tr>
<td></td>
<td>Occurrence or non-occurrence of BKN or OVC between 450 m (1 500 ft) and 3000 m (10 000 ft)</td>
<td></td>
</tr>
<tr>
<td>Cloud height</td>
<td>± 30 m (100 ft) up to 300 m (1 000 ft)</td>
<td>70% of cases</td>
</tr>
<tr>
<td></td>
<td>± 30% between 300 m (1 000 ft) and 3 000 m (10 000 ft)</td>
<td></td>
</tr>
<tr>
<td>Air temperature</td>
<td>± 1°C</td>
<td>70% of cases</td>
</tr>
<tr>
<td><strong>TREND FORECAST</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind direction</td>
<td>± 20°</td>
<td>90% of cases</td>
</tr>
<tr>
<td>Wind speed</td>
<td>± 2.5 m/s (5 kt)</td>
<td>90% of cases</td>
</tr>
<tr>
<td>Visibility</td>
<td>± 200 m up to 800 m</td>
<td>90% of cases</td>
</tr>
<tr>
<td></td>
<td>± 30% between 800 m and 10 km</td>
<td></td>
</tr>
<tr>
<td>Precipitation</td>
<td>Occurrence or non-occurrence</td>
<td>90% of cases</td>
</tr>
<tr>
<td>Cloud amount</td>
<td>One category below 450 m (1 500 ft)</td>
<td>90% of cases</td>
</tr>
<tr>
<td></td>
<td>Occurrence or non-occurrence of BKN or OVC between 450 m (1 500 ft) and 3000 m (10 000 ft)</td>
<td></td>
</tr>
<tr>
<td>Cloud height</td>
<td>± 30 m (100 ft) up to 300 m (1 000 ft)</td>
<td>90% of cases</td>
</tr>
<tr>
<td></td>
<td>± 30% between 300 m (1 000 ft) and 3 000 m (10 000 ft)</td>
<td></td>
</tr>
<tr>
<td>Element to be forecast</td>
<td>Operationally desirable accuracy of forecasts</td>
<td>Minimum percentage of cases within range</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td><strong>FORECAST FOR TAKE-OFF</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind direction</td>
<td>± 20°</td>
<td>90% of cases</td>
</tr>
<tr>
<td>Wind speed</td>
<td>± 2.5 m/s (5 kt) up to 12.5 m/s (25 kt)</td>
<td>90% of cases</td>
</tr>
<tr>
<td>Air temperature</td>
<td>± 1°C</td>
<td>90% of cases</td>
</tr>
<tr>
<td>Pressure value (QNH)</td>
<td>± 1 hPa</td>
<td>90% of cases</td>
</tr>
<tr>
<td><strong>AREA, FLIGHT AND ROUTE FORECASTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper-air temperature</td>
<td>± 2°C (mean for 900 km (500 NM))</td>
<td>90% of cases</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>± 20%</td>
<td>90% of cases</td>
</tr>
<tr>
<td>Upper-wind</td>
<td>± 5 m/s (10 kt) (modulus of vector difference for 900 km (500 NM))</td>
<td>90% of cases</td>
</tr>
<tr>
<td>Significant en-route weather phenomena and cloud</td>
<td>Occurrence or non-occurrence</td>
<td>80% of cases</td>
</tr>
<tr>
<td></td>
<td>Location: ± 100 km (60 NM)</td>
<td>70% of cases</td>
</tr>
<tr>
<td></td>
<td>Vertical extent: ± 300 m/1 000 ft</td>
<td>70% of cases</td>
</tr>
<tr>
<td></td>
<td>Flight level of tropopause: ± 300 m (1 000 ft)</td>
<td>80% of cases</td>
</tr>
<tr>
<td></td>
<td>Max wind level: ± 300 m (1 000 ft)</td>
<td>80% of cases</td>
</tr>
</tbody>
</table>
**ATTACHMENT C. SELECTED CRITERIA APPLICABLE TO AERODROME REPORTS**

(THE GUIDANCE IN THIS TABLE RELATES TO PART I, 4 AND TO APPENDIX 3)

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Surface wind</th>
<th>Visibility (VIS)</th>
<th>Runway visual range&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Cloud</th>
<th>Temperature</th>
<th>Pressure (QNH, QFE)</th>
<th>Supplementary information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>OBS (Time, MIN)</td>
<td>Present weather</td>
</tr>
<tr>
<td>Local routine and special report</td>
<td>2/10 min</td>
<td>2/10 min</td>
<td>2 min</td>
<td>10 min</td>
<td>1 min</td>
<td>1 min</td>
<td>No criteria</td>
</tr>
<tr>
<td>METAR/SPECI</td>
<td>10 min</td>
<td>10 min</td>
<td>10 min</td>
<td>10 min</td>
<td>10 min</td>
<td>10 min</td>
<td>No tendency observed (&quot;N&quot;)</td>
</tr>
<tr>
<td>Relevant reporting scales for all messages</td>
<td>Direction in three figures rounded off to the nearest 10 degrees (Degrees 1–4 down, degrees 5–9 up)</td>
<td>Speed in 1 m/s or 1 kt</td>
<td>Speed &lt; 0.5 m/s (1 kt) indicated as CALM</td>
<td>♂</td>
<td>Stop applicable</td>
<td>Step applicable</td>
<td>♂</td>
</tr>
</tbody>
</table>

Notes:
- Special cases:
  - Minimum VIS = prevailing VIS
  - VIS fluctuating and prevailing VIS cannot be determined
- No general criteria applicable to all WX phenomena (for special criteria, see Appendix 3, 4.4.2)
- Minimum and maximum speed
- Prevailing VIS and minimum VIS + direction
- Minimum VIS
- No tendency observed ("N")
- Upward ("U") or downward ("D")
- No tendency available, the tendency is to be omitted

Legend:
- VRB: Variable direction, wind speeds of at least 5 m/s
- TCU: Turbulent conditions
- CAVOK: Ceiling 1 000 m and VIS 10 km

**References:**
1. [Table Format]
2. [Column Details]
3. [Row Details]
4. [Note]
5. [Formula]
6. [Criterion]
7. [Details]
8. [Specific Conditions]
9. [Conditions]
10. [Pressure Units]
11. [All Criteria]
12. [Significance and Wind Shear]
13. [Rounding]
14. [References]
15. [HPa]
16. [Varying Conditions]
17. [Magnitude]
18. [Appendix Details]
19. [Operational Significance]
20. [Mean Sea Level]
21. [Whole Degrees]
Notes:
1. Considered for the past 10 minutes (exception: if the 10-minute period includes a marked discontinuity (i.e. runway visual range changes or passes 175, 300, 550 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 runway visual range 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 \( \bar{R}_{5(AB)} \) = five-minute mean runway visual range value during period AB and \( \bar{R}_{5(BC)} \) = five-minute mean runway visual range 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, for mean values and, if applicable, referring period for extreme values, 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.
10. 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.
11. As listed in Appendix 3, 4.8.
12. Also sea-surface temperature and state of the sea or the significant wave height from offshore structures in accordance with regional air navigation agreement.
13. Report if RVR and/or VIS < 1 500 m, limits for assessments 50 and 2 000 m.
14. 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.
15. Measured in 0.1 hPa.
ATTACHMENT D. CONVERSION OF INSTRUMENTED READINGS INTO RUNWAY VISUAL RANGE AND VISIBILITY
(SEE APPENDIX 3, 4.3.5)

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, this attachment provides guidance on the use and application of the main conversion factors to 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-1. The use of a continuous function which approximates the step function such as displayed in Figure D-1 is preferred, due to its higher accuracy, to the stepped relationship described in paragraph 4 below.

4. In instrumented systems without continuous adjustment of the illumination threshold, the use of four equally spaced illumination threshold values with agreed corresponding background luminance ranges is convenient but will reduce accuracy. The four values are shown in Figure D-1 in the form of a step function; they are tabulated in Table D-1 for greater clarity.

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

Figure D-1. Relationship between the illumination threshold $E_T$ (lx) and background luminance $B$ (cd/m$^2$)

\[
\log (E_T) = 0.57 \log (B) + 0.05 (\log (B))^2 - 6.66
\]
<table>
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<tr>
<th>Condition</th>
<th>Illumination threshold (lx)</th>
<th>Background luminance (cd/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Night</td>
<td>$8 \times 10^{-7}$</td>
<td>$\leq 50$</td>
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<tr>
<td>Intermediate</td>
<td>$10^{-5}$</td>
<td>51–999</td>
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<tr>
<td>Normal day</td>
<td>$10^{-4}$</td>
<td>1 000–12 000</td>
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<tr>
<td>Bright day (sunlit fog)</td>
<td>$10^{-3}$</td>
<td>$&gt; 12 000$</td>
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</tbody>
</table>
PART III. AERONAUTICAL CLIMATOLOGY

1. GENERAL PROVISIONS

1.1 Aeronautical climatological information should be based on observations made over a period of at least five consecutive years and that period should be indicated in the information supplied. The period should be updated or extended by the addition of more recent data as soon as practicable.

1.2 Meteorological observations for regular and alternate aerodromes should be collected, processed and stored in a form suitable for the preparation of aerodrome climatological information in any form or forms and within the time period as agreed between the meteorological authority and the aeronautical user or users.

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

1.3 Aerodrome climatological tables and summaries should contain information on the location, height and exposure of the sensors from which the observations are derived.

1.4 Aerodrome climatological tables and summaries should contain information regarding the total number of observations and the observing times on which they are based.

2. AERODROME CLIMATOLOGICAL TABLES

2.1 Aerodrome climatological tables should be prepared in a form suitable to meet the specific request of the aeronautical user. Where appropriate, the layout for the climatological tables may follow the models for the climatological summaries.

2.2 Aerodrome climatological tables should be supplied for specified intervals as agreed between the meteorological authority and the aeronautical user. Aerodrome climatological tables may include the following information:

- Frequencies of specified wind directions and speeds at 10 m above runway level;
- Frequencies of specified range of runway visual range/visibility;
- Mean number of days with occurrence of specified weather phenomena, for example, sandstorms, fog, freezing rain, thunderstorms;
- Frequencies of specified range of the height of the operationally significant cloud base;
- Frequencies of specified range intervals of surface temperatures; and
- Mean atmospheric pressure at aerodrome level.

Upon request, frequencies of simultaneous occurrence of specified values of two or more of the elements listed above may be provided to meet user requirements.

Notes:
1. Climatological information on low visibility conditions should be based on measurements of RVR for those aerodromes where such observations are required under Part I, 4.6.3.2.
2. Procedures governing light intensity settings and other particulars used for the RVR assessment should be specified.
3. **AERODROME CLIMATOLOGICAL SUMMARIES**

3.1 Aerodrome climatological summaries should, in general, follow the format of the models given in the attachment hereto.

3.2 Aerodrome climatological summaries should include the following information on meteorological conditions at an aerodrome:

- Frequencies (per cent) of the occurrence of runway visual range/visibility (both in metres) and/or height of the base of the lowest cloud layer (in metres) of BKN or OVC extent below specified values at specified times (Model A);
- Frequencies (per cent) of visibility below specified values (in metres) at specified times (Model B);
- Frequencies (per cent) of the height of the base (in metres) of the lowest cloud layer of BKN or OVC extent below specified values at specified times (Model C);
- Frequencies of occurrence of concurrent wind direction (in 30° sectors) and speed within specified ranges (Model D);
- Frequencies (per cent) of surface temperature (screen) in specified ranges of 5°C at specified times (Model E);
- Mean values and variations therefrom, including maximum and minimum values of meteorological elements required for operational planning purposes including take-off calculations (no model included).
ATTACHMENT. AERODROME CLIMATOLOGY SUMMARY – TABULAR FORMS

MODEL A  Frequencies (per cent) of the occurrence of runway visual range/visibility (both in metres) and/or height of the base of the lowest cloud layer (in metres) of BKN or OVC extent below specified values at specified times

MODEL B  Frequencies (per cent) of visibility below specified values (in metres) at specified times

MODEL C  Frequencies (per cent) of the height of the base (in metres) of the lowest cloud layer of BKN or OVC extent below specified values at specified times

MODEL D  Frequencies of occurrence of concurrent wind direction (in 30° sectors) and speed within specified ranges

MODEL E  Frequencies (per cent) of surface temperature (screen) in specified ranges of 5°C at specified times
## AERODROME CLIMATOLOGICAL SUMMARY

**MODEL A**

### TABULAR FORM

**AERODROME:** ________  **RWY (TDZ):** ________  **MONTH:** ________  **PERIOD OF RECORD:** ________

**TOTAL NUMBER OF OBSERVATIONS:** ____________

**LATITUDE:** ____________  **LONGITUDE:** ____________  **ELEVATION ABOVE MSL:** ________ M

### FREQUENCIES (PER CENT) OF THE OCCURRENCE OF RUNWAY VISUAL RANGE/VISIBILITY (BOTH IN METRES) AND/OR HEIGHT OF THE BASE OF THE LOWEST CLOUD LAYER (IN METRES) OF BKN OR OVC EXTENT BELOW SPECIFIED VALUES AT SPECIFIED TIMES

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**REMARKS**
AERODROME CLIMATOLOGICAL SUMMARY  
MODEL B
TABULAR FORM

AERODROME: ___________  MONTH: ___________  PERIOD OF RECORD: _______

TOTAL NUMBER OF OBSERVATIONS: ___________

LATITUDE: ___________  LONGITUDE: ___________  ELEVATION ABOVE MSL: _______ M

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</tbody>
</table>

Note: Frequencies at three-hourly intervals may suffice to describe the main climatological features.
AERODROME CLIMATOLOGICAL SUMMARY

AERODROME: ____________  MONTH: ____________  PERIOD OF RECORD: ________

TOTAL NUMBER OF OBSERVATIONS: ______________

LATITUDE: ____________  LONGITUDE: ____________  ELEVATION ABOVE MSL: ________ M

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Note: Frequencies at three-hourly intervals may suffice to describe the main climatological features.
### AERODROME CLIMATOLOGICAL SUMMARY

**MODEL D**

**TABULAR FORM**

**AERODROME:**___________  **MONTH:**___________  **PERIOD OF RECORD:**_______

**TOTAL NUMBER OF OBSERVATIONS:**___________  **OBSERVING TIME:**___________

**LATITUDE:**___________  **LONGITUDE:**___________  **ELEVATION ABOVE MSL:**_________M

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### AERODROME CLIMATOLOGICAL SUMMARY

**MODEL E**

**TABULAR FORM**

AERODROME: ___________  MONTH: ___________  PERIOD OF RECORD: ___________

TOTAL NUMBER OF OBSERVATIONS: ___________

LATITUDE: ___________  LONGITUDE: ___________  ELEVATION ABOVE MSL: ___________ M

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</table>

**Notes:**

1. The range 5–10 comprises the values 5.0 to 9.9 inclusive.
2. Frequencies at three-hourly intervals may suffice to describe the main climatological features.
PART IV. FORMAT AND PREPARATION OF FLIGHT DOCUMENTATION

1. FLIGHT DOCUMENTATION

1.1 Flight documentation to be provided in accordance with Part I, 9.3 should be prepared as set out in 2 below to ensure worldwide standardization.

1.2 Model charts and forms used in flight documentation are reproduced in Part II, Appendix 1.

2. PREPARATION OF FLIGHT DOCUMENTATION

2.1 General

2.1.1 Documentation must be clear and legible.

2.1.2 Information identifying the forecast areas, sections of routes, aerodromes, units used, validity dates and times, flight levels or other height indication, types of charts and in the case of wind and temperature and volcanic ash forecasts, dates and times of observation on which the prognosis is based, should be inserted in the appropriate spaces provided on each form.

2.1.3 Only those meteorological abbreviations which are approved by ICAO and WMO should be used in completing the documents. Other aeronautical abbreviations used should be those approved by ICAO.

2.1.4 A range of values should be indicated by giving the limits separated by a hyphen except that, in cases where a minus follows the hyphen, the hyphen must be replaced by the word “to”.

2.1.5 When a meteorological office has to prepare charts which are normally received from a world area forecast centre (WAFC), it should apply the provisions given in 3 below.

2.1.6 Projections and scales of weather charts used for the preparation of flight documentation should be selected in accordance with international recommendations promulgated by WMO.

3. CHARTS PREPARED BY WORLD AREA FORECAST CENTRES

3.1 General

3.1.1 Charts based on forecasts issued by world area forecast centres should be prepared with map bases and projections as prescribed in 3.2 below.

3.1.2 Charts should be fixed-time prognostic charts.

3.1.3 Charts should be clearly identified in accordance with 2.1.2 above and include the name of the issuing world area forecast centre.
3.2 Map bases and projections

3.2.1 Map bases should have:

(a) Latitude indicated by dotted lines at 10° intervals;
(b) Longitude indicated by dotted lines at 10° intervals from the equator to 80° latitude and at 90° longitude intervals from 80° latitude to the Pole;
(c) The intersection of latitude and longitude lines at the intervening 5° intervals optionally marked by a cross where this adds to the clarity of the chart;
(d) The dots comprising the latitude lines at intervals of:
   (i) 1° of longitude for 10° latitude lines from the equator to 60° (in the case of polar stereographic projection);
   (ii) 5° of longitude for latitudes 70° and 80°;
(e) The dots comprising the longitude lines at intervals of 1° of latitude from the equator to 80°;
(f) Latitude and longitude values clearly indicated at various points throughout the chart (i.e. not only at the edges);
(g) Major geographical features depicted in a way that makes them easily recognizable;
(h) Major aerodromes indicated, where practicable, 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 ICAO regional air navigation plan.

Note: Meteorological data should take precedence over chart background.

3.2.2 Projections used in middle and high latitudes should be polar stereographic true at 60° latitude. In low-latitude regions, the Mercator projection true at 22.5°N and 22.5°S should be used. When a forecast embraces high and low latitudes, the projection appropriate to the larger portion of the area should be adopted.

3.3 Contents of charts

3.3.1 Forms of presentation:

(a) Symbols used in models to present significant weather should be selected from Table IV.1 (a) or (b) as appropriate;
(b) Symbols used in models to present fronts and convergence zones and other features should be selected from Table IV.2;
(c) Height indication* on significant weather charts is normally restricted to the limits of the chart, for example FL 100 and FL 250. However, in agreement with operators, values outside the chart limits may be included when appropriate. In particular, the symbol for volcanic eruption should appear on all charts, irrespective of the height of the observed or forecast ash cloud.

3.3.2 In charts based on forecasts issued by world area forecast centres, wind direction and speed should be depicted by arrows with feathers and shaded pennants.

4. COMPLETION OF MODELS

Note: The model charts and forms are shown in Part II, Appendix 1.

* Height indication: See Part II, Appendix 8, 4.2.3.
### Table IV.1

(a) Significant weather (in accordance with Part II, Appendix 2, 1.3.2 and 1.3.3)

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Weather Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tropical cyclone</td>
<td>Moderate aircraft icing</td>
</tr>
<tr>
<td>Severe squall line</td>
<td>Severe aircraft icing</td>
</tr>
<tr>
<td>Moderate turbulence</td>
<td>Widespread sandstorm or duststorm</td>
</tr>
<tr>
<td>Severe turbulence</td>
<td>Volcanic eruption</td>
</tr>
</tbody>
</table>

(b) Significant weather (in accordance with Part II, Appendix 5, 4.3)

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Weather Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tropical cyclone</td>
<td>Widespread fog</td>
</tr>
<tr>
<td>Severe squall line</td>
<td>Drizzle</td>
</tr>
<tr>
<td>Moderate turbulence</td>
<td>Rain</td>
</tr>
<tr>
<td>Severe turbulence</td>
<td>Snow</td>
</tr>
<tr>
<td>Mountain waves</td>
<td>Shower</td>
</tr>
<tr>
<td>Moderate aircraft icing</td>
<td>Widespread blowing snow</td>
</tr>
<tr>
<td>Severe aircraft icing</td>
<td>Severe sand or dust haze</td>
</tr>
<tr>
<td>Hail</td>
<td>Widespread sandstorm or duststorm</td>
</tr>
<tr>
<td>Volcanic eruption</td>
<td>Widespread haze</td>
</tr>
<tr>
<td>Freezing precipitation(^a)</td>
<td>Widespread mist</td>
</tr>
<tr>
<td>Radioactive materials in the atmosphere</td>
<td>Widespread smoke</td>
</tr>
<tr>
<td>Mountain obscuration</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) The symbol \(\approx\) is used for supercooled precipitation but not for precipitation that is transformed into ice coming into contact with an aircraft which is at a very low temperature.

Note: Where the abbreviation CB is used it should refer to only those thunderstorms which warrant the issuance of a SIGMET as given in Part II, Appendix 6, 1.1.4.

### Table IV.2

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold front at the surface</td>
<td></td>
<td>Tropopause high</td>
</tr>
<tr>
<td>Warm front at the surface</td>
<td></td>
<td>Tropopause low</td>
</tr>
<tr>
<td>Occluded front at the surface</td>
<td></td>
<td>Tropopause level</td>
</tr>
<tr>
<td>Quasi-stationary front at the surface</td>
<td></td>
<td>Freezing level</td>
</tr>
<tr>
<td>Convergence line</td>
<td></td>
<td>Position, speed and level of maximum wind (see Table IV.3)</td>
</tr>
<tr>
<td>Intertropical convergence zone(^a)</td>
<td></td>
<td>State of the sea</td>
</tr>
<tr>
<td>Widespread strong surface wind(^b)</td>
<td></td>
<td>Sea-surface temperature</td>
</tr>
</tbody>
</table>

\(^a\) The separation of the two lines gives a qualitative representation of the width of the zone; the hatched lines may be added to indicate areas of activity.

\(^b\) This symbol refers to widespread surface wind speeds exceeding 16 m/s (30 kt).

### Table IV.3 (in accordance with 4.3.11)

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 FL 220 and FL 400. The heavy line delineating the jet axis begins/ends at the points where a wind speed of 40 m/s (80 kt) is forecast.
4.1 **Model A: OPMET information**

4.1.1 Model A consists of the direct reproduction of METARs, TAFs and SIGMETs as received. Obvious transmission errors should be corrected before reproduction, where possible.

4.1.2 An appropriate selection of ICAO location indicators and abbreviations for weather phenomena should be compiled by meteorological authorities concerned, to accompany flight documentation. The location indicators should preferably be in alphabetical order.

4.1.3 SIGMET is a warning information and hence it is of the highest priority, and is prepared in abbreviated plain language.

4.2 **Model IS: upper wind and temperature chart for standard isobaric surface**

4.2.1 Charts for depicting upper winds and temperatures included in flight documentation should be prognostic charts for fixed-times of validity and for fixed flight levels clearly indicated on the label of the charts.

4.2.2 Heights indicated on the chart should be expressed as flight levels.

4.2.3 Wind direction and speed should be depicted on charts by arrows with feathers and shaded pennants, with a sufficiently dense grid.

4.2.4 Air temperature at selected grid points of a sufficient density should be indicated by insertion of the value of the temperature in whole degrees Celsius. Labels on upper-level charts should state that all temperatures are negative, except those which are preceded by the appropriate indicator for positive values (+).

4.2.5 The information depicted on wind and temperature charts should be at grid points that coincide with the relevant grid points in the digital data received from a WAFC.

4.3 **Models SWH, SWM and SWL: significant weather charts**

4.3.1 Models SWH, SWM and SWL are charts of significant weather. Model SWH is used to depict expected significant weather phenomena above FL 250. Model SWM is used to depict expected significant weather phenomena between FL 100 and FL 250. Model SWL is used to depict expected significant weather phenomena below FL 100. The layer of the atmosphere to which the chart refers should be clearly indicated on the chart. The symbols used to depict expected significant weather phenomena should be selected from Table IV.1 (a) for Models SWH and SWM and from Table IV.1 (b) for Model SWL.

4.3.2 The heights on SWH and SWM charts should be expressed in flight levels. The heights used on SWL charts should be expressed as altitudes in metres or feet (hectofeet) as appropriate. The heights for the levels between which a phenomenon is expected to occur should be given with the value for the lower level being placed underneath that for the higher level.

4.3.3 The types and surface plan positions of fronts (and in tropical regions, convergence zones) with which en-route significant weather is associated should be represented using symbols selected from Table IV.2. Arrows should be placed at suitable intervals along the front giving the direction of expected movement of the front with a figure to indicate the expected mean speed of movement in knots or in kilometres per hour during the period from three hours before to three hours after the validity time.

4.3.4 On SWL charts only, the positions of centres of high- and low-pressure systems should be represented by a cross and the letter H or L, respectively, together with the values of
the central pressure in hectopascals (hPa). The expected movement of pressure centres should be indicated by an arrow in the direction of the movement with a figure to indicate the expected mean speed of movement in knots or in kilometres per hour during the period from three hours before to three hours after the validity time.

4.3.5 The boundaries of the areas of significant weather should be indicated on the chart by a scalloped line, except for areas of clear air turbulence, which should be delineated by a broken line.

Note: For clarity, the clear air turbulence area may be marked by a figure inside a square relating to a legend on a margin of the chart to explain the intensity and the vertical extent of the turbulence.

4.3.6 On SWL charts, the height of the 0°C isotherm, when it falls within the applicable vertical range of the chart, should be indicated either by the insertion at selected points of its height, preceded by 0° within small rectangles, or by means of dashed contour lines at appropriately spaced height intervals. The height of the 0°C isotherm should be indicated by altitude.

4.3.7 On SWH charts, cumulonimbus (CB) clouds are included if they are ISOL EMBD (isolated embedded), OCNL EMBD (occasional embedded), FRQ (frequent) or FRQ EMBD (frequent embedded).

4.3.8 In addition to the provisions of 4.3.7 above, on SWM charts clouds associated with any of the significant weather phenomena listed in Table IV.1 (a) in the layer FL 100 to FL 250 should be indicated using the abbreviations FEW (few), SCT (scattered), BKN (broken) and OVC (overcast) for 1–2 oktas, 3–4 oktas, 5–7 oktas and 8 oktas, respectively.

4.3.9 On SWL and SWM charts all cumulonimbus clouds should be indicated using the following abbreviations:

- ISOL: an area of individual cumulonimbus and/or thunderstorms with a maximum spatial coverage less than 50 per cent of the area forecast to be affected;
- OCNL: an area of well-separated cumulonimbus and/or thunderstorms with a maximum spatial coverage between 50 and 75 per cent of the area forecast to be affected;
- FRQ: an area of thunderstorms within which there is little or no separation between adjacent thunderstorms with a maximum spatial coverage greater than 75 per cent of the area forecast to be affected.

The abbreviation EMBD (embedded) may be added to any one of these three abbreviations to indicate cumulonimbus clouds that are embedded within cloud layers and cannot readily be recognized. These embedded CBs may or may not be protruding from the layer. On SWL charts, all other clouds should be depicted using the abbreviations FEW (few), SCT (scattered), BKN (broken) and OVC (overcast) for 1–2 oktas, 3–4 oktas, 5–7 oktas and 8 oktas, respectively. Type of cloud should be indicated in conformity with WMO Code table 0500 but, where appropriate, the abbreviation LYR (layer or layered) may be used instead.

4.3.10 On charts SWH and SWM as appropriate, the heights of the tropopause, except for low and high points of the tropopause topography, should be indicated by flight levels in small rectangles. The number of insertions should be sufficient to indicate strong gradients of tropopause height. Low and high points of the tropopause topography should be indicated by the letters L or H, respectively, inside the appropriate pentagon as shown in Table IV.2 and model SN.

4.3.11 On charts SWH, and SWM as appropriate, the orientation of the axis of the jet stream should be indicated by a single heavy line, broken at suitable intervals to show the speed
of the maximum wind, by means of arrows with feathers and shaded pennants followed by the flight level (with the prefix FL) of the maximum wind.

Notes:
1. The heavy line delineating the jet axis begins/ends at the points where a wind speed of 160 kilometres per hour/80 knots is forecast.
2. Wind arrows along the jet axis should depict the absolute speed of the maximum wind together with the indication of level at suitable intervals. Significant changes of speed and/or level of maximum wind (for example change in maximum wind of 20 knots, change in flight level of 3 000 feet or less if practicable) are denoted by a double bar perpendicular to the jet axis (see Table IV.3).
3. The vertical extent of the jet stream is indicated (in flight level) below the flight level, for example FL 270, accompanied by +20/–30 indicating that the height of the jet extends from FL 240 to FL 290.

4.4 **Model TCG: tropical cyclone advisory information in graphical format**

4.4.1 Model TCG should be used to present information on the name of the tropical cyclone (NN to be used if unnamed), position of the centre, direction and speed indicated by an arrow in the direction of the movement, forecast of centre position and maximum surface wind at +6 hours, +12 hours, +18 hours and +24 hours.

4.4.2 Model TCG should also depict the area of gale force winds around the cyclone. Areas covered by cumulonimbus clouds with their tops can also be shown using small boxes. Extra information about the cyclone, tropical cyclone advisory centre and time of the next advisory, as well as remarks, is set out in the chart.

4.5 **Model VAG: volcanic ash advisory information in graphical format**

4.5.1 Model VAG should be used to present information on the forecast transport and dispersion of a volcanic ash cloud.

4.5.2 Model VAG should consist of a set of four charts on one page, used to depict the horizontal transport and dispersion of a volcanic ash cloud at various layers of the atmosphere. The top left chart depicts the estimated or observed layers showing the time of the observation, the top right chart the +6 h forecast, and the two bottom charts the +12 h and +18 h forecasts, the reference time being the observation time, regardless of eruption time. The layer of the atmosphere to which each polygon refers should be clearly indicated in flight levels in each chart. Extra information about the volcano, time of eruption, information source, etc. is given in the text set out below the charts.

4.5.3 The validity time of the forecast should be clearly marked on each set of charts and should consist of the date and the time in UTC.

4.5.4 The symbols used to depict the volcanic ash cloud and the volcano producing it should be selected from Table IV.1, including the name and IAVCEI reference number of the volcano where known.

4.6 **Model STC: SIGMET for tropical cyclone in graphical format**

4.6.1 Model STC should be used to present SIGMET information on tropical cyclones on the observed and the six-hour forecast position of the tropical cyclone in graphical format.

4.6.2 Model STC should consist of a chart depicting the observed or estimated position clearly marked and the observed and the six-hour forecast position of the tropical cyclone. The validity time of the forecast, that is the date and time in UTC, and the sequence number of the SIGMET should be clearly marked on the chart.
4.6.3 The symbols used to depict the tropical cyclone and its forecast positions should be selected from Table IV.1.

4.7 Model SVA: SIGMET for volcanic ash in graphical format

4.7.1 Model SVA should be used to present SIGMET information on the observed and the six-hour forecast transport and dispersion of volcanic ash cloud in graphical format.

4.7.2 Model SVA should consist of a chart depicting the observed or estimated position clearly marked and the observed and the six-hour forecast position of volcanic ash cloud in the layers of atmosphere affected. The validity time of the forecast, that is the date and time in UTC, and the sequence number of the SIGMET should be clearly marked on the chart.

4.7.3 The symbols used to depict the volcanic ash cloud and the volcano producing it should be selected from Table IV.1.

4.8 Model SGE: SIGMET for phenomena other than tropical cyclone and volcanic ash in graphical format

4.8.1 Model SGE should be used to present SIGMET information on the forecast position for phenomena other than tropical cyclone and volcanic ash in graphical format.

4.8.2 Model SGE should consist of a chart depicting the observed position clearly marked and the observed and the six-hour forecast position of the phenomena concerned. The validity time of the forecast, that is the date and time in UTC, and the sequence number of the SIGMET should be clearly marked on the chart. Indication of the intensity or its expected change and/or movement should be included.

4.8.3 The symbols used to depict the phenomena should be selected from Table IV.1.

4.9 Model SN: sheet of notations used in flight documentation

Model SN is a sheet of the relevant notations used in flight documentation and should be supplied with flight documentation as required.