



Annex 3
Fourteenth Edition
Corrigendum No. 2
(English/Arabic/Russian/
Spanish)
19/10/01

**INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES**

**METEOROLOGICAL SERVICE FOR
INTERNATIONAL AIR NAVIGATION**

**ANNEX 3
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION**

FOURTEENTH EDITION -JULY 2001

CORRIGENDUM NO. 2

1. Please replace existing page APP 2-10, dated 1/1 1/01, by the attached new page bearing the notation "Corr 2".
 2. Record the entry of this corrigendum on page (ii).
-

International Standards
and Recommended Practices



Annex 3
to the Convention on
International Civil Aviation

Meteorological Service for International Air Navigation

This edition incorporates all amendments
adopted by the Council prior to 8 March 2001
and supersedes, on 1 November 2001, all previous
editions of Annex 3.

For information regarding the applicability
of the Standards and Recommended Practices,
see Foreword.

Fourteenth Edition
July 2001

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

[illegible][illegible]

TABLE OF CONTENTS

	<i>Page</i>		<i>Page</i>
FOREWORD	(v)	4.13 Contents of reports	4-12
CHAPTER 1. Definitions	1-1	4.14 Observations and reports of volcanic activity	4-12
1.1 Definitions	1-1	CHAPTER 5. Aircraft observations and reports	5-1
1.2 Terms used with a limited meaning	1-5	5.1 Obligations of States	5-1
CHAPTER 2. General provisions	2-1	5.2 Aircraft observations	5-1
2.1 Objective, determination and provision of meteorological service	2-1	5.3 Reporting of aircraft observations during flight	5-1
2.2 Supply, quality assurance and use of meteorological information	2-1	5.4 Routine aircraft observations	5-1
2.3 Notifications required from operators	2-2	5.5 Special aircraft observations	5-1
CHAPTER 3. World area forecast system and meteorological offices	3-1	5.6 Other non-routine aircraft observations	5-2
3.1 Objectives of the world area forecast system	3-1	5.7 Content of air-reports	5-2
3.2 World area forecast centres	3-1	5.8 Criteria for reporting meteorological and related parameters in automated air reports	5-3
3.3 Regional area forecast centres	3-2	5.9 Exchange of air-reports	5-3
3.4 Meteorological offices	3-4	5.10 Recording and post-flight reporting of aircraft observations of volcanic activity	5-4
3.5 Meteorological watch offices	3-4	CHAPTER 6. Forecasts	6-1
3.6 Volcanic ash advisory centres	3-5	6.1 Interpretation and use of forecasts	6-1
3.7 Tropical cyclone advisory centres	3-6	6.2 Aerodrome forecasts	6-1
CHAPTER 4. Meteorological observations and reports	4-1	6.3 Landing forecasts	6-3
4.1 Aeronautical meteorological stations and observations	4-1	6.4 Forecasts for take-off	6-5
4.2 Routine observations and reports	4-2	6.5 Area and route forecasts, other than forecasts issued within the framework of the world area forecast system	6-5
4.3 Special observations and reports	4-2	6.6 Area forecasts for low-level flights	6-6
4.4 Coordination of requirements for observations and reports between the meteorological and ATS authorities	4-4	CHAPTER 7. SIGMET and AIRMET information, aerodrome warnings and wind shear warnings	7-1
4.5 Observing and reporting of surface wind	4-4	7.1 SIGMET information — general provisions	7-1
4.6 Observing and reporting of visibility	4-5	7.2 Format and exchange of SIGMET messages	7-1
4.7 Observing and reporting of runway visual range	4-6	7.3 AIRMET information	7-2
4.8 Observing and reporting of present weather	4-8	7.4 Format and exchange of AIRMET messages	7-3
4.9 Observing and reporting of cloud	4-9	7.5 Aerodrome warnings	7-3
4.10 Observing and reporting of air temperature and dew-point temperature	4-10	7.6 Wind shear warnings	7-3
4.11 Observing and reporting of pressure values	4-10	CHAPTER 8. Aeronautical climatological information	8-1
4.12 Observing and reporting of supplementary information	4-11	8.1 General provisions	8-1
		8.2 Aerodrome climatological tables	8-1

8.3	Aerodrome climatological summaries	8-1	11.4	Use of aeronautical mobile service communications	11-3
8.4	Copies of meteorological observational data.	8-2	11.5	Use of aeronautical data link service — contents of D-VOLMET.	11-3
CHAPTER 9. Service for operators and flight crew members.			9-1	11.6	Use of aeronautical broadcasting service — contents of VOLMET broadcasts.
9.1	General provisions	9-1			
9.2	Information for operators for pre-flight planning and for in-flight re-planning under centralized operational control	9-1			
9.3	Briefing, consultation and display	9-2			
9.4	Flight documentation — general	9-3			
9.5	Flight documentation — upper wind and upper-air temperature information	9-4			
9.6	Flight documentation — significant weather charts.	9-5			
9.7	Flight documentation — aerodrome forecasts.	9-6			
9.8	Flight documentation — supplementary charts and other forms of presentation.	9-6			
9.9	Automated pre-flight information systems	9-6			
9.10	Information for aircraft in flight	9-7			
CHAPTER 10. Information for air traffic services, search and rescue services and aeronautical information services.			10-1		
10.1	Information for air traffic services units	10-1			
10.2	Information for search and rescue services units.	10-2			
10.3	Information for aeronautical information services units.	10-2			
CHAPTER 11. Requirements for and use of communications			11-1		
11.1	Requirements for communications.	11-1			
11.2	Use of aeronautical fixed service communications — meteorological bulletins in alphanumeric format	11-2			
11.3	Use of aeronautical fixed service communications — world area forecast system products	11-2			
			APPENDICES		
			APPENDIX 1. Flight documentation — model charts and forms APP 1-1		
			APPENDIX 2. Technical specifications for local routine reports, local special reports and reports in the METAR/SPECI code forms. APP 2-1		
			APPENDIX 3. Criteria for reporting meteorological and related parameters in automated air-reports. APP 3-1		
			APPENDIX 4. Technical specifications for aerodrome forecasts in the TAF code form APP 4-1		
			APPENDIX 5. Technical specifications for SIGMET and AIRMET messages and special air-reports APP 5-1		
			ATTACHMENTS		
			ATTACHMENT A. Guidance on area forecasts in abbreviated plain language ATT A-1		
			ATTACHMENT B. Operationally desirable and currently attainable accuracy of measurement or observation. ATT B-1		
			ATTACHMENT C. Selected criteria applicable to aerodrome reports. ATT C-1		
			ATTACHMENT D. Conversion of instrumented readings into runway visual range and visibility ATT D-1		
			ATTACHMENT E. Operationally desirable accuracy of forecasts ATT E-1		

FOREWORD

Historical background

Standards and Recommended Practices relating to meteorology were first adopted by the Council on 16 April 1948, pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago, 1944), and designated as Annex 3 to the Convention with the title *Standards and Recommended Practices — Meteorological Codes*. The Standards and Recommended Practices were based on recommendations of the Special Session of the Meteorology Division, held in September 1947.

Table A shows the origin of subsequent amendments, together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted or approved by the Council, when they became effective and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

Attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as is practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that are important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

- a) *Standards and Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

- b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.
- c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted

dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

- d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

- a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption;
- b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text;
- c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices;
- d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in five languages — English, Arabic, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb “shall” is used, and for Recommended Practices the operative verb “should” is used.

Any reference to a portion of this document, which is identified by a number, includes all subdivisions of the portion.

Applicability

The Standards and Recommended Practices in this document govern the application of the *Regional Supplementary Procedures* (Doc 7030, Part 3 — Meteorology), in which document will be found statements of regional choices, where such options are permitted by this Annex.

Responsibility

In accordance with a similar provision in the Foreword to Annex 6, Part II, the responsibility which devolves upon an operator, in accordance with the provisions of Annex 3, falls upon the pilot-in-command in the case of international general aviation.

Relation to corresponding WMO publications

The regulatory material contained in Annex 3 is, except for a few minor editorial differences, identical with that appearing in the Technical Regulations (Chapter C.3.1) of the World Meteorological Organization (WMO).

The aeronautical meteorological code forms referred to in Annex 3 are developed by the World Meteorological Organization on the basis of aeronautical requirements contained in this Annex, or stated from time to time by the Council. The aeronautical meteorological code forms are promulgated by WMO in its Publication No. 306 — *Manual on Codes*, Volume I.

Table A. Amendments to Annex 3

<i>Amendment(s)</i>	<i>Source(s)</i>	<i>Subject(s)</i>	<i>Adopted/approved Effective Applicable</i>
1st Edition	Second Session of the Meteorology Division	Meteorological codes for the transmission of meteorological information for aeronautical purposes.	16 April 1948 15 September 1948 1 January 1949
1 to 21	Special Session of the Meteorology Division	Updating and improvement of meteorological codes.	17 September 1948 23 December 1948 1 January 1949
22 to 37	Third Session of the Meteorology Division	Use of plain language and a simplified code for flight conditions in air-reports.	28 May 1951 1 October 1951 1 January 1952
38	First Air Navigation Conference	Introduction of the radiotelephony or radiotelegraphy AIREP form of air-report.	15 December 1953 1 August 1954 1 September 1954
39	First Air Navigation Conference	Revised radiotelegraphy form of POMAR Code for air-reports.	18 May 1954 20 August 1954 1 September 1954
40	World Meteorological Organization	New aeronautical meteorological figure codes in an Attachment, replacing those (except the POMAR code) hitherto appearing in the SARPs.	28 September 1954 1 January 1955 1 January 1955
41	Fourth Session of the Meteorology Division	Introduction of Standards and Recommended Practices governing the obligations of Contracting States relating to the establishment of meteorological organization in each State, adequate to satisfy Articles 28 and 37 of the Convention; consequential change of title of Annex 3 to read <i>International Standards and Recommended Practices — Meteorology</i> .	1 April 1955 1 August 1955 1 January 1956
42	Second Air Navigation Conference	Simplification of the detailed specifications for the method of determining the position in the AIREP and POMAR forms of air-report.	8 May 1956 1 September 1956 1 December 1956
43	Third Air Navigation Conference	Introduction of the term “SIGMET information” to replace the terms “advisory message” and “warning message”; amendment of the table for “State of Sea” in the POMAR code.	13 June 1957 1 October 1957 1 December 1957
44	Rules of the Air and Air Traffic Services/ Search and Rescue Divisions	Changes in the list of elements in Section 1 (Position report) of the AIREP form of air-report — deletion of the element “Flight conditions” and amendment of the last element in the section to read “Next position and time over”.	18 February 1960 1 May 1960 1 August 1960
45	Rules of the Air and Air Traffic Services/ Search and Rescue Divisions	Amendment of model AIREP and POMAR forms of air-report consequential to Amendment 44.	18 February 1960 — 1 August 1960
46	World Meteorological Organization	Updating of aeronautical meteorological figure codes, introduced by WMO, as of 1 January 1960.	8 June 1960 — 8 June 1960

<i>Amendment(s)</i>	<i>Source(s)</i>	<i>Subject(s)</i>	<i>Adopted/approved Effective Applicable</i>
47	Fifth Session of the Meteorology Division	Amendment to the procedures for aircraft meteorological observations and reports, modifying those for special observations and introducing requirements for additional observations; deletion of the POMAR form of air-report; elimination of flight meteorological watch and the introduction of en-route forecast service to supplement area meteorological watch; amendment to the provisions concerning meteorological conditions along the route to an alternate aerodrome.	2 December 1960 1 April 1961 1 July 1961
48	Fifth Session of the Meteorology Division	Amendment to model AIREP form of air-report to reflect changes in procedures for aircraft meteorological observations and reports, consequential to an amendment to the PANS-RAC.	2 December 1960 — 1 July 1961
49	Fifth Session of the Meteorology Division	Introduction of definition of “D-value”.	8 April 1963 1 August 1963 1 November 1963
50	World Meteorological Organization	Updating of aeronautical meteorological figure codes, introduced by WMO, as of 1 January 1964.	18 March 1964 — 18 March 1964
51	Meteorology and Operations Divisional Meeting	Introduction of a requirement for observations to be made at locations where they will be representative of the area for which they are primarily required; extension of the criteria for special air-reports to cover phenomena likely to affect efficiency as well as safety, and deleting the requirement for “additional aircraft observations” according to regionally agreed criteria; deletion from the AIREP form of air-report of D-value, weather and cloud as standard items; introduction of a modified model AIREP form; changes to the provisions relating to forms of meteorological messages and providing for the exchange of information in pictorial form; introduction of definition of “plain language”.	31 May 1965 1 October 1965 10 March 1966
52	World Meteorological Organization	Updating of aeronautical meteorological figure codes, introduced by WMO, as of 10 March 1966.	12 December 1966 — 12 December 1966
53	Meteorology and Operations Divisional Meeting	Permitting regional air navigation agreement on the use of a pictorial form of message for the dissemination of forecasts; replacement of the term “symbolic form of message” by a more specific description of the form of message to which this expression was intended to refer.	12 December 1966 12 April 1967 24 August 1967
54	World Meteorological Organization	Updating of aeronautical meteorological figure codes, introduced by WMO, as of 1 January 1968.	13 June 1967 — 1 January 1968
55	France	Permitting changes to be made to air-reports before their ground-to-ground dissemination.	16 December 1968 16 April 1969 18 September 1969
56	Sixth Air Navigation Conference	Introduction of: specifications for area forecast centres; simplified specifications for meteorological offices to reflect increasing centralization; extended coverage of aircraft reports to include adverse weather conditions encountered during initial climb and final approach; routine reporting by aircraft of “spot” rather than “mean” winds; improved criteria for in-flight reports of the intensity of turbulence; new definition of “air traffic services reporting office” and changes in the definition of “air traffic services unit”; changes to the aeronautical meteorological codes introduced by WMO, as of 18 September 1969.	15 May 1970 15 September 1970 4 February 1971

<i>Amendment(s)</i>	<i>Source(s)</i>	<i>Subject(s)</i>	<i>Adopted/approved Effective Applicable</i>
57	Second Meeting of the Technical Panel on Supersonic Transport Operations	Amendment to the definition of “SIGMET information” to take account of the requirements of SST aircraft operations; introduction of provisions for making and recording special observations whenever moderate turbulence, hail or cumulonimbus clouds are encountered during transonic or supersonic flight.	19 March 1971 6 September 1971 6 January 1972
58	World Meteorological Organization	Updating of aeronautical meteorological codes, introduced by WMO, as of 1 January 1972.	19 March 1971 — 6 January 1972
59	Sixth Air Navigation Conference	Permitting the omission of information on “next position and time over” from Section 1 of air-reports exchanged between meteorological offices; introduction of changes to the formats and data conventions in the model form of air-report to make it suitable for direct input into computers.	24 March 1972 24 July 1972 7 December 1972
60	Sixth Air Navigation Conference. Eighth Air Navigation Conference. Meteorology Divisional Meeting (1974)	Complete revision of Annex 3, incorporating the PANS-MET, the specifications of which were regarded as being suitable for inclusion in Annex 3 as Standards and Recommended Practices; the revision took into account recently approved operational requirements and up-to-date methods of meeting them; introduction of new Standards and Recommended Practices, relating to service for operators and flight crew members, meteorological information for air traffic services and for search and rescue services, together with requirements for communications and their use; the title of Annex 3 was, accordingly, amended to read <i>Meteorological Service for International Air Navigation</i> .	26 November 1975 26 March 1976 12 August 1976
61	Ninth Air Navigation Conference. Meteorology Divisional Meeting (1974)	New provisions and revision of existing provisions to improve the coordination between meteorological offices/stations and air traffic services units and the supply of meteorological information to the latter; new specifications for observations and reports for take-off and landing; introduction of a note referring to the specifications of Annex 14 for the siting and construction of equipment and installations on operational areas to reduce the hazard to aircraft to a minimum; replacement of the expression “supersonic transport aircraft” by the expression “supersonic aircraft”; updating of Part 2, Appendix 2; revision of definition of “nephanalysis” and deletion of “(29.92 in.)” from definition of “flight level”; deletion of Attachment D — Aeronautical Meteorological Codes.	14 December 1977 14 April 1978 10 August 1978
62	Eighth Air Navigation Conference and ICAO Council	Inclusion in Appendix 1 of model charts and forms developed by WMO on the basis of the operational requirements contained in Annex 3; transfer of the data designators and geographical designators from Appendix 2 to Annex 3 to the <i>Manual of Aeronautical Meteorological Practice</i> (Doc 8896).	26 June 1978 26 October 1978 29 November 1979
63	MET Divisional Meeting (1974). ICAO Secretariat. Operational Flight Information Service Panel. Ninth Air Navigation Conference. Doc 9328	Definition for “meteorological bulletin”; correction to shortcomings in ground-to-ground dissemination of air-reports; decrease in SIGMET messages dealing with “active thunderstorm area”; deletion of reference to “reporting lines”; reference to new <i>Manual of Runway Visual Range Observing and Reporting Practices</i> .	23 March 1981 23 July 1981 26 November 1981
64	ICAO Secretariat	New provisions and revision of existing provisions to meet operational requirements for observing and reporting of low-level wind shear, including the introduction of wind shear warnings for the climb-out and approach phases of flight.	6 December 1982 6 April 1983 24 November 1983

<i>Amendment(s)</i>	<i>Source(s)</i>	<i>Subject(s)</i>	<i>Adopted/approved Effective Applicable</i>
65	Communications/ Meteorology Div- isional Meeting (1982). Third Meeting of the ADAPT Panel	New provisions and revision of existing provisions related to the introduction of the new world area forecast system; methods of exchange of operational meteorological data; improvement of accuracy of runway visual range assessment, and reporting.	10 June 1983 10 October 1983 22 November 1984
66	Communications/ Meteorology Divisional Meeting (1982). Second Asia/ Pacific Regional Air Navigation Meeting. Twenty-second and twenty-third meetings of the European Air Navigation Planning Group. World Meteorological Organization. Recommendations of the ANC relating to the method of reference date/time and units of measurement. ICAO Secretariat	Amendment of the provisions related to the transmission of wind shear information beyond the aerodrome, criteria for the issuance of selected special reports, inclusion of cloud information in aerodrome forecasts, flight documentation to be provided for short-haul flights, format of the SIGMET message and meteorological bulletin headings; introduction of the definition for “SIGMET information”; alignment of Annex 3 with Annex 5 in respect of units of measurement and the referencing of time.	24 March 1986 27 July 1986 20 November 1986
67	Communications/ Meteorology Divisional Meeting (1982). Twenty- second and twenty- fifth meetings of the European Air Navigation Planning Group. ICAO Secretariat. World Meteorological Organization	Amendment of the provisions related to light intensity settings used for RVR assessment; the identification of selected aerodromes and the deletion of the requirement for temperature circles on WAFS charts; the transmission time of forecasts from regional area forecast centres to users; introduction of provisions for the origination and dissemination of volcanic ash warnings; inclusion of wind speed units in examples of the aviation meteorological figure codes; alignment of Annex 3 with the PANS-RAC in respect of the elements of the air-report; editorial amendment of the example of the SIGMET message.	27 March 1987 27 July 1987 19 November 1987
68	Communications/ Meteorology Divisional Meeting (1982). ICAO Secretariat. World Meteorological Organization	Amendment of the provisions relating to identification of RVR reporting positions; the criteria for the issuance of selected special reports for changes in RVR; RVR values for touchdown zone for all runways available for landing to be included in reports disseminated beyond the aerodrome; model charts and forms for flight documentation; issuance and updating of SIGMET messages relating to volcanic ash clouds; explicit provisions regarding the need to provide the aeronautical information services units with MET information; alignment with Annex 10 in respect of definitions for aeronautical fixed telecommunication network and aeronautical mobile service; alignment with PANS-OPS, Volume II, Part III, paragraph 6.3.1 in respect of terminology; editorial amendments to paragraph 3.3.7 to delete the equivalent pressure levels; the example of the SPECI report; the reference in Attachment B, Part 3, paragraph 1.4 b); and the footnote in Attachment C concerning visibility and RVR.	21 March 1989 23 July 1989 16 November 1989

<i>Amendment(s)</i>	<i>Source(s)</i>	<i>Subject(s)</i>	<i>Adopted/approved Effective Applicable</i>
69	Communications/ Meteorology/ Operations Divisional Meeting (1990). ICAO Secretariat	Amendment of the provisions related to the transition to the final phase of the WAFS; aeronautical meteorological codes, and guidance material on the selected criteria applicable to aerodrome reports; aeronautical climatological information; SIGMET information and related guidance material for the issuance of SIGMETs; automatic weather observing stations; meteorological information for helicopter operations; and alignment with Annex 6, Parts I and II in respect of the definition for alternate aerodrome.	23 March 1992 27 July 1992 12 November 1992; 1 July 1993
70	Communications/ Meteorology/ Operations Divisional Meeting (1990). Limited North Atlantic (COM/MET/RAC) Regional Air Navigation Meeting (1992). Third Asia/ Pacific Regional Air Navigation Meeting (1993). Thirty- second meeting of the European Air Navigation Planning Group. ICAO Secretariat	Definitions of AIRMET information, extended range operation, GAMET area forecast, operational control and tropical cyclone; amendment to the provisions concerning horizontal resolution of and the code form in which the upper wind and temperature grid point forecasts are to be prepared by the world area forecast centres; issuance of special reports for changes in temperature at aerodromes; provisions related to the reporting and forecasting of meteorological information at aerodromes on which the new aeronautical meteorological codes are based and a consequential amendment to Models A1, A2, TA1, TA2 and SN to take account of the updated aeronautical meteorological codes; automated air reporting; provision of information on weather phenomenon hazardous to low-level flights; introduction of the minimum threshold value for the maximum surface wind speed for which SIGMETs for tropical cyclones should be issued; observation and reporting of wind shear to take account of new technology in ground-based wind shear observing equipment; interregional exchange of METARs and SPECIs to support extended range operations and long-haul flights conducted under centralized operational control; editorial amendments to replace the term “line squall” by “squall line”; editorial amendments to Models SWL and SN, to align the depiction of freezing level, and editorial corrections to Model A2; inclusion in Model SN of symbols for “volcanic eruptions”, “state of the sea” and “sea surface temperature”; updating operationally desirable accuracy of measurement or observation and the currently attainable accuracy of measurement or observation; introduction of criteria for the inclusion of severe mountain waves in SIGMET information.	17 March 1995 24 July 1995 1 January 1996
71	Limited North Atlantic (COM/ MET/RAC) Regional Air Navigation Meeting (1992). Third Asia/ Pacific Regional Air Navigation Meeting (1993). Thirty- eighth meeting of the European Air Navigation Planning Group (EANPG/38). United States. ICAO Secretariat	Definitions of automatic dependent surveillance, Human Factors principles, international airways volcano watch, level, tropical cyclone advisory centre, volcanic ash advisory centre and VOLMET data link service; amendment to the provisions regarding the indication of the designated meteorological authority in States’ AIPs; introduction of the role of the Human Factors principles; inclusion of 6-hour and 36-hour validity WAFS upper wind/temperature forecasts; introduction of requirements and a new model for volcanic ash advisories in graphical format; specification of the frequency of update of volcanic ash advisories and the specific role of VAACs and TCACs; an editorial amendment to ensure consistency in the order of the words “RVR” and “RWY”; an amendment to the present weather abbreviations; introduction of the requirements regarding “VOLMET” data link service; editorial amendments regarding air reporting; inclusion of “forecast temperature” in aerodrome forecasts; introduction of requirements for the standardization of area forecasts and flight documentation for low-level flights and consequential amendments to the Appendix — Model Charts and Forms; the deletion of the use of national language in connection with SIGMET messages; introduction of requirements for the provision of meteorological information by automated pre-flight information systems; introduction of the provision of meteorological information for centralized flight planning in extended range operations; quantitative definitions of CB clouds and thunderstorms to be used in WAFS SIGWX charts and consequential amendments to guidance material.	11 March 1998 20 July 1998 5 November 1998

<i>Amendment(s)</i>	<i>Source(s)</i>	<i>Subject(s)</i>	<i>Adopted/approved Effective Applicable</i>
72	Limited Middle East (COM/MET/RAC) RAN Meeting (1996). Ninth meeting of the ASIA/PAC Air Navigation Planning and Implementation Regional Group. Thirty-sixth, thirty-ninth and fortieth meetings of the European Air Navigation Planning Group. International Air Transport Association. Secretariat	Changes to the definition of flight crew member, grid point data in numerical form, pilot-in-command, regional area forecast centre and world area forecast centre; introduction of definitions for minimum sector altitude, quality assurance, quality control, quality management, quality system and visibility; introduction of requirements regarding global exchange of OPMET information; updated format for volcanic ash and tropical cyclone advisory messages; introduction of requirements on the transmission of information on the accidental release of radioactive materials, inclusion of radiation symbol on WAFS SIGWX charts; updated operational requirements for world area forecast system (WAFS) data regarding the frequency of issuance of WAFS upper wind/temperature data increased to four times per day; inclusion of FL 140 and humidity in the GRIB global data, introduction of the BUFR code, inclusion of “strong surface winds” and “mountain obscuration” symbols on low-level SIGWX charts; operational requirements for aeronautical MET codes regarding the introduction of standardized VOLMET phraseologies, uniform use of date/time groups in METAR and TAF code forms, additional reference level for height of clouds and freezing level in GAMET messages, discrimination between improvements and deterioration of visibility, cloud base and vertical visibility in aerodrome reports and forecasts; introduction of templates for local meteorological report, METAR/SPECI, TAF and SIGMET; the algorithm to report turbulence and provision of a turbulence index, and the operational interpretation of turbulence index; provisions for the MET component for automated pre-flight information systems and harmonized AIS/MET pre-flight briefing; provisions regarding quality assurance and quality control of MET information; SIGMET information in graphical format and quantitative criteria for SIGMET messages; inclusion of forward-scatter meters in RVR provisions; and editorial amendments.	7 March 2001 16 July 2001 1 November 2001

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 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 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 the Standards and Recommended Practices for Meteorological Service for International Air Navigation, 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, located at an aerodrome, designated to provide meteorological service for international air navigation.

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 radiobeacon 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 PANS-ATM (Doc 4444).

Air traffic services unit. A generic term meaning variously, 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. Alternate aerodromes include the following:

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

En-route alternate. An aerodrome at which an aircraft would be able to land after experiencing an abnormal or emergency condition while en route.

ETOPS en-route alternate. A suitable and appropriate alternate aerodrome at which an aeroplane would be able to land after experiencing an engine shut-down or other abnormal or emergency condition while en route in an ETOPS operation.

Destination alternate. An alternate aerodrome to which an aircraft may proceed should it become 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 State 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 of coverage (world area forecast system). A geographical area for which a regional area forecast centre supplies forecasts for flights departing from aerodromes in its service area.

Area of responsibility (world area forecast system). A geographical area for which a regional area forecast centre prepares significant weather forecasts.

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.

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 power-units where the flight time at the one power-unit 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 State 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.

Note 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; and
- c) when set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.

Note 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 alphanumeric form. Processed meteorological data for a set of regularly spaced points on a chart, in a code form suitable for manual use.

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 States. The watch is coordinated by ICAO with the cooperation of other concerned international organizations.

Level. A generic term relating to 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 Contracting State.

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 the area contained within a sector of a circle of 46 km (25 NM) radius centred on a radio aid to navigation.

Nephanalysis. The graphical depiction of analysed cloud data on a geographical map.

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.

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.

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. All the planned and systematic activities implemented within the quality system, and demonstrated as needed, to provide adequate confidence that an entity will fulfil requirements for quality (ISO 8402*).

* ISO Standard 8402 — *Quality Management and Quality Assurance — Vocabulary*, Second Edition.

Quality control. The operational techniques and activities that are used to fulfil requirements for quality (ISO 8402*).

Quality management. All activities of the overall management function that determine the quality policy, objectives and responsibilities, and implementing them by means such as quality planning, quality control, quality assurance and quality improvement within the quality system (ISO 8402*).

Quality system. The organizational structure, procedures, processes and resources needed to implement quality management (ISO 8402*).

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

Regional area forecast centre (RAFC). A meteorological centre designated to prepare and supply significant weather forecasts and upper wind and temperature charts for flights departing from aerodromes within its service area and to supply grid point data in digital form for up to worldwide coverage.

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.

Service area (world area forecast system). A geographical area within which a regional area forecast centre is responsible for supplying area forecasts to meteorological authorities and other users.

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 sub-tropical 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 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, relevant regional area forecast centres and international OPMET data banks regarding the lateral and vertical extent and forecast movement of volcanic ash in the atmosphere following volcanic eruptions.

VOLMET broadcast. Routine broadcast containing, as appropriate, current aerodrome weather reports, aerodrome forecasts and SIGMET messages for aircraft in flight.

VOLMET data link service (D-VOLMET). Provision of current aerodrome weather reports, aerodrome forecasts and SIGMET messages through data link.

World area forecast centre (WAFc). A meteorological centre designated to prepare and supply significant weather forecasts and upper-air forecasts in digital and/or pictorial form

* ISO Standard 8402 — *Quality Management and Quality Assurance — Vocabulary*, Second Edition.

on a global basis to regional area forecast centres, and direct to States by appropriate means as part of the aeronautical fixed service.

World area forecast system (WAFS). A worldwide system by which world and regional 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 this Annex, 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.

CHAPTER 2. GENERAL PROVISIONS

Introductory Note 1.— It is recognized that the provisions of this Annex with respect to meteorological information are subject to the understanding that the obligation of a Contracting State is for the supply, under Article 28 of the Convention, of meteorological information and that the responsibility for the use made of such information is that of the user.

Introductory Note 2.— Although the Convention on International Civil Aviation allocates to the State of Registry certain functions which that State is entitled to discharge, or obligated to discharge, as the case may be, the Assembly recognized, in Resolution A23-13, that the State of Registry may be unable to fulfil its responsibilities adequately in instances where aircraft are leased, chartered or interchanged — in particular without crew — by an operator of another State and that the Convention may not adequately specify the rights and obligations of the State of an operator in such instances until such time as Article 83 bis of the Convention enters into force. Accordingly, the Council urged that if, in the above-mentioned instances, the State of Registry finds itself unable to discharge adequately the functions allocated to it by the Convention, it delegate to the State of the Operator, subject to acceptance by the latter State, those functions of the State of Registry that can more adequately be discharged by the State of the Operator. It was understood that pending entry into force of Article 83 bis of the Convention the foregoing action would only be a matter of practical convenience and would not affect either the provisions of the Chicago Convention prescribing the duties of the State of Registry or any third State. However, as Article 83 bis of the Convention entered into force on 20 June 1997, such transfer agreements will have effect in respect of Contracting States which have ratified the related Protocol (Doc 9318) upon fulfilment of the conditions established in Article 83 bis.

Introductory Note 3.— In the case of international operations effected jointly with aeroplanes not all of which are registered in the same Contracting State, nothing in this Annex prevents the States concerned entering into an agreement for the joint exercise of the functions placed upon the State of Registry by the provisions of this Annex.

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 Contracting State 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 this Annex 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 State concerned.

2.1.4 Each Contracting State 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 Annex 15, Appendix 1, GEN 1.1.

2.1.5 Each Contracting State 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 WMO Publication No. 49, Technical Regulations, Volume I — General Meteorological Standards and Recommended Practices, Education and Training.

2.2 Supply, quality assurance and use 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 **Recommendation.**— *In order to meet the objective of meteorological service for international air navigation, the*

Contracting State should ensure that the designated meteorological authority referred to in 2.1.4 establishes and implements a properly organized quality system comprising procedures, processes and resources necessary to provide for the quality management of the meteorological information to be supplied to the users listed in 2.1.2.

2.2.3 Recommendation.— *The quality system established in accordance with 2.2.2 should be in conformity with the International Organization for Standardization (ISO) 9000 series of quality assurance standards, and certified by an approved organization.*

Note.— *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.*

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. Where 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 1.— *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 Chapters 3, 4, 6, 7, 8 and 9 of this Annex and the relevant regional air navigation plans. Guidance concerning the accuracy of measurement and observation, and accuracy of forecasts is given in Attachments B and E respectively to this Annex.*

Note 2.— *Notwithstanding the provisions in 2.2.4, provisional aerodrome forecasts may still be issued, as necessary, in accordance with 9.7.4.*

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 Chapter 11 of this Annex.*

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 shall be consistent with Human Factors principles and shall be in forms which require a minimum of interpretation by these users, as specified in the following chapters.

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

2.3 Notifications required from operators

2.3.1 An operator requiring meteorological service or changes in existing meteorological service shall notify, sufficiently in advance, the meteorological authority or the meteorological office(s) concerned. The minimum amount of advance notice required shall be as agreed between the meteorological authority or meteorological office(s) 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 aerodrome meteorological office, or the meteorological office concerned, shall be notified by the operator or a flight crew member:

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

2.3.4 Recommendation.— *The notification to the aerodrome meteorological office, or the meteorological office concerned, of individual flights should contain the following information except that, in the case of scheduled flights, the*

requirement for some or all of this information may be waived by agreement between the meteorological office and the operator:

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

CHAPTER 3. WORLD AREA FORECAST SYSTEM AND METEOROLOGICAL OFFICES

3.1 Objectives of the world area forecast system

The objectives of the world area forecast system shall be:

- a) to supply meteorological offices with forecasts of en-route meteorological conditions concerning upper winds, upper-air temperatures, direction, speed and height of maximum wind, tropopause height and significant weather in pictorial and/or alphanumeric form suitable, as far as practicable, for direct use by operators, flight crew members, air traffic services units and other aeronautical users; and
- b) to supply meteorological authorities and other users with upper wind, upper-air temperature, direction, speed and height of maximum wind and tropopause height forecasts and forecasts of significant weather phenomena for grid points in digital form.

These objectives shall be achieved through a comprehensive, integrated, worldwide and, as far as practicable, uniform system, and in a cost-effective manner.

3.2 World area forecast centres

3.2.1 A Contracting State, 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 global forecasts for grid points in digital form for all required levels and in a standard format; the forecasts shall comprise upper winds, upper-air temperatures, tropopause heights and maximum wind speed, direction and height;
- b) to prepare global forecasts of significant weather phenomena;
- c) to issue the forecasts referred to in a) and b) in digital and/or pictorial form;
- d) to prepare and issue amendments to the forecasts;
- e) to receive information concerning the accidental release of radioactive materials into the atmosphere, from its associated WMO regional specialized meteorological centre for the provision of transport model products for radiological environmental emergency response, in order to include the information in significant weather forecasts; and

- f) 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 significant weather forecasts.

Note 1.— Criteria for the issuance of amendments to the forecasts are given in 3.2.12 and 3.2.13.

Note 2.— Specifications for the preparation of significant weather and upper-air prognostic charts are contained in Appendix 1.

3.2.2 Recommendation.— *In case of interruption of the operation of a WAFC, its functions should be carried out by the other WAFC.*

3.2.3 Recommendation.— *The forecasts of upper winds and upper-air temperatures, direction, speed and height of maximum winds and tropopause heights prepared four times daily by a WAFC should be valid for 6, 12, 18, 24, 30 and 36 hours after the time (0000, 0600, 1200 and 1800 UTC) of the synoptic data on which the forecasts were based and should be available for start of transmission in the above order as soon as technically feasible but not later than 6 hours after standard time of observation.*

3.2.4 Recommendation.— *Forecasts of significant weather phenomena prepared by WAFCs should be issued four times a day for fixed valid times of 0000, 0600, 1200 and 1800 UTC. The transmission of each forecast should be completed as soon as technically feasible but at least nine hours before its validity time when issued in chart form and at least twelve hours before its validity time when issued in the BUFR code form.*

3.2.5 Recommendation.— *When the forecasts of significant weather phenomena are issued in binary code form, the BUFR code should be used.*

Note.— The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, Volume I.2, Part B — Binary Codes.

3.2.6 Recommendation.— *Forecasts of significant weather phenomena should include all the items listed in 9.6.1. When the forecasts are issued in chart form or in the BUFR code form, they should be in agreement with the specifications in 3.3.7.*

3.2.7 Recommendation.— *The grid point forecasts prepared by a WAFC should comprise:*

- a) wind and temperature data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa), 300 (300 hPa), 340 (250 hPa), 390 (200 hPa) and 450 (150 hPa);
- b) tropopause height, and direction, speed and height of maximum wind;
- c) wind and temperature data for flight levels 530 (100 hPa) and 600 (70 hPa) when and where required; and
- d) humidity data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa) and 180 (500 hPa).

3.2.8 Recommendation.— The grid point forecasts of upper winds and upper-air temperatures, direction, speed and height of maximum winds and tropopause heights should be prepared by a WAFC in a fixed grid with a horizontal resolution of 140 km.

Note.— 140 km represents a distance of about 1.25° of latitude.

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

3.2.10 Recommendation.— The grid point forecasts of upper winds, upper-air temperatures, direction, speed and height of maximum winds and tropopause heights should be issued by a WAFC in the GRIB code form.

Note.— The GRIB code form is contained in WMO Publication No. 306, Manual on Codes, Volume I.2, Part B — Binary Codes.

3.2.11 Recommendation.— The upper wind and upper-air temperature forecasts in pictorial form should be issued for flight levels as determined by regional air navigation agreement.

3.2.12 Recommendation.— Amendments to upper wind and upper-air temperature forecasts should be issued in accordance with the following criteria:

Upper wind:

Change in direction of 30° or more, provided the wind speed is 60 km/h (30 kt) or more before or after the change; change in speed of 40 km/h (20 kt) or more.

Upper-air temperatures:

Change of more than 5°C.

3.2.13 Recommendation.— WAFCs should apply the following criteria for the amendment of significant en-route weather forecasts:

Aircraft icing and turbulence:

Newly expected occurrence; error in expected position of phenomena; intensity increasing; intensity decreasing from severe to light or nil, or from moderate to nil.

Jet streams:

Newly expected occurrence or disappearance; error in expected position > 400 km; error in speed > 20 per cent; error in core height > 900 m (3 000 ft).

Other significant en-route weather phenomena, and any new information concerning volcanic eruptions or the accidental release of radioactive materials into the atmosphere, of significance to aircraft operations:

Newly expected occurrence; no longer expected.

3.2.14 Recommendation.— Amendments to the upper wind and upper-air temperature forecasts should be prepared in accordance with the criteria in 3.2.12 in the form of amended meteorological bulletins and abbreviated plain-language messages and should be issued with the minimum possible delay.

Note.— Guidance on the use of abbreviated plain language is given in Attachment A.

3.2.15 Recommendation.— Amendments to forecasts of significant weather phenomena should be issued with the minimum possible delay in accordance with the criteria in 3.2.13 and supplied in the form of abbreviated plain-language messages.

Note.— Guidance on the preparation of abbreviated plain-language significant weather forecast messages is given in Attachment A.

3.3 Regional area forecast centres

3.3.1 A Contracting State, having accepted, by regional air navigation agreement, the responsibility for providing an RAFC within the framework of the area forecast system, shall arrange for that centre:

- a) to receive global digital grid point data from a WAFC, so as to meet the needs of meteorological authorities and other users within its service area, including those needs related to centralized flight planning;
- b) to store the digital grid point data received from a WAFC, and to process and supply selectively these data to meteorological authorities and other users in its service area, in an agreed format;
- c) to prepare upper wind and temperature charts on the basis of the data received, and to supply the relevant charts and abbreviated plain-language amendments thereto to users as agreed between the RAFC and the users within its service area;

Note.— The upper wind and temperature charts will be produced from grid point data received from a WAFC, except on those occasions when the RAFC considers it essential to adjust the chart(s) on the basis of recent basic data received.

- d) to receive information concerning the accidental release of radioactive materials into the atmosphere, from its associated WMO regional specialized meteorological centre for the provision of transport model products for radiological environmental emergency response, in order to include the information in significant weather forecasts;
- 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 significant weather forecasts;
- f) to notify the relevant WAFC immediately of the content of and reasons for any amendments it has issued to the forecast received from the WAFC;
- g) to prepare significant weather charts and, as required, significant weather forecast messages in abbreviated plain language, for its area of responsibility;

Note.— In order to prepare these charts and amendments thereto the RAFC will also need to receive basic synoptic and asynoptic data, including satellite data (polar-orbiting and geostationary) and aircraft meteorological reports.

- h) to supply the significant weather charts, significant weather forecast messages in abbreviated plain language, and plain-language amendments thereto in the same manner as in c);
- i) to exchange the significant weather charts and abbreviated plain-language amendments thereto with other RAFCs as necessary, so as to enable each centre to provide significant weather charts for its area of coverage; and
- j) to prepare WINTeM messages and issue them to users as required.

Note 1.— Specifications for the preparation of significant weather and upper-air prognostic charts are contained in Appendix 1.

Note 2.— Guidance on the preparation of abbreviated plain-language significant weather forecast messages is contained in Attachment A.

Note 3.— The WINTeM code is contained in WMO Publication No. 306, Manual on Codes, Volume I.1, Part A — Alphanumeric Codes.

3.3.2 Recommendation.— *The lists of States/territories served by the RAFCs in each service area, as shown in the air navigation plans, should be adjusted as necessary in accordance with regional air navigation agreement.*

3.3.3 Recommendation.— *The areas of responsibility for the preparation of significant weather forecasts should be*

as agreed by the RAFCs responsible for providing significant weather charts and plain-language amendments thereto for flight operations conducted over the area of coverage, and subject to subsequent regional air navigation agreement.

Note.— The areas of responsibility are contained in the relevant regional air navigation plan.

3.3.4 Recommendation.— *The areas of coverage of the forecasts in chart and/or alphanumeric form supplied to the users should be determined by agreement between the relevant RAFC and the users.*

Note.— Maximum areas of coverage suitable for use in flight documentation are contained in the relevant regional air navigation plan.

3.3.5 Recommendation.— *RAFC products should be issued four times a day for fixed valid times of 0000, 0600, 1200 and 1800 UTC. The transmission of each forecast should be completed at least 9 hours before its validity time, unless otherwise determined by regional air navigation agreement.*

Note.— Such regional agreement should take into account, as necessary, the flight documentation requirements for inter-regional flights and the exchange of SIGWX charts between RAFCs concerned.

3.3.6 Recommendation.— *The digital data should be transmitted to meteorological authorities and other users with minimum delay after receipt from the WAFC.*

3.3.7 Recommendation.— *The significant weather charts should include the phenomena listed in 9.6.1 between:*

- a) flight levels 250 and 630; and
- b) flight levels 100 and 250 for limited geographical areas, as determined by regional air navigation agreement. If the average elevation of the topography of the area could extend a significant topographical effect to flight level 100, a higher level should be specified for the base of the charts, in consultation with the RAFC or WAFC concerned, and in accordance with regional air navigation agreement.

3.3.8 Recommendation.— *The upper wind and upper-air temperature charts should be provided for flight levels as determined by regional air navigation agreement.*

3.3.9 Recommendation.— *Amendments to significant weather forecasts should be supplied in the form of abbreviated plain-language messages.*

Note.— Guidance on the preparation of abbreviated plain-language significant weather forecast messages is contained in Attachment A.

3.3.10 Recommendation.— *RAFCs should apply the following criteria for the amendment of significant en-route weather forecasts:*

Aircraft icing and turbulence:

Newly expected occurrence; error in expected position of phenomena; intensity increasing; intensity decreasing from severe to light or nil, or from moderate to nil.

Jet streams:

Newly expected occurrence or disappearance; error in expected position > 400 km; error in speed > 20 per cent; error in core height > 900 m (3 000 ft).

Other significant en-route weather phenomena, and any new information concerning volcanic eruptions or the accidental release of radioactive materials into the atmosphere, of significance to aircraft operations:

Newly expected occurrence; no longer expected.

3.3.11 Recommendation.— *RAFCs should supply to meteorological authorities and other users within their service areas amendments to upper wind and upper-air temperature forecasts with minimum delay after receipt from a WAFC.*

3.4 Meteorological offices

3.4.1 Each Contracting State 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 operational needs.

3.4.2 An aerodrome meteorological office shall carry out all or some of the following functions as necessary to meet the needs of flight operations at the aerodrome:

- a) prepare and/or obtain forecasts and other relevant information for flights with which it is concerned; the extent of its responsibilities to prepare forecasts shall be related to the local availability and use of en-route and aerodrome forecast material received from other offices;
- b) prepare and/or obtain forecasts of local meteorological conditions;
- c) maintain a continuous survey of meteorological conditions over the aerodromes for which it is designated to prepare forecasts;
- d) provide briefing, consultation and flight documentation to flight crew members and/or other flight operations personnel;
- e) supply other meteorological information to aeronautical users;
- f) display the available meteorological information;

g) exchange meteorological information with other meteorological offices; 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.

3.4.3 Recommendation.— *The aerodrome meteorological offices at which briefing, consultation and/or flight documentation are required, as well as the areas and/or air routes to be covered, should be determined by regional air navigation agreement and, as necessary, by supplementary agreement between the meteorological authority and the operator concerned.*

3.4.4 Recommendation.— *The aerodromes for which landing forecasts are required should be determined by regional air navigation agreement.*

3.4.5 The extent to which an aerodrome meteorological office prepares forecasts and/or makes use of products from WAFCs and/or RAFCs and other sources shall be determined by the meteorological authority concerned.

3.4.6 Meteorological offices using WAFS GRIB or BUFR data and/or WAFS forecast charts shall notify the WAFC and RAFC concerned immediately if significant discrepancies in accordance with 3.2.12, 3.2.13 and 3.3.10 are detected or reported in respect of WAFS data and products.

3.4.7 Recommendation.— *Aerodrome meteorological offices should use as far as practicable output products of the world area forecast system in the preparation of flight documentation.*

3.4.8 For aerodromes without meteorological offices:

- a) the meteorological authority concerned shall designate one or more meteorological offices to supply meteorological information as required; and
- b) the competent authorities shall establish means by which such information can be supplied to the aerodromes concerned.

3.5 Meteorological watch offices

3.5.1 A Contracting State, having accepted the responsibility for providing air traffic services within a flight information region or a control area, shall establish one or more meteorological watch offices, or arrange for another Contracting State to do so.

3.5.2 A meteorological watch office shall:

- a) maintain 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 7.3.1:
 - 1) prepare AIRMET information related to its area of responsibility;
 - 2) supply AIRMET information to associated air traffic services units; and
 - 3) disseminate AIRMET information;
- f) supply information received on pre-eruption volcanic activity, a volcanic eruption and volcanic ash cloud for which a SIGMET has not already been issued, to its associated ACC/FIC, as agreed between the meteorological and ATS authorities concerned, and to its associated VAAC as determined by regional air navigation agreement; and
- g) supply information received concerning the accidental release of radioactive materials into the atmosphere, in the area for which it maintains watch or adjacent areas, to its associated ACC/FIC, as agreed between the meteorological and ATS authorities concerned, and to aeronautical information service units, as agreed between the meteorological and appropriate civil aviation authorities concerned. The information shall comprise location, date and time of the accident, and forecast trajectories of the radioactive materials.

Note. — The information is provided, at the request of the delegated authority in a State, by WMO regional specialized meteorological centres for the provision of transport model products for radiological environmental emergency response.

3.5.3 The extent to which a meteorological watch office makes use of products from WAFCs and/or RAFCs and other sources shall be determined by the meteorological authority concerned.

3.5.4 **Recommendation.**— *The boundaries of the area over which meteorological watch is to be maintained by a meteorological watch office should, in so far as is practicable, 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.*

3.5.5 **Recommendation.**— *Meteorological watch should be maintained continuously; however, in areas with a low density of traffic the watch may be restricted to the period relevant to expected flight operations.*

3.6 Volcanic ash advisory centres

3.6.1 A Contracting State, 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; and
- 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:
 - 1) meteorological watch offices, area control centres and flight information centres serving flight information regions in its area of responsibility which may be affected;
 - 2) other VAACs whose areas of responsibility may be affected;
 - 3) world area forecast centres, relevant regional area forecast centres, international OPMET data banks, international NOTAM offices, and centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems; and
 - 4) airlines requiring the advisory information through the AFTN address provided specifically for this purpose;

Note.— The AFTN address to be used by the VAACs is given in the Handbook on the International Airways Volcano Watch (IAVW) — Operational Procedures and Contact List (Doc 9766) and on the ICAO Web site at: <http://www.icao.int> under: Air Navigation Bureau, Meteorology, International Airways Volcano Watch.

- 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.

3.6.2 Recommendation.— The advisory information on volcanic ash issued in abbreviated plain language should comprise the following in the order indicated:

1. **VOLCANIC ASH ADVISORY;**
2. **ISSUED:** year month date (yyyymmdd)/time in UTC (using “Z”) or date month year (ddxxx*yyyy)/time in UTC (using “Z”);
3. **VAAC:** name of volcanic ash advisory centre;
4. **VOLCANO:** name and IAVCEI** number (or “UNKNOWN” or “UNNAMED”);
5. **LOCATION:** degrees/minutes (“Nnnnn” or “Snnnn”, “Wnnnnn” or “Ennnnn” or “UNKNOWN” or “UNNAMED”);
6. **AREA:** State, or region if ash is not reported over a State;
7. **SUMMIT ELEVATION:** elevation in m or ft (including units);
8. **ADVISORY NUMBER:** year in full and message number (assuming separate sequence for each volcano);
9. **INFORMATION SOURCE:** free text;
10. **AVIATION COLOUR CODE:** colour code (“RED”, “ORANGE”, “YELLOW”, “GREEN”) or (“UNKNOWN”) or (“NOT GIVEN”) or (“NIL”);
11. **ERUPTION DETAILS:** free text description (including date/time of eruption(s)) or (“UNKNOWN”);
12. **OBS ASH DATE/TIME:** dd/time (UTC) (using “Z”);
13. **OBS ASH CLOUD:** “SFC” or “FLnnn/nnn, boundary coordinates/area, direction of movement in eight compass points (“N”, “NE”, “E”, “SE”, “S”, “SW”, “W”, “NW”) and speed of each cloud mass in km/h or kt (including units), (up to 4 layers)”; or if ash reported (e.g. AIREP) but not identifiable from satellite data, include “ASH NOT IDENTIFIABLE FROM SATELLITE DATA” and instead of forecast ash positions include “WINDS” followed by upper winds for up to four selected layers;
14. **FCST ASH CLOUD + 6 HR:** forecast height and position for each cloud mass for fixed valid time UTC (six hours from observed time of ash cloud given in Item 12), in flight levels, and degrees/minutes or km or NM;
15. **FCST ASH CLOUD + 12 HR:** forecast height and position for each cloud mass for fixed valid time UTC (twelve hours from observed time of ash cloud given in Item 12), in flight levels, and degrees/minutes or km or NM;
16. **FCST ASH CLOUD + 18 HR:** forecast height and position for each cloud mass for fixed valid time UTC (eighteen hours from observed time of ash cloud given in Item 12), in flight levels, and degrees/minutes or km or NM, or “ASH DISSIPATED”;
17. **NEXT ADVISORY:** year month date (yyyymmdd)/time in UTC (using “Z”) or date month year (ddxxx*yyyy)/time in UTC (using “Z”) or “NO LATER THAN year month date (yyyymmdd)/time (UTC)” (using “Z”) or date month year (ddxxx*yyyy)/time in UTC (using “Z”) or “NO FURTHER ADVISORIES” or “WILL BE ISSUED BY”;
18. **REMARKS:** free text or “NIL”.

Note 1.— Abbreviations when available from the PANS-ABC (Doc 8400) should be used when including free text.

Note 2.— Inclusion of a “colon” after each element heading and insertion of a “return” between Items 7 and 8; 13 and 14; and 16 and 17 are mandatory.

Note 3.— The numbers 1 to 18 are included only for clarity, and they are not part of the advisory message, as shown in the example in Appendix 5.

Note 4.— An example of a volcanic ash advisory is given in Appendix 5.

3.6.3 Recommendation.— The volcanic ash advisory information listed in 3.6.2, when issued in graphical format, should be as specified in Appendix 1.

3.7 Tropical cyclone advisory centres

3.7.1 A Contracting State, 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,

* Use abbreviations for months of the year from the PANS-ABC (Doc 8400), for example, “JAN”.

** International Association of Volcanology and Chemistry of the Earth’s Interior (IAVCEI).

central pressure and maximum surface wind near the centre; in abbreviated plain language to:

- 1) meteorological watch offices in its area of responsibility;
 - 2) other TCACs whose areas of responsibility may be affected; and
 - 3) world area forecast centres, relevant regional area forecast centres and international OPMET data banks, and centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems;
- c) issue updated advisory information to meteorological watch offices for each tropical cyclone, as necessary, but at least every six hours.

3.7.2 Recommendation.— *The advisory information on tropical cyclones should comprise the following in the order indicated:*

1. *TC ADVISORY;*
2. *DTG: year month date (yyyymmdd)/time (in UTC) (using “Z”) of issue;*
3. *TCAC: name of TCAC (location indicator or full name);*
4. *TC: name of tropical cyclone;*
5. *NR: advisory number (starting with “01” for each cyclone);*
6. *PSN: position of the centre in degrees and minutes (“Nnnnn” or “Snnnn”, “Wnnnnn” or “Ennnnn”);*
7. *MOV: direction and speed of movement respectively to at least eight compass points (“N”, “NE”, “E”, “SE”, “S”, “SW”, “W”, “NW”) and in km/h (or kt);*
8. *C: central pressure (in hPa);*
9. *MAX WIND: maximum surface wind near the centre (mean over 10 minutes, in km/h (or kt));*
10. *FCST PSN + 12 HR: forecast of centre position for fixed valid time of UTC (12 hours after time of issuance of the advisory);*
11. *FCST MAX WIND + 12 HR: forecast of maximum surface wind for fixed valid time of UTC (12 hours after time of issuance of the advisory);*
12. *FCST PSN + 18 HR: forecast of centre position for fixed valid time of UTC (18 hours after time of issuance of the advisory);*
13. *FCST MAX WIND + 18 HR: forecast of maximum surface wind for fixed valid time of UTC (18 hours after time of issuance of the advisory);*
14. *FCST PSN + 24 HR: forecast of centre position for fixed valid time of UTC (24 hours after time of issuance of the advisory);*
15. *FCST MAX WIND + 24 HR: forecast of maximum surface wind for fixed valid time of UTC (24 hours after time of issuance of the advisory);*
16. *NXT MSG: expected year month date (yyyymmdd)/time (in UTC) (using “Z”) of issuance of next advisory (using “BFR”, if applicable) or “NO MSG EXP”.*

Note 1.— The numbers 1 to 16 are included only for clarity, and they are not part of the advisory message, as shown in the example in Appendix 5.

Note 2.— An example of a tropical cyclone advisory is given in Appendix 5.

CHAPTER 4. METEOROLOGICAL OBSERVATIONS AND REPORTS

4.1 Aeronautical meteorological stations and observations

4.1.1 Each Contracting State shall establish at aerodromes and other points of significance to international air navigation, 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.

4.1.2 **Recommendation.**— *Each Contracting State 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 and/or cloud.

4.1.4 **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 and construction of equipment and installations on operational areas, aimed at reducing the hazard to aircraft to a minimum, are contained in Annex 14, Volume I, Chapter 8.*

4.1.5 **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.*

4.1.6 **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.*

4.1.7 **Recommendation.**— *Each Contracting State should arrange for its aeronautical meteorological stations to be inspected at sufficiently frequent intervals to ensure that a high standard of observations is maintained, that instruments and all their indicators are functioning correctly, and to check whether the exposure of the instruments has changed significantly.*

4.1.8 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, runway visual range and cloud height 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 these systems shall observe Human Factors principles. Provision shall be made for the manual insertion of meteorological parameters in case of failure of the integrated automatic systems.

Note 1.— *Categories of precision approach and landing operations are defined in Annex 6, Part I.*

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

4.1.9 **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, runway visual range and cloud height 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 these systems should observe Human Factors principles. Provision should be made for the manual insertion of meteorological parameters in case of failure of the integrated automatic systems.*

4.1.10 **Recommendation.**— *Where an integrated 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.*

4.1.11 **Recommendation.**— *Where automatic observing equipment forms part of an integrated semi-automatic system, displays of data which are made available to the local ATS units should be a subset of and displayed parallel to those available in the local meteorological service unit. In those displays, each meteorological element should be annotated to identify, as appropriate, the locations for which the element is representative.*

4.1.12 The observations shall form the basis for the preparation of reports to be disseminated at the aerodrome of origin and for reports to be disseminated beyond the aerodrome of origin.

4.1.13 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 and currently attainable accuracy of measurement or observation is given in Attachment B.

4.2 Routine observations and reports

4.2.1 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.

4.2.2 Reports of routine observations shall be issued as:

- a) local routine reports in abbreviated plain language, in accordance with the template shown in Appendix 2, only for dissemination at the aerodrome of origin (intended for arriving and departing aircraft); and
- b) routine reports in the METAR code form prescribed by the World Meteorological Organization, in accordance with the template shown in Appendix 2, for dissemination to other aerodromes beyond the aerodrome of origin (mainly intended for flight planning, VOLMET broadcasts and D-VOLMET).

Note 1.— Meteorological information used in ATIS (voice-ATIS and D-ATIS) is to be extracted from the local routine report, in accordance with Annex 11, 4.3.6.1 g).

Note 2.— The METAR code form is contained in WMO Publication No. 306, Manual on Codes, Volume I.1, Part A — Alphanumeric Codes.

Note 3.— Examples of local routine reports and routine reports in the METAR code form are given in Appendix 2.

4.2.3 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.

4.2.4 Routine reports in the METAR code form shall be disseminated to international OPMET data banks 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.

4.2.5 Routine reports in the METAR code form shall be disseminated to other aerodromes in accordance with regional air navigation agreement.

4.2.6 Routine reports in the METAR code form shall contain all information which the codes provide for, except the meteorological elements given in optional groups which shall be included in accordance with regional air navigation agreement.

4.3 Special observations and reports

4.3.1 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. The list 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 operators concerned;
- d) the available supplementary information concerning the occurrence of significant meteorological conditions in the approach and climb-out areas as given in 4.12.1; and
- e) those values which constitute criteria for special reports in the SPECI code form.

4.3.2 Reports of special observations shall be issued as:

- a) local special reports in abbreviated plain language, in accordance with the template shown in Appendix 2, only for dissemination at the aerodrome of origin (intended for arriving and departing aircraft); and
- b) special reports in the SPECI code form prescribed by the World Meteorological Organization, in accordance with the template shown in Appendix 2, for dissemination to other aerodromes beyond the aerodrome of origin (mainly intended for flight planning, VOLMET broadcasts and D-VOLMET).

Note 1.— Meteorological information used in ATIS (voice-ATIS and D-ATIS) is to be extracted from the local special report, in accordance with Annex 11, 4.3.6.1 g).

Note 2.— The SPECI code form is contained in WMO Publication No. 306, Manual on Codes, Volume I.1, Part A — Alphanumeric Codes.

Note 3.— Examples of local special reports and special reports in the SPECI code form are given in Appendix 2.

4.3.3 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 an indicator corresponding to the one in the meteorological station, and where arrangements are in force for the use of this indicator to make observations to meet the needs for 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.

4.3.4 **Recommendation.**— *Special reports in the SPECI code form should 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 20 km/h (10 kt) or more;*
- b) *when the mean surface wind speed has changed by 20 km/h (10 kt) or more from that given in the latest report;*
- c) *when the variation from the mean surface wind speed (gusts) has increased by 20 km/h (10 kt) or more from that given in the latest report, the mean speed before and/or after the change being 30 km/h (15 kt) or more;*
- d) *when the wind changes through values of operational significance. The threshold values should be established by the meteorological authority in consultation with the appropriate ATS authority and operators concerned, taking into account changes in the wind which would:*
 - 1) *require a change in runway(s) in use; and*
 - 2) *indicate that the runway tailwind and crosswind components have changed through values representing the main operating limits for typical aircraft operating at the aerodrome;*
- e) *when the visibility is improving and changes to or passes through one or more of the following values, or when the visibility is deteriorating and passes through one or more of the following values:*
 - 1) *800, 1 500 or 3 000 m;*

- 2) *5 000 m, in cases where significant numbers of flights are operated in accordance with the visual flight rules;*

- f) *when the runway visual range is improving and changes to or passes through one or more of the following values, or when the runway visual range is deteriorating and passes through one or more of the following values: 150, 350, 600 or 800 m;*
- g) *when the onset, cessation or change in intensity of any of the following weather phenomena or combinations thereof occurs:*

- *freezing precipitation*
- *freezing fog*
- *moderate or heavy precipitation (including showers thereof)*
- *low drifting dust, sand or snow*
- *blowing dust, sand or snow (including snowstorm)*
- *duststorm*
- *sandstorm*
- *thunderstorm (with or without precipitation)*
- *squall*
- *funnel cloud (tornado or waterspout);*

- h) *when the height of base of the lowest cloud layer of BKN or OVC extent is lifting and changes to or passes through one or more of the following values, or when the height of base of the lowest cloud layer of BKN or OVC extent is lowering and passes through one or more of the following values:*

- 1) *30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft);*
- 2) *450 m (1 500 ft), in cases where significant numbers of flights are operated in accordance with the visual flight rules;*

- i) *when the amount of a cloud layer below 450 m (1 500 ft) changes:*

- 1) *from SKC, FEW or SCT to BKN or OVC; or*
- 2) *from BKN or OVC to SKC, FEW or SCT;*

- j) *when the sky is obscured and the vertical visibility is improving and changes to or passes through one or more of the following values, or when the vertical visibility is deteriorating and passes through one or more of the following values: 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft).*

4.3.5 When a deterioration of one weather element is accompanied by an improvement in another element, a single special report in the SPECI code form shall be issued; it shall then be treated as a deterioration report.

4.3.6 **Recommendation.**— *A special report in the SPECI code form representing a deterioration in conditions should be*

disseminated immediately after the observation. A special report in the SPECI code form 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. A special report in the SPECI code form representing a deterioration of one weather element and an improvement in another element should be disseminated immediately after the observation.

4.3.7 Special reports in the SPECI code form shall be disseminated to international OPMET data banks 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.

4.3.8 Special reports in the SPECI code form shall be disseminated to other aerodromes in accordance with regional air navigation agreement.

4.3.9 Special reports in the SPECI code form shall contain all information which the codes provide for, except the meteorological elements given in optional groups which shall be included in accordance with regional air navigation agreement.

4.4 Coordination of requirements for observations and reports between the meteorological and ATS 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 indicators or instruments of the kind referred to in 4.5.4 (surface wind), 4.7.9 (runway visual range) and 4.11.2 (pressure) or in 4.1.8 (integrated automatic systems);
- b) the calibration and maintenance of these indicators/instruments;
- c) the use to be made of these indicators/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 Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services (Doc 9377).

4.5 Observing and reporting of surface wind

Introductory Note.— Selected criteria applicable to meteorological information referred to in 4.5 to 4.12 for inclusion in aerodrome reports are given in tabular form in Attachment C.

4.5.1 **Recommendation.**— The mean direction and the mean speed of the surface wind should be measured, as well as significant variations of the wind direction and speed. Since, in practice, the surface wind cannot be measured directly on the runway, surface wind observations for take-off and landing should be the best practicable indication of the winds which an aircraft will encounter during take-off and landing.

4.5.2 **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. Surface wind observations for local routine and special reports should be representative of conditions at a height of 6 to 10 m (20 to 30 ft) above the runway. Surface wind observations made for reports in the METAR and SPECI code forms should be representative of conditions at a height of 6 to 10 m (20 to 30 ft) above the whole runway where there is only one runway and the whole runway complex where there is more than one runway.

4.5.3 **Recommendation.**— Representative surface wind observations should be obtained by the use of sensors appropriately sited as determined by local conditions. 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, e.g. lift-off 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.

4.5.4 Surface wind indicators relating to each sensor shall be located in the meteorological station with corresponding indicators in the appropriate air traffic services units. The indicators 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 4.5.3, the indicators shall be clearly marked to identify the runway and section of runway monitored by each sensor.

4.5.5 Recommendation.— *The averaging period for wind observations should be:*

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

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 20 km/h (10 kt) before or after the change, or a change in wind speed of 20 km/h (10 kt) or more, lasting at least 2 minutes.

4.5.6 Recommendation.— *In local routine and special reports, variations in the wind direction should be given if the total variation is 60° or more; such directional variations should be expressed as the two extreme directions between which the wind has varied during the past 10 minutes. Variations from the mean wind speed (gusts) during the past 10 minutes should be reported only when the variation from the mean speed is 20 km/h (10 kt) or more; such speed variations (gusts) should be expressed as the maximum and minimum speeds attained. When the 10-minute period includes a marked discontinuity in the wind direction and/or speed, only variations in direction and speed occurring since the discontinuity should be reported. The variations in direction and speed should be derived:*

- a) for non-automated systems from the wind direction and speed indicators or from the anemograph recorder trace if available; and/or
- b) for automated systems from the actual measured values of wind direction and speed, and not from the 2-minute and 10-minute running averages required under 4.5.5.

Note.— See note under 4.5.5.

4.5.7 Recommendation.— *Where multiple sensors are installed, the 2-minute time averages of and significant variations in the surface wind direction and speed for each sensor used in local routine and special reports should be monitored by automatic equipment.*

4.5.8 Recommendation.— *In local routine and special reports, the name of the element should be given. The wind direction and speed and significant variations thereof should be given; the wind direction should be given in three figures rounded to the nearest 10° true; this should be followed by “/” and by the wind speed. The units used for speed should be kilometres per hour or knots and should be indicated in the written form of the message. If the wind is observed from more*

than one location along the runway, the locations for which these values are representative should be indicated, as necessary. When there is more than one runway in use and the wind related to these runways is observed, the available wind values for each runway should be given, as necessary, and the runways to which the values refer should be indicated. When directional variations are to be reported, the two extreme directions between which the wind has varied should be reported in degrees. When variations from the mean speed are to be reported, they should be reported as the maximum and minimum values of the speed attained in kilometres per hour or knots. When the wind speed is less than 2 km/h (1 kt), this should be indicated as calm. When a wind speed of 200 km/h (100 kt) or more is reported, it should be indicated as 200 km/h (or 100 kt). No mean wind direction should be indicated for variable winds with a total variation of 60° or more when:

- a) variations in wind direction are less than 180° and the mean wind speed is 6 km/h (3 kt) or less; the two extreme directions between which the wind has varied should be indicated; or
- b) variations in wind direction are 180° or more, or where it is not possible to report a mean wind direction, for example, when a thunderstorm passes over the aerodrome; the wind should be indicated as variable with no reference to the two extreme directions between which the wind has varied.

4.5.9 Recommendation.— *In reports in the METAR/SPECI code forms:*

- a) variations from the mean wind direction should be given if the total variation is 60° or more but less than 180° with mean speeds above 6 km/h (3 kt);
- b) maximum wind speed should be included only if it exceeds the mean speed by 20 km/h (10 kt) or more; and
- c) minimum wind speed should not be given.

4.6 Observing and reporting of visibility

4.6.1 Recommendation.— *The visibility should be measured or observed by reference to objects or lights whose distance from the point of observation is known.*

Note 1.— The definition of visibility is given in Chapter 1.

Note 2.— Guidance on the conversion of instrumented readings into visibility is given in Attachment D.

4.6.2 Recommendation.— *Where observations are made using automatic observing equipment, provision should be made for manual insertion of the visibility value(s) in the corresponding displays.*

4.6.3 Recommendation.— When local routine and special reports are used for departing aircraft, the visibility observations for these reports should be representative of the take-off/climb-out area; when local routine and special reports are used for arriving aircraft, the visibility observations for these reports should be representative of the approach/landing area. Visibility observations made for reports in the METAR/SPECI code forms should be representative of the aerodrome and its immediate vicinity; in such observations special attention should be given to significant directional variations.

4.6.4 Recommendation.— In local routine and special reports, the name of the element should be given and the units used for visibility should be specified clearly. When the visibility is less than 800 m it should be expressed in steps of 50 m; when it is 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 10 km or more, it should be given as 10 km, except when the conditions for the use of CAVOK apply. If the visibility is observed from more than one location along the runway as specified in 4.6.3, the values representative of these locations should be indicated, as necessary. 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 given, as necessary, and the runways to which the values refer should be indicated.

Note 1.— Specifications concerning the use of CAVOK are given in 4.13.2.

Note 2.— Guidance on currently attainable accuracy for observing visibility is given in Attachment B.

4.6.5 Recommendation.— In reports in the METAR/SPECI code forms, when the visibility is not the same in different directions the lowest visibility should be reported. When the visibility is not the same in different directions and the visibility in one or more directions is more than 50 per cent above the lowest visibility, the lowest visibility observed should be reported and its general direction in relation to the site of the meteorological station 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. Directional variations in visibility should be reported when the lowest visibility is less than 1 500 m and the visibility in another direction is more than 5 000 m. Where such variations in visibility are observed in more than one direction, then the most operationally significant direction should be reported. When the visibility is fluctuating rapidly, and significant directional variations cannot be given, the lowest visibility should be reported, with no indication of direction.

4.7 Observing and reporting of runway visual range

4.7.1 Recommendation.— Since, in practice, the runway visual range cannot be measured directly on the runway and in

view of other limitations imposed by observation methods, a runway visual range observation should be the best possible assessment of 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. For this assessment a height of approximately 5 m (15 ft) should be regarded as corresponding to the average eye level of a pilot in an aircraft.

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

4.7.2 Runway visual range observations shall be representative of the touchdown zone and, depending on the category of operation for which the runway is intended and the length of the runway, of the mid-point and stop-end of the runway.

4.7.3 Runway visual range observations shall be made on all runways intended for Category II and III instrument approach and landing operations.

4.7.4 Recommendation.— Runway visual range observations should be made 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 Annex 14, Volume I, Chapter 1, under “Instrument runway”.

4.7.5 Recommendation.— Runway visual range observations should be carried out 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.

4.7.6 Recommendation.— Runway visual range should be reported throughout periods when either the horizontal visibility or the runway visual range is observed to be less than 1 500 m.

4.7.7 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.

4.7.8 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.*

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

4.7.9 Where runway visual range is determined by instrumented means, one indicator, or more if required, shall be located in the meteorological station with corresponding indicators in the appropriate air traffic services units. The indicators in the meteorological station and in the air traffic services units shall be connected to the same measuring device(s).

4.7.10 Recommendation.— *Where instrumented systems are used for the assessment of runway visual range, output should be updated at least every 60 seconds to permit the provision of current, representative values. The averaging period for runway visual range values should be:*

- a) 10 minutes for reports in the METAR/SPECI code forms except 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 should be used for obtaining mean values; and*

Note.— *A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least 2 minutes, which reaches or passes through criteria for the issuance of special reports in the SPECI code form given in 4.3.4 f).*

- b) 1 minute for local routine and special reports and for runway visual range indicators in air traffic services units.*

4.7.11 Recommendation.— *When instrumented systems are used for the assessment of runway visual range, computations should be made separately for each available runway. Whatever intensities are used, RVR should not be computed for a light intensity of 3 per cent or less of the maximum light intensity available on a runway. 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 reports in the METAR/SPECI code forms, the runway visual range should be based on the same light intensity settings as those appropriate for use during take-off and landing at the time the report is made, but excluding any temporary changes in the light intensity settings.

Note.— *Guidance on the conversion of instrumented readings into runway visual range is given in Attachment D.*

4.7.12 Recommendation.— *The units providing air traffic service and aeronautical information service for an aerodrome should be kept informed without delay of changes in the serviceability status of the runway visual range observing system.*

4.7.13 The reporting scale shall consist of increments of 25 m for runway visual range below 400 m, increments of 50 m for runway visual range between 400 m and 800 m and increments of 100 m for runway visual range above 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.

4.7.14 Recommendation.— *Fifty metres should be considered the lower limit and 1 500 metres the upper limit for assessments of runway visual range. Outside of these limits reports should merely indicate that the runway visual range is less than 50 m or more than 1 500 m.*

4.7.15 Recommendation.— *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 4.3.2 a) or b) apply). The transmission of such reports should normally be completed within 15 seconds after the termination of the observation.*

4.7.16 Recommendation.— *In local routine and special reports, the name of the element should be given in abbreviated form and the units used should be included. When runway visual range is above the maximum value which can be determined by the system in use, it should be reported using the term “ABV” followed by the maximum value that can be determined by the system. When the runway visual range is below the minimum value which can be determined by the system in use, it should be reported using the term “BLW” followed by the minimum value that can be determined by that system. If runway visual range is observed from one location along the runway, about 300 m from the threshold, it should be included without any indication of location. If the runway visual range is observed from more than one location along the runway, the value representative of the touchdown zone should be given first, followed by the values representative of the mid-point and stop-end. The locations for which these values are representative should be indicated as “TDZ”, “MID” and “END” respectively. When there is more than one*

runway in use, the available runway visual range values for each runway should be given and the runways to which the values refer should be indicated; if more than one runway is in use, but runway visual range is available only for one runway, that information should be indicated.

4.7.17 Recommendation.— In reports in the METAR/SPECI code forms, only the value representative of the touchdown zone should be given and no indication of location on the runway should be included. 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.

4.7.18 Recommendation.— Where 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 in reports in the METAR/SPECI code forms as follows:

- a) if the runway visual range values during the 10-minute period have shown a distinct tendency, such that the mean during the first 5 minutes varies by 100 m or more from the mean during the second 5 minutes of the period, this should be indicated. When the variation of the runway visual range values shows an upward or downward tendency this should be indicated by the abbreviation “U” or “D” respectively. In circumstances when actual fluctuations during the 10-minute period indicate no distinct tendency, this should be reported using the abbreviation “N”. When indications of tendency are not available, none of the foregoing abbreviations should be included; and
- b) if the one-minute runway visual range values during the 10-minute period vary from the mean value by more than 50 m or more than 20 per cent of the mean value, whichever is greater, the one-minute mean minimum and the one-minute mean maximum values should be reported instead of the 10-minute mean value. If the 10-minute period immediately preceding the observation includes a marked discontinuity in runway visual range values, only those values occurring after the discontinuity should be used to obtain variations.

Note.— A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least 2 minutes, which reaches or passes through criteria for the issuance of special reports in the SPECI code form given in 4.3.4 f).

4.8 Observing and reporting of present weather

4.8.1 Recommendation.— The present weather occurring at and/or near the aerodrome should be observed. When local routine and special reports are used for departing aircraft, the

present weather information should be representative of the take-off and climb-out area; when local routine and special reports are used for arriving aircraft, the present weather information should be representative of the approach and landing area. Observations of present weather made for reports in the METAR/SPECI code forms should be representative of the aerodrome and its immediate vicinity.

4.8.2 Recommendation.— Where observations are made using automatic observing equipment, provision should be made for manual insertion in the corresponding displays of those weather elements which cannot be determined adequately by that equipment.

4.8.3 Recommendation.— Present weather phenomena should be reported in terms of type and characteristics and qualified with respect to intensity or proximity to the aerodrome, as appropriate.

4.8.4 Recommendation.— The types of present weather phenomena which should be reported, their respective abbreviations and relevant criteria for their reporting of significance to aviation are as follows:

- a) Precipitation

Drizzle	DZ
Rain	RA
Snow	SN
Snow grains	SG
Ice pellets	PL
Ice crystals (very small ice crystals in suspension, also known as diamond dust)	IC
— Reported only when associated visibility is 5 000 m or less.	
Hail	GR
— Reported when diameter of largest hailstones is 5 mm or more.	
Small hail and/or snow pellets	GS
— Reported when diameter of largest hailstones is less than 5 mm.	
- b) Obscurations (hydrometeors)

Fog	FG
— Reported when visibility is less than 1 000 m, except when qualified by “MI”, “BC”, “PR” or “VC” (see 4.8.5 and 4.8.6).	
Mist	BR
— Reported when visibility is at least 1 000 m but not more than 5 000 m.	
- c) Obscurations (lithometeors)

The following should be used only when the obscuration consists predominantly of lithometeors and the visibility is 5 000 m or less except “SA” when qualified by “DR” (see 4.8.5) and volcanic ash.

Sand	SA
Dust (widespread)	DU

Haze	HZ
Smoke	FU
Volcanic ash	VA

Partial (a substantial part of the aerodrome covered by fog while the remainder is clear) PR

d) Other phenomena	
Dust/sand whirls (dust devils)	PO
Squall	SQ
Funnel cloud (tornado or waterspout)	FC
Duststorm	DS
Sandstorm	SS

4.8.5 **Recommendation.**— The characteristics of the present weather phenomena which should be reported, as necessary, and their respective abbreviations are as follows:

Thunderstorm TS

— Used to report a thunderstorm with rain “TSRA”, snow “TSSN”, ice pellets “TSPL”, hail “TSGR” or small hail and/or snow pellets “TSGS” or combinations thereof, for example, “TSRASN”. When thunder is heard during the 10-minute period preceding the time of observation but no precipitation is observed at the aerodrome, the abbreviation “TS” should be used without qualification.

Shower SH

— Used to report showers of rain “SHRA”, snow “SHSN”, ice pellets “SHPL”, hail “SHGR”, small hail and/or snow pellets “SHGS”, or combinations thereof, for example “SHRASN”. Showers observed in the vicinity of the aerodrome (see 4.8.6) should be reported as “VCSH” without qualification regarding type or intensity of precipitation.

Freezing (supercooled water droplets or precipitation, used only with FG, DZ and RA) FZ

Blowing BL

— Used to report DU, SA or SN (including snowstorm) raised by the wind to a height of 2 m (6 ft) or more above the ground; in the case of snow, also used to report snow falling from a cloud and mixed with snow raised by the wind from the ground.

Low drifting (used with DU, SA or SN raised by the wind to less than 2 m (6 ft) above ground level) DR

Shallow (less than 2 m (6 ft) above ground level) MI

Patches (fog patches randomly covering the aerodrome) BC

4.8.6 **Recommendation.**— The relevant intensity or, as appropriate, the proximity to the aerodrome of the reported present weather phenomena should be indicated as follows:

	(abbreviated plain language)	(METAR)
Light	FBL	—
Moderate	MOD	(no indication)
Heavy	HVY	+

— Used only with: precipitation; SH and TS (in these cases intensity refers to precipitation in accordance with 4.8.7); BLDU; BLSA; BLSN; DS; SS; and PO, FC (in these cases HVY means well developed).

Vicinity VC

— Not at the aerodrome but not further away than approximately 8 km from the aerodrome perimeter and used only with DS, SS, FG, FC, SH, PO, BLDU, BLSA, BLSN and TS when not reported under 4.8.5.

4.8.7 **Recommendation.**— In local routine and special reports, one or more up to a maximum of three of the present weather abbreviations given in 4.8.4 and 4.8.5 should 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 at or near the aerodrome of significance to flight operations. In reporting this information, the indication of intensity or proximity as appropriate, should be reported first followed respectively by the characteristics and the type of weather phenomena. Where two different types of weather are observed, they should 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 should 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.

4.9 Observing and reporting of cloud

4.9.1 **Recommendation.**— Cloud amount, type and height of base should be observed as necessary to describe the general cloud distribution.

4.9.2 **Recommendation.**— Where ceilometers are used as a part of automated observing equipment to measure height of cloud base, provision should be made for manual insertion

of cloud amounts and, where appropriate, cloud type(s), together with the heights of those layers or masses not directly measurable by the ceilometer(s).

4.9.3 Recommendation.— Cloud observations for local routine and special reports should be representative of the approach area or, in the case of aerodromes with precision approach runways, of the middle marker site of the instrument landing system. Cloud observations made for reports in the METAR/SPECI code forms should be representative of the aerodrome and its immediate vicinity.

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

4.9.4 Recommendation.— The height of the base of cloud should normally 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 should be made in order that the height of clouds reported to arriving aircraft should refer to the threshold elevation. In the case of reports from offshore structures the height of the base of cloud should be given above mean sea level.

4.9.5 Recommendation.— In local routine and special reports, the name of the element should be given together with cloud amount using the abbreviations “FEW” (1 to 2 oktas), “SCT” (3 to 4 oktas), “BKN” (5 to 7 oktas) or “OVC” (8 oktas). If there are no clouds and no restriction on vertical visibility and the abbreviation “CAVOK” is not appropriate, the abbreviation “SKC” should be used. If there are no clouds of operational significance, i.e. below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, no cumulonimbus and no restriction on vertical visibility and the abbreviations “CAVOK” and “SKC” are not appropriate, the abbreviation “NSC” should be used. When the sky is obscured and information on vertical visibility is available, it should be reported as shown in the template in Appendix 2. When several layers or masses of cloud are observed, their amount and height should be reported in the following order:

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

The type of cloud should be identified only for cumulonimbus and towering cumulus when observed at or near the aerodrome. The height of the base of cloud should be reported in

steps of 30 m (100 ft) up to 3 000 m (10 000 ft) together with the units used and in steps of 300 m (1 000 ft) above 3 000 m (10 000 ft). When the cloud base is diffuse or ragged or fluctuating rapidly, the minimum height of the cloud, or cloud fragments, should be given, followed by the relevant abbreviation. 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. When there is more than one runway in use and cloud heights are observed by instruments for these runways, the available cloud height values for each runway should be given, as necessary, and the runways to which the values refer should be indicated.

Note.— Towering cumulus is used to indicate cumulus congestus clouds of great vertical extent.

4.10 Observing and reporting of air temperature and dew-point temperature

4.10.1 Recommendation.— The air temperature and the dew-point temperature should be reported to the nearest whole degree Celsius, with observed values involving 0.5°C rounded up to the next higher whole degree Celsius, for example, +2.5°C should be rounded off to +3°C, −2.5°C should be rounded off to −2°C.

4.10.2 Recommendation.— Observations of air temperature and dew-point temperature should be representative of the whole runway complex.

4.10.3 Recommendation.— In local routine and special reports, the air temperature should be identified by “T” and the dew-point temperature by “DP”. For a temperature below 0°C the value should be preceded by “MS”.

4.11 Observing and reporting of pressure values

4.11.1 Recommendation.— The atmospheric pressure should be measured and QNH and/or QFE values should be computed in tenths of a hectopascal.

4.11.2 Recommendation.— For local air traffic services units QNH and, if required, QFE should be kept current by routine issues, supplemented by the issue of new data whenever changes occur which exceed an agreed magnitude. Such supplementary data need not be issued when the air traffic services unit is equipped with a remote indicator from the barometer in the meteorological station or with a separate barometer, and where arrangements are in force for the use of the remote indicator, or separate barometer, to make observations to meet the need for local routine and special reports.

4.11.3 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.

4.11.4 Recommendation.— In local routine reports QNH should be included regularly and QFE should be included either on request or, if so agreed locally, on a regular basis. Those values should be rounded down to the nearest lower whole hectopascal and given in four digits together with the units used. If QFE values are required for more than one runway, the required values should be indicated using four digits for each runway.

4.11.5 Recommendation.— In reports in the METAR/SPECI code forms QNH values should be included and the values should be rounded down to the nearest lower whole hectopascal.

4.12 Observing and reporting of supplementary information

4.12.1 Recommendation.— Observations made at aerodromes should include the available supplementary information concerning significant meteorological conditions, particularly those in the approach and climb-out areas, and specifically the location of cumulonimbus or thunderstorm, moderate or severe turbulence, wind shear, hail, severe squall line, moderate or severe icing, freezing precipitation, severe mountain waves, sandstorm, duststorm, blowing snow or funnel cloud (tornado or waterspout). Where practicable, the information should identify the vertical extent and direction and rate of movement of the phenomenon. As icing, turbulence and to a large extent, wind shear, for the time being cannot be satisfactorily observed from the ground, evidence of their existence should be derived from aircraft observations during the climb-out or approach phases of flight to be made in accordance with Chapter 5, 5.5 and 5.6.

Note.— The preparation and dissemination of warnings of wind shear in the climb-out and approach paths is dealt with in Chapter 7, 7.6.1 to 7.6.6.

4.12.2 Recommendation.— Where observations are made using automatic observing equipment, provision should be made for manual insertion of information concerning significant meteorological conditions which cannot be determined adequately by that equipment.

4.12.3 Recommendation.— When any of the following weather phenomena or combinations thereof were 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, this should be reported, up to a maximum of three groups, in the supplementary information:

- freezing precipitation
- moderate or heavy precipitation (including showers thereof)

- moderate or heavy blowing snow (including snowstorm)
- duststorm or sandstorm
- thunderstorm
- funnel cloud (tornado or water spout)
- volcanic ash.

4.12.4 Recommendation.— The available supplementary information should be included in local routine and special reports using the following abbreviations, or combinations thereof, for:

- a) cumulonimbus cloud and significant meteorological conditions: “CB”, “TS”, “MOD TURB”, “SEV TURB”, “WS”, “GR”, “SEV SQL”, “MOD ICE”, “SEV ICE”, “FZDZ”, “FZRA”, “SEV MTW”, “SS”, “DS”, “BLSN” or “FC”;
- b) location of the phenomenon: “IN APCH”, “IN CLIMB-OUT” or “INC”; and
- c) recent weather: “REFZDZ”, “REFZRA”, “REDZ”, “RERA”, “RESN”, “RESG”, “REGR”, “REGS”, “REPL”, “RESHRA”, “RESHSN”, “RESHSG”, “RESHPL”, “RESHGR”, “RESHGS”, “REIC”, “REBLN”, “RESS”, “REDS”, “RETS”, “REFC” or “REVA”.

Where necessary, additional information should be included using abbreviated plain language.

4.12.5 Recommendation.— In reports in the METAR/SPECI code forms, information on recent weather of operational significance, as given in 4.12.3, observed at the aerodrome within the period since the last issued routine report or last hour, whichever is the shorter, but not at the time of observation and, where local circumstances so warrant, information on wind shear should be added, while other supplementary information should be added in such reports only in accordance with regional air navigation agreement.

Note.— The local circumstances referred to in 4.12.5 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.

4.12.6 Recommendation.— Information on sea-surface temperature and the state of the sea should be included in reports in the METAR/SPECI code forms from aeronautical meteorological stations established on offshore structures in support of helicopter operations, as determined by regional air navigation agreement.

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

4.12.7 Recommendation.— Information on the state of the runway, provided by the appropriate airport authority,

should be included in reports in the METAR/SPECI code forms in accordance with regional air navigation agreement.

4.13 Contents of reports

4.13.1 **Recommendation.**— *Local routine and special reports and routine and special reports in the METAR/SPECI code forms should contain the following information in the order indicated, except that local special reports need not contain information as provided for under 4.3.3:*

- a) *identification of the type of report;*
- b) *location indicator;*
- c) *time of the observation;*
- d) *surface wind direction and speed;*
- e) *visibility;*
- f) *runway visual range, when applicable;*
- g) *present weather;*
- h) *cloud amount, type (only for cumulonimbus and towering cumulus clouds at or near the aerodrome) and height of base;*
- i) *air temperature and dew-point temperature;*
- j) *QNH and, when applicable, QFE (QFE included only in local routine and special reports by agreement between the meteorological and air traffic services authorities and operators concerned); and*
- k) *supplementary information.*

Note 1.— The location indicators referred to under b) and their significations are published in Doc 7910 — Location Indicators.

Note 2.— For explanation of towering cumulus see note following 4.9.5.

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

- a) *visibility, 10 km or more;*
- b) *no cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus; and*
- c) *no weather of significance to aviation as given in 4.8.4 and 4.8.5;*

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

4.14 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.

CHAPTER 5. AIRCRAFT OBSERVATIONS AND REPORTS

5.1 Obligations of States

Each Contracting State shall arrange, according to the provisions of this chapter, 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 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 Reporting of aircraft observations during flight

5.3.1 Aircraft observations shall be reported by air-ground data link. Where air-ground data link is not available or appropriate, aircraft observations shall be reported by voice communications.

5.3.2 Aircraft observations shall be reported during flight at the time the observation is made or as soon thereafter as is practicable.

5.4 Routine aircraft observations

5.4.1 **Recommendation.**— *When air-ground data link is used and automatic dependent surveillance (ADS) 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.*

5.4.2 When voice communications are used, routine observations shall be made during the en-route phase in relation to those air traffic services reporting points or intervals:

- a) at which the applicable air traffic services procedures require routine position reports; and
- b) which are those separated by distances corresponding most closely to intervals of one hour of flying time.

5.4.3 **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.*

5.4.4 In the case of air routes with high-density air traffic (e.g. organized tracks), an aircraft from among the aircraft operating at each flight level shall be designated, at approximately hourly intervals, to make routine observations in accordance with 5.4.1 or 5.4.2, as appropriate. The designation procedures shall be subject to regional air navigation agreement.

5.4.5 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 5.4.1.

5.4.6 When voice communications are used, an aircraft shall be exempted from making the routine observations specified in 5.4.2 when:

- a) the aircraft is not equipped with RNAV equipment; or
- b) the flight duration is 2 hours or less; or
- c) the aircraft is at a distance equivalent to less than one hour of flying time from the next intended point of landing; or
- d) the altitude of the flight path is below 1 500 m (5 000 ft).

5.4.7 **Recommendation.**— *When voice communications are used, additional exemptions may be prescribed by regional air navigation agreement for flights over routes and areas with high-density air traffic and/or with adequate synoptic networks. Such procedures should take the form of exemption or designation procedures and should:*

- a) *make it possible for the minimum requirements for aircraft observations of all meteorological offices concerned to be met; and*
- b) *be as simple as possible to implement and preferably not involving consideration of individual cases.*

5.5 Special aircraft observations

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

- a) severe turbulence; or
- b) 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.

In addition, in the case of transonic and supersonic flights:

- i) moderate turbulence; or
- j) hail; or
- k) cumulonimbus clouds.

5.6 Other non-routine aircraft observations

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

Note.— According to Chapter 4, 4.12.1 and Chapter 7, 7.6.2, 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.

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

5.6.3 **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.

5.7 Content of air-reports

5.7.1 When voice communications are used, the elements contained in routine and special air-reports shall be:

Routine air-reports

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)

Special air-reports

Message type designator

Section 1

(Position information)
Aircraft identification
Position or latitude and longitude
Time
Flight level or altitude

Section 3

(Meteorological information)
Condition prompting the issuance of a special air-report, to be selected from the list presented under 5.5.

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

Note 2.— In the case of the transmission of a special air-report of pre-eruption volcanic activity, volcanic eruption or volcanic ash cloud, additional requirements are indicated in 5.10.

5.7.2 When air-ground data link is used and ADS 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
Temperature
Turbulence (if available)
Humidity (if available)

Note.— When ADS is being applied, the requirements of routine air-reports may be met by the combination of the basic ADS data block (data block 1) and the meteorological information data block (data block 2), available from ADS reports. The ADS message format is specified in the PANS-ATM (Doc 4444), Part II, Section 14.4 and in Annex 10, Volume III, Part I — Digital Data Communication Systems.

5.7.3 When air-ground data link is used while ADS is not being applied, the elements contained in routine reports shall be in accordance with 5.7.1.

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

5.7.4 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
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 under 5.5).

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

Note 2.— In the case of the transmission of a special air-report of pre-eruption volcanic activity, volcanic eruption or volcanic ash cloud, additional requirements are indicated in 5.10.

5.8 Criteria for reporting meteorological and related parameters in automated air-reports

When air-ground data link is used, the wind direction, wind speed, wind quality flag, temperature, turbulence and humidity included in air-reports shall be reported in accordance with the criteria shown in Appendix 3.

5.9 Exchange of air-reports

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

- routine and special air-reports by voice communications, the ATS units relay them without delay to their associated meteorological watch office;
- routine air-reports by data link communications, the ATS units relay them without delay to WAFCs and, as appropriate, to RAFCs; and
- special air-reports by data link communications, the ATS units relay them without delay to their associated meteorological watch office, WAFCs and, as appropriate, to RAFCs.

5.9.2 The meteorological watch offices shall assemble the routine air-reports received by voice communications and shall disseminate them to WAFCs and, as appropriate, RAFCs, and other meteorological offices in accordance with regional air navigation agreement. The exchange of collectives on an hourly basis may be found desirable when reports are numerous.

5.9.3 The meteorological watch office shall transmit without delay the special air-reports received by voice communications to WAFCs and, as appropriate, RAFCs.

5.9.4 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.

5.9.5 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 7.2.11, i.e. to meteorological watch offices and other meteorological offices in accordance with regional air navigation agreement.

5.9.6 Air-reports received at WAFCs and RAFCs 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.

5.9.7 **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.*

5.9.8 Air-reports shall be exchanged in the format in which they are received, except that when voice communications are used, if the position is given by reference to an ATS reporting point, it shall be converted, by the meteorological watch office, into the corresponding latitude and longitude.

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

5.10.1 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.

Note.— The detailed instructions for recording and reporting volcanic activity observations are given in the PANS-ATM (Doc 4444), Appendix 1.

5.10.2 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.

5.10.3 The completed report of volcanic activity received by a 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.

CHAPTER 6. FORECASTS

6.1 Interpretation and use of forecasts

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

Note.— Guidance on the operationally desirable accuracy of forecasts is given in Attachment E.

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

6.2 Aerodrome forecasts

6.2.1 An aerodrome forecast shall be prepared by the meteorological office designated by the meteorological authority concerned.

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

6.2.3 Aerodrome forecasts and amendments thereto shall be issued in accordance with the template shown in Appendix 4 and exchanged in the TAF code form and include the following information in the order indicated:

- a) code name TAF/TAF AMD;
- b) location indicator;
- c) date and time of origin of forecast;
- d) date and period of validity of forecast;
- e) surface wind;
- f) visibility;

- g) weather;
- h) cloud; and
- i) expected significant changes to one or more of these elements during the period of validity.

Additional elements shall be included in aerodrome forecasts in accordance with regional air navigation agreement.

Note 1.— The TAF code form is contained in WMO Publication No. 306, Manual on Codes, Volume I.1, Part A — Alphanumeric Codes.

Note 2.— Examples of aerodrome forecasts in the TAF code form are given in Appendix 4.

6.2.4 Meteorological offices preparing aerodrome forecasts 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.

6.2.5 Recommendation.— *The criteria used for the inclusion of change groups in aerodrome forecasts or for the amendment of aerodrome forecasts should be based on the following:*

- a) *when the surface wind is forecast to change through values of operational significance, the threshold values should be established by the meteorological authority in consultation with the appropriate ATS authority and operators concerned, taking into account changes in the wind which would:*

1) require a change in runway(s) in use; and

2) indicate that the runway tailwind and crosswind components will change through values representing the main operating limits for typical aircraft operating at the aerodrome;

- b) *when the visibility is forecast to improve and change to or pass through one or more of the following values, or when the visibility is forecast to deteriorate and pass through one or more of the following values:*

1) 150, 350, 600, 800, 1 500 or 3 000 m;

2) 5 000 m in cases where significant numbers of flights are operated in accordance with the visual flight rules;

- c) when any of the following weather phenomena or combinations thereof are forecast to begin or end or change in intensity:

- freezing precipitation
- freezing fog
- moderate or heavy precipitation (including showers thereof)
- low drifting dust, sand or snow
- blowing dust, sand or snow (including snowstorm)
- duststorm
- sandstorm
- thunderstorm (with or without precipitation)
- squall
- funnel cloud (tornado or waterspout)
- other weather phenomena given in 4.8.4 only if they are expected to cause a significant change in visibility;

- d) when the height of base of the lowest layer or mass of cloud of BKN or OVC extent is forecast to lift and change to or pass through one or more of the following values, or when the height of the lowest layer or mass of cloud of BKN or OVC extent is forecast to lower and pass through one or more of the following values:

- 1) 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft); or
- 2) 450 m (1 500 ft), in cases where significant numbers of flights are operated in accordance with the visual flight rules;

- e) when the amount of a layer or mass of cloud below 450 m (1 500 ft) is forecast to change:

- 1) from SKC, FEW or SCT to BKN or OVC; or
- 2) from BKN or OVC to SKC, FEW or SCT;

- f) when cumulonimbus clouds are forecast to develop or dissipate;

- g) 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

- h) any other criteria based on local aerodrome operating minima, as agreed between the meteorological authority and the operators.

6.2.6 Recommendation.— The period of validity of routine aerodrome forecasts should be not less than 9 hours nor more than 24 hours; this period should be determined by regional air navigation agreement. The period of validity should be subdivided, as necessary, in accordance with 6.2.11. Routine aerodrome forecasts valid for less than 12 hours

should be issued every 3 hours and those valid for 12 to 24 hours should be issued every 6 hours.

6.2.7 Recommendation.— When a change in any of the elements given in 6.2.2 is required to be indicated in accordance with the criteria given in 6.2.5, 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.

6.2.8 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 2 hours but in any case should not exceed 4 hours.

6.2.9 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 6.2.8 or the validity period should be subdivided in accordance with 6.2.11.

6.2.10 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”.

6.2.11 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 four-figure time group in whole hours and minutes UTC indicating the time the change is expected to occur. The subdivided period following the abbreviation “FM” should be self-contained and all forecast conditions given before the abbreviation should be superseded by those following the abbreviation.

6.2.12 Recommendation.— In forecasting surface wind, the expected prevailing direction should 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 (6 km/h (3 kt) or less) or thunderstorms, the forecast wind direction should be indicated as variable using “VRB”. When the wind is forecast to be less than 2 km/h (1 kt), the forecast wind speed should be indicated as calm. When a wind speed of 200 km/h (100 kt) or more is forecast, it should be indicated as 200 km/h (or 100 kt).

6.2.13 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. When visibility is forecast to vary in different directions the lowest forecast visibility should be given.

Note.— Guidance on operationally desirable accuracy of forecasts of visibility is given in Attachment E.

6.2.14 Recommendation.— The following weather phenomena or combinations thereof, their characteristics and, where appropriate, intensity should 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 (including snowstorm)
- duststorm
- sandstorm
- thunderstorm (with or without precipitation)
- squall
- funnel cloud (tornado or waterspout)
- other weather phenomena given in 4.8.4 only if they are expected to cause a significant change in visibility.

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

6.2.15 Recommendation.— Cloud amount should be forecast using the abbreviations “FEW”, “SCT”, “BKN” or “OVC” as necessary. If no clouds are forecast, and the

abbreviation “CAVOK” is not appropriate, the abbreviation “SKC” should be used. 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 and the units used. 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, whenever forecast and not already included under a) to c).

Cloud information should be limited to cloud of operational significance, i.e. cloud below 1 500 m (5 000 ft) or the highest minimum sector altitude, whichever is greater, and cumulonimbus whenever forecast. In applying this limitation, when no cumulonimbus and no cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, are forecast and “CAVOK” or “SKC” are not appropriate, the abbreviation “NSC” should be used.

6.2.16 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 aerodrome forecast should be given, together with their corresponding times of occurrence.

6.2.17 Aerodrome forecasts in the TAF code form and amendments thereto shall be disseminated to international OPMET data banks 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.

6.3 Landing forecasts

6.3.1 A landing forecast shall be prepared by the meteorological office designated by the meteorological authority concerned; such forecasts are intended to meet 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-type forecast in accordance with the template shown in Appendix 2, as determined by regional air navigation agreement.

Note.— Examples of trend forecasts are given in Appendix 2.

6.3.3 A trend-type landing forecast shall consist of a local routine or local special report, or a routine or special report in the METAR/SPECI code forms, for an aerodrome to which is appended a concise statement of the expected trend of the meteorological conditions at that aerodrome. The period of validity of a trend-type landing forecast shall be 2 hours from the time of the report which forms part of the landing forecast. The trend-type landing forecast shall indicate significant changes in respect of one or more of the elements surface wind, visibility, weather and cloud. 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”.

6.3.4 When a change is expected to occur, the trend part of the trend-type forecast message shall begin with one of the change indicators “BECMG” or “TEMPO”.

6.3.5 The change indicator “BECMG” shall be used to describe forecast changes where the meteorological conditions are expected to reach or pass through specified values at a regular or irregular rate. The period during which, or the time at which, the change is forecast to occur shall be indicated, using the abbreviations “FM”, “TL”, or “AT”, as appropriate, each followed by a time group in hours and minutes. When the change is forecast to begin and end wholly within the trend forecast period, the beginning and end of the change shall be indicated by using the abbreviations “FM” and “TL” respectively with their associated time groups. When the change is forecast to commence at the beginning of the trend forecast period but be completed before the end of that period, the abbreviation “FM” and its associated time group shall be omitted and only “TL” and its associated time group shall be used. When the change is forecast to begin during the trend forecast period and be completed at the end of that period, the abbreviation “TL” and its associated time group shall be omitted and only “FM” and its associated time group shall be used. When the change is forecast to occur at a specified time during the trend forecast period, the abbreviation “AT” followed by its associated time group shall be used. When the change is forecast to commence at the beginning of the trend forecast period and be completed by the end of that period or when the change is forecast to occur within the trend forecast period but the time is uncertain, the abbreviations “FM”, “TL” or “AT” and their associated time groups shall be omitted and the change indicator “BECMG” shall be used alone.

6.3.6 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.

6.3.7 The indicator “PROB” shall not be used in trend-type landing forecasts.

6.3.8 The trend part of the trend-type landing 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 20 km/h (10 kt) or more;
- b) a change in mean wind speed of 20 km/h (10 kt) or more; and
- c) changes in the wind through values of operational significance. The threshold values should be established by the meteorological authority in consultation with the appropriate ATS authority and operators concerned, taking into account changes in the wind which would:
 - 1) require a change in runway(s) in use; and
 - 2) indicate that the runway tailwind and crosswind components will change through values representing the main operating limits for typical aircraft operating at the aerodrome.

6.3.9 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 part of the trend-type landing 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.

6.3.10 The trend part of the trend-type landing forecast shall indicate the expected onset, cessation or change in intensity of one or more, up to a maximum of three, of the following weather phenomena or combinations thereof:

- freezing precipitation
- freezing fog
- moderate or heavy precipitation (including showers thereof)
- low drifting dust, sand or snow
- blowing dust, sand or snow (including snowstorm)
- duststorm
- sandstorm
- thunderstorm (with or without precipitation)
- squall
- funnel cloud (tornado or waterspout)
- other weather phenomena given in 4.8.4 only if they are expected to cause a significant change in visibility.

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

6.3.11 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 part of the trend-type landing forecast shall indicate the change. When the height of the base of a cloud layer is below, is expected to fall below or rise above 450 m (1 500 ft), the trend part of the trend-type landing forecast shall also indicate changes in cloud amount from SKC, FEW, or SCT increasing to BKN or OVC, or changes from BKN or OVC decreasing to SKC, FEW or SCT. When no cumulonimbus and no cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, are forecast and “CAVOK” and “SKC” are not appropriate, the abbreviation “NSC” shall be used.

6.3.12 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 part of the trend-type landing forecast shall indicate the change.

6.3.13 Criteria for the indication of changes based on local aerodrome operating minima, additional to those specified in 6.3.8 to 6.3.12, shall be used as agreed between the meteorological authority and the operator(s) concerned.

6.3.14 The order of the elements and the terminology, units and scales used in the trend part of the trend-type landing forecast shall be the same as those used in the report to which it is appended.

6.4 Forecasts for take-off

6.4.1 A forecast for take-off shall be prepared by the meteorological office designated by the meteorological authority concerned.

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 3 hours before the expected time of departure.*

6.4.4 **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.*

6.4.5 **Recommendation.**— *Meteorological offices preparing forecasts for take-off should keep the forecasts under continuous review and, when necessary, should issue amendments promptly. The criteria for the issuance of amendments for forecasts for take-off for surface wind direction and speed, temperature and pressure and any other elements agreed locally should be agreed between the meteorological authority and the operators concerned. The criteria should be consistent with the corresponding criteria for special reports established for the aerodrome in accordance with 4.3.1.*

6.5 Area and route forecasts, other than forecasts issued within the framework of the world area forecast system

Note.— *Provisions concerning forecasts issued within the framework of the world area forecast system are contained in Chapter 3 and those concerning area forecasts for low-level flights, under Section 6.6.*

6.5.1 Area and route forecasts shall contain upper winds, upper-air temperatures, significant en-route weather phenomena and associated clouds. Other elements may be added as required. This information shall cover the flight operations for which they are intended in respect of time, altitude and geographical extent.

6.5.2 Meteorological offices preparing area and route forecasts shall keep the forecasts under continuous review and issue amendments as necessary.

6.5.3 A list of criteria to be used for amendments to area and route forecasts shall be established by the meteorological authority, in consultation with operators and other users concerned.

6.5.4 **Recommendation.**— *Amendments to area and route forecasts should be issued in accordance with criteria in 3.2.12 and 3.2.13.*

6.5.5 Area and route forecasts and amendments thereto, disseminated locally, shall be in one of the forms prescribed for the exchange of such information between meteorological offices or in another form as agreed locally.

6.5.6 Area and route forecasts and amendments thereto which are exchanged between meteorological offices in a code form prescribed by the World Meteorological Organization shall be in the WINTEN or ROFOR code form.

Note.— *The WINTEN and ROFOR code forms are contained in WMO Publication No. 306, Manual on Codes, Volume I.1, Part A — Alphanumeric Codes.*

6.5.7 **Recommendation.**— *The order of the elements in area and route forecasts (or amendments thereto) in abbreviated plain language should normally follow that of the corresponding coded form of message. The terminology and units employed should be consistent with those used in the related aerodrome reports and forecasts. The identifier employed should be “AREA FCST” or “ROUTE FCST” respectively, preceded in the case of amendments by “AMD”. The CAVOK procedure applied in aerodrome forecasts should not be used in area and route forecasts.*

6.6 Area forecasts for low-level flights

6.6.1 **Recommendation.**— *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 of amendments thereto should be determined by the meteorological authority in consultation with the users.*

6.6.2 When the density of traffic operating below flight level 100 warrants the issuance of AIRMET information in accordance with 7.3.1, area forecasts for such operations shall be exchanged between meteorological offices responsible for the issuance of flight documentation for low-level flights in the flight information regions concerned.

6.6.3 Area forecasts for low-level flights exchanged between meteorological offices in support of the issuance of

AIRMET information 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. 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. When prepared in GAMET format, they 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 area forecasts shall contain the following information as necessary and, when prepared in GAMET format, in the order indicated. Additional elements in Section II shall be included in accordance with regional air navigation agreement:

- a) location indicator of the air traffic services unit serving the flight information region(s) to which the area forecast for low-level flights refers; for example, “YUCC”;
- b) message identification using the abbreviation “GAMET”;
- c) date-time groups indicating the period of validity in UTC; for example, “VALID 220600/221200”;
- d) location indicator of the meteorological office originating the message, followed by a hyphen to separate the preamble from the text; for example, “YUDO-”;
- e) on the next line, name of the flight information region, or a sub-area thereof, for which the area forecast for low-level flights is issued; for example “AMSWELL FIR/2 BLW FL120”;
- f) on the next line, indication of the beginning of the first section of the area forecast using the abbreviation “SECN I”;
- g) widespread mean surface wind speed exceeding 60 km/h (30 kt); for example, “SFC WSPD: 10/12 65 KMH”;
- h) widespread areas of surface visibility below 5 000 m including the weather phenomena causing the reduction of visibility; for example, “SFC VIS: 06/08 3000 M BR N OF 51 DEG N”;
- i) significant weather conditions encompassing thunderstorms and heavy sand- and duststorm (except for phenomena for which a SIGMET message has already been issued); for example, “SIGWX: 11/12 ISOL TS”;
- j) mountain obscuration; for example, “MT OBSC: MT PASSES S OF 48 DEG N”;

- k) 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, giving height indications of their bases and tops; for example, “SIG CLD: 06/09 OVC 800/1100 FT AGL N OF N51 10/12 ISOL TCU 1200/8000 FT AGL”;
 - l) icing (except for that occurring in convective clouds and for severe icing for which a SIGMET message has already been issued); for example, “ICE: MOD FL050/080”;
 - m) turbulence (except for that occurring in convective clouds and for severe turbulence for which a SIGMET message has already been issued); for example, “TURB: MOD ABV FL090”;
 - n) mountain wave (except for severe mountain wave for which a SIGMET message has already been issued); for example, “MTW: MOD ABV FL080 E OF 63 DEG N”;
 - o) SIGMET messages applicable to the FIR concerned or the sub-area thereof, for which the area forecast is valid; for example, “SIGMET APPLICABLE: 3,5”.
 - p) on the next line, indication of the beginning of the second section of the area forecast using the abbreviation “SECN II”;
 - q) pressure centres and fronts and their expected movements and developments; for example, “PSYS: 06 L 1004 HPA 51.5 DEG N 10.0 DEG E MOV NE 25 KT WKN”;
 - r) 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); for example, “WIND/T: 2000 FT 270/70 KMH PS03 5000 FT 250/80 KMH MS02 10000 FT 240/85 KMH MS11”;
 - s) cloud information not included under k), giving cloud amount, type and height indications of the bases and tops above ground level (AGL) or above mean sea level (AMSL); for example, “CLD: BKN SC 2500/8000 FT AGL”;
 - t) height indication of 0° C level(s) above ground level (AGL) or above mean sea level (AMSL), if lower than the top of the airspace for which the forecast is supplied; for example, “FZLV: 3000 FT AGL”;
 - u) forecast lowest QNH during the period of validity; for example, “MNM QNH: 1004 HPA”;
 - v) sea-surface temperature and state of the sea if required by regional air navigation agreement; for example, “SEA: T15 HGT 5 M”;
 - w) location of volcanic eruptions which are producing ash clouds of significance to aircraft operations, name of volcano and time of first eruption, if known; for example, “VA: MT. HOKKAIDO KOMAGATAKE PSN N4292 E14040 ERUPTED VA CLD TOP 4900 FT MOV SE”.
- Each of the items g) to o) and q) to w) shall, when applicable, be included in the GAMET area forecast beginning on a new line and include an indication of the location (referring where possible, to latitude and longitude and/or locations or geographic features well known internationally) and level, where appropriate. Items g) to o) for which no hazardous phenomenon is expected to occur, or which are already covered by a SIGMET message, shall be omitted from the area forecast. When no weather phenomena hazardous to low-level flights occur and no SIGMET information is applicable, the term “HAZARDOUS WX NIL” shall replace all items listed under g) to o). 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 7.3.1.*
- 6.6.4 Area forecasts for low-level flights exchanged between meteorological offices in support of the issuance of AIRMET information shall be issued every 6 hours for a period of validity of 6 hours and transmitted to meteorological offices concerned not later than one hour prior to the beginning of their validity period.
- Note.— The requirements for flight documentation for low-level flights are stated in 9.6.3 and 9.8.3.*

EXAMPLE OF GAMET AREA FORECAST

YUCC GAMET VALID 220600/221200 YUDO-
 AMSWELL FIR/2 BLW FL100
 SECN I
 SFC WSPD: 10/12 65 KMH
 SFC VIS: 06/08 3000 M BR N OF N51
 SIGWX: 11/12 ISOL TS
 SIG CLD: 06/09 OVC 800/1100 FT AGL N OF N51 10/12 ISOL TCU 1200/8000 FT AGL
 ICE: MOD FL050/080
 TURB: MOD ABV FL090
 SIGMETS APPLICABLE: 3,5
 SECN II
 PSYS: 06 L 1004 HPA N51.5 E10.0 MOV NE 25 KT WKN
 WIND/T: 2000 FT 270/70 KMH PS03 5000 FT 250/80 KMH MS02 10000 FT 240/85 KMH MS11
 CLD: BKN SC 2500/8000 FT AGL
 FZLVL: 3000 FT AGL
 MNM QNH: 1004 HPA
 SEA: T15 HGT 5M
 VA: NIL

Meaning: An area forecast for low-level flights (GAMET) issued for sub-area two of the Amswell* flight information region (identified by YUCC Amswell area control centre) for below flight level 100 by the Donlon/International* meteorological office (YUDO); the message is valid from 0600 UTC to 1200 UTC on the 22nd of the month.

Section I:

surface wind speeds:	between 1000 UTC and 1200 UTC 65 kilometres per hour;
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 100);
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 70 kilometres per hour, temperature plus 3 degrees Celsius; at 5 000 feet above ground level wind direction 250 degrees; wind speed 80 kilometres per hour, temperature minus 2 degrees Celsius; at 10 000 feet above ground level wind direction 240 degrees; wind speed 85 kilometres per hour, 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 sea 5 metres;
volcanic ash:	nil.

* Fictitious locations

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

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

7.1 SIGMET information — general provisions

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. The information shall be indicated using one of the following as appropriate:

a) at subsonic cruising levels:

thunderstorm	
— obscured	OBSC TS
— embedded	EMBD TS
— frequent	FRQ TS
— squall line	SQL TS
— obscured with hail	OBSC TS GR
— embedded with hail	EMBD TS GR
— frequent, with hail	FRQ TS GR
— squall line with hail	SQL TS GR
tropical cyclone	
— tropical cyclone with 10-minute mean surface wind speed of 63 km/h (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)

b) at transonic levels and supersonic cruising levels:

turbulence	
— moderate turbulence	MOD TURB
— severe turbulence	SEV TURB
cumulonimbus	
— isolated cumulonimbus	ISOL CB
— occasional cumulonimbus	OCNL CB
— frequent cumulonimbus	FRQ CB
hail	
— hail	GR
volcanic ash	
— volcanic ash	VA (+ volcano name, if known)

Note.— Guidance on the preparation of SIGMET messages is given in Appendix 5.

7.1.2 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 7.1.1 shall be included. SIGMET information concerning thunderstorms or a tropical cyclone shall not include references to associated turbulence and icing.

7.1.3 SIGMET information shall be cancelled when the phenomena are no longer occurring or are no longer expected to occur in the area.

7.2 Format and exchange of SIGMET messages

7.2.1 The content and order of elements in a SIGMET message shall be in accordance with the template shown in Appendix 5.

7.2.2 SIGMET messages shall be prepared in abbreviated plain language, using approved ICAO abbreviations and numerical values of self-explanatory nature.

7.2.3 **Recommendation.**— *Meteorological watch offices in a position to do so should issue SIGMET information for volcanic ash cloud and tropical cyclones in graphical format*

using the WMO BUFR code form, in addition to the issuance of this SIGMET information in abbreviated plain language in accordance with 7.2.2.

Note.— The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, Volume I.2, Part B — Binary Codes.

7.2.4 Messages containing SIGMET information for subsonic aircraft shall be identified as “SIGMET”, those containing SIGMET information for supersonic aircraft during transonic or supersonic flight shall be identified as “SIGMET SST”.

7.2.5 The sequence number referred to in the template in Appendix 5 shall correspond with the number of SIGMET messages issued for the flight information region since 0001 UTC on the day concerned. Separate series of sequence numbers shall be used for “SIGMET” and “SIGMET SST” messages.

7.2.6 **Recommendation.**— *The period of validity of a SIGMET message should be not more than 6 hours, and preferably not more than 4 hours. It should be indicated by the term “VALID” in accordance with the template in Appendix 5.*

7.2.7 **Recommendation.**— *In the special case of SIGMET messages for volcanic ash cloud and tropical cyclones, an outlook should be included giving information for up to 12 hours beyond the period of validity specified in 7.2.6, concerning the trajectory of the volcanic ash cloud and positions of the tropical cyclone centre.*

7.2.8 **Recommendation.**— *SIGMET messages issued in accordance with 7.2.7 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.*

7.2.9 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.

7.2.10 **Recommendation.**— *A SIGMET message relating to the expected occurrence of weather phenomena listed in 7.1.1, with the exception of volcanic ash cloud and tropical cyclones, should be issued not more than 6 hours, and preferably not more than 4 hours, before the expected time of occurrence of that phenomenon. SIGMET messages concerning volcanic ash cloud or tropical cyclones expected to affect a flight information region should be issued up to 12 hours before the commencement of the period of validity or as soon as practicable if such advance warning of the existence of these phenomena is not available. SIGMET messages for volcanic ash and tropical cyclones should be updated at least every 6 hours.*

7.2.11 SIGMET messages shall be disseminated to meteorological watch offices, WAFCs and, as appropriate,

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

7.2.12 SIGMET messages shall be transmitted to international operational meteorological data banks 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.

7.3 AIRMET information

7.3.1 AIRMET information shall be issued by a meteorological watch office in accordance with regional air navigation agreement, taking into account the density of air traffic operating below flight level 100. AIRMET information shall give a concise description in abbreviated plain language concerning the occurrence and/or expected occurrence of specified en-route weather phenomena, which have not been included in Section I of the area forecast for low-level flights issued in accordance with Section 6.6 and which may affect the safety of low-level flights, and of the development of those phenomena in time and space. The information shall be indicated using one of the following as appropriate:

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

surface wind speed	
— widespread mean surface wind speed above 60 km/h (30 kt)	SFC WSPD (+ wind speed and units)
surface visibility	
— widespread areas affected by reduction of visibility to less than 5 000 m, including the weather phenomenon causing the reduction of visibility	SFC VIS (+ visibility) (+ weather phenomenon, to be selected from the list in 4.8.4)
thunderstorms	
— isolated thunderstorms without hail	ISOL TS
— occasional thunderstorms without hail	OCNL TS
— isolated thunderstorms with hail	ISOL TSGR
— occasional thunderstorms with hail	OCNL TSGR
mountain obscuration	
— mountains obscured	MT OBSC
cloud	
— widespread areas of broken or overcast cloud with height of base less than 300 m (1 000 ft) above ground level:	

— broken	BKN CLD (+ height of the base and top and units)
— overcast	OVC CLD (+ height of the base and top and units)
— cumulonimbus clouds which are:	
— isolated	ISOL CB
— occasional	OCNL CB
— frequent	FRQ CB
— towering cumulus clouds which are:	
— isolated	ISOL TCU
— occasional	OCNL TCU
— frequent	FRQ TCU
icing	
— moderate icing (except for icing in convective clouds)	MOD ICE
turbulence	
— moderate turbulence (except for turbulence in convective clouds)	MOD TURB
mountain wave	
— moderate mountain wave	MOD MTW

Note.— Guidance on the preparation of AIRMET messages is given in Appendix 5.

7.3.2 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 7.3.1 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 7.1.1.

7.3.3 AIRMET information shall be cancelled when the phenomena are no longer occurring or are no longer expected to occur in the area.

7.4 Format and exchange of AIRMET messages

7.4.1 The content and order of elements in an AIRMET message shall be in accordance with the template shown in Appendix 5.

7.4.2 AIRMET messages shall be prepared in abbreviated plain language, using approved ICAO abbreviations and numerical values.

7.4.3 The sequence number referred to in the template in Appendix 5 shall correspond with the number of AIRMET messages issued for the flight information region since 0001 UTC on the day concerned.

7.4.4 **Recommendation.**— *The period of validity of an AIRMET message should be not more than 6 hours, and preferably not more than 4 hours. It should be indicated by the term “VALID” in accordance with the template in Appendix 5.*

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

7.5 Aerodrome warnings

7.5.1 Aerodrome warnings shall give concise information, in plain language, of meteorological conditions which could adversely affect aircraft on the ground, including parked aircraft, and the aerodrome facilities and services. The warnings shall be issued in accordance with local arrangements to operators, aerodrome services and to others concerned, by the meteorological office designated to provide service for that aerodrome.

7.5.2 **Recommendation.**— *Aerodrome warnings should relate to the occurrence or expected occurrence of one or more of the following phenomena:*

- tropical cyclone
- thunderstorm
- hail
- snow
- freezing precipitation
- hoar frost or rime
- sandstorm
- duststorm
- rising sand or dust
- strong surface wind and gusts
- squall
- frost.

7.5.3 **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 meteorological office and the users of the warnings.*

7.6 Wind shear warnings

7.6.1 Wind shear warnings shall give concise information of 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. The warnings shall be

prepared and disseminated for aerodromes where wind shear is considered a factor in accordance with local arrangements with the appropriate ATS authority and operators concerned and by the meteorological office designated to provide service for the aerodrome or disseminated directly from automated ground-based wind shear remote-sensing or detection equipment referred to in 7.6.2 a) and b). 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.

Note 1.— 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.

Note 2.— Guidance on the subject of wind shear is contained in the Circular Wind Shear (Circ 186).

Note 3.— Information on wind shear is also to be included as supplementary information in local routine and special reports and routine and special reports in the METAR/SPECI code forms in accordance with 4.12.1, 4.12.4 and 4.12.5.

7.6.2 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 Chapter 5, 5.6.1; 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.

7.6.3 Recommendation.— Wind shear warnings should be prepared in abbreviated plain language. Wind shear in the approach area should be reported, for example, as “WS WRNG SURFACE WIND 320/20KMH WIND AT 60M 360/50KMH IN APCH” or “WS WRNG SURFACE WIND 320/10KT WIND AT 60M 360/25KT IN APCH”. Where microbursts are observed, reported by pilots or detected by ground-based wind shear detection or remote-sensing equipment, the wind shear warning should include a specific reference to microburst, for example, “WS WRNG MBST APCH RWY 26”.

7.6.4 Recommendation.— Where information from ground-based wind shear detection or remote-sensing equipment is used to prepare a wind shear warning, the warning should, 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, for example, “WS WRNG 30KT AIRSPEED LOSS 2NM FINAL RWY 13” or “WS WRNG 60KMH AIRSPEED LOSS 4KM FINAL RWY 13”.

7.6.5 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 given unchanged in the warning, for example, “WS WRNG B747 REPORTED MOD WS IN APCH RWY 34 AT 1510”.

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

Note 2.— Specifications for reporting the intensity of wind shear are still undergoing development. It is recognized, however, that pilots, when reporting wind shear, may use the qualifying terms “moderate”, “strong” or “severe”, based to a large extent on their subjective assessment of the intensity of the wind shear encountered. In accordance with 7.6.5, such reports are to be incorporated unchanged in wind shear warnings.

7.6.6 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.

CHAPTER 8. AERONAUTICAL CLIMATOLOGICAL INFORMATION

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 Annex 14, Volume I, 3.1.3 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.**— 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.

8.1.4 **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.

8.1.5 **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

8.2.1 **Recommendation.**— Each Contracting State 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.

8.2.2 **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).

8.2.3 **Recommendation.**— Aerodrome climatological tables should include information required for the preparation of aerodrome climatological summaries in accordance with 8.3.2.

8.3 Aerodrome climatological summaries

8.3.1 **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.

8.3.2 **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) are given in WMO Publication No. 49, Technical Regulations, Volume II, C.3.2.

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.

CHAPTER 9. SERVICE FOR OPERATORS AND FLIGHT CREW MEMBERS

9.1 General provisions

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

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

9.1.2 Meteorological information supplied to operators and flight crew members shall cover the flight in respect of time, altitude and geographical extent. Accordingly, the information shall relate to appropriate fixed times, or periods of time, and shall extend to that aerodrome of intended landing at which new information is to be supplied. On request, or whenever conditions impose doubt as to the practicability of landing at that aerodrome, additional information shall be included, covering the meteorological conditions expected between the aerodrome of intended landing and one alternate aerodrome designated by the operator. In addition, if agreed between the meteorological authority and the operator, information up to a further aerodrome may be supplied.

9.1.3 Meteorological information supplied to operators and flight crew members shall include upper winds and upper-air temperatures, significant en-route weather phenomena, meteorological reports, aerodrome forecasts, forecasts for take-off, landing forecasts, SIGMET information and those special air-reports not covered by a SIGMET, and AIRMET information, which are available at the meteorological office and which are relevant to the planned flight operations.

9.1.4 **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.*

9.1.5 Where necessary, the meteorological authority of the State providing service for operators and flight crew members shall initiate coordinating action with the meteorological authorities of other States with a view to obtaining from them the reports and/or forecasts required.

9.1.6 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) grid point data in digital form;
- c) briefing;
- d) consultation;
- e) display; or
- f) in lieu of a) to e), by means of an automated pre-flight information system providing self-briefing and flight documentation facilities while retaining access by operators and aircrew members to consultation, as necessary, with the meteorological office, in accordance with 9.9.4.

9.1.7 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.

9.1.8 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 meteorological office and the operator concerned. The service shall normally be confined to flights originating within the territory of the State concerned, unless otherwise agreed between the meteorological authority and the operator concerned. At an aerodrome without a meteorological office, arrangements for the supply of meteorological information shall be as agreed upon between the meteorological authority and the operator concerned.

9.2 Information for operators for pre-flight planning and for in-flight re-planning under centralized operational control

9.2.1 Meteorological information for pre-flight planning and in-flight re-planning by operators shall include the following information, as required:

- a) current and forecast upper winds, upper-air temperatures, tropopause heights and maximum wind information and amendments thereto;

- b) existing and expected significant en-route weather phenomena and jetstream information and amendments thereto;
- c) a forecast for take-off;
- d) reports in the METAR code form and, where available, reports in the SPECI code form for the aerodrome of departure, take-off and en-route alternate aerodromes, the aerodrome of intended landing and destination alternate aerodromes as determined by regional air navigation agreement;
- e) aerodrome forecasts and amendments thereto for the aerodromes of departure and intended landing, and for take-off, en-route and destination alternate aerodromes as determined by regional air navigation agreement; and
- f) SIGMET information and appropriate special air-reports relevant to the whole of the routes concerned as determined by regional air navigation agreement.

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

9.2.2 Recommendation.— Meteorological information for pre-flight planning and in-flight re-planning by operators for supersonic aircraft should include data covering the levels used for transonic and supersonic flight, together with the levels that may be used for subsonic flight. Particular mention should be made of occurrence and expected occurrence, location and vertical extent of cumulonimbus clouds, turbulence and precipitation.

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

9.2.4 When upper-air information is supplied in chart form, it shall consist of charts for standard isobaric surfaces and/or other types of upper-air charts as applicable.

9.2.5 Recommendation.— When upper-air information is supplied by WAFCs in grid point format it should be in the GRIB code form.

Note.— The GRIB code is contained in WMO Publication No. 306, Manual on Codes, Volume I.2, Part B — Binary Codes.

9.2.6 Recommendation.— The upper wind and upper-air temperature information and the significant en-route weather information requested for pre-flight planning and in-flight re-planning by the operator should normally be supplied as soon as it becomes available, but not later than 3 hours before

departure. Other meteorological information requested for pre-flight planning and in-flight re-planning by the operator should normally be supplied as soon as is practicable.

9.2.7 Recommendation.— Whenever it becomes apparent that the meteorological information to be included in the flight documentation will differ materially from that made available for pre-flight planning and in-flight re-planning, the operator should be advised immediately and, if practicable, be supplied with the revised information.

9.3 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 9.9.

9.3.1 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.

9.3.2 Meteorological information used for briefing and consultation shall include any or all of the information listed in 9.2.1.

9.3.3 Recommendation.— Briefing and/or consultation for flight crew members of supersonic aircraft should include meteorological information covering the flight levels of transonic and supersonic flight. Particular mention should be made of occurrence and expected occurrence, location and vertical extent of cumulonimbus clouds, turbulence and precipitation.

9.3.4 Recommendation.— Briefing and/or consultation for low-level flights, including those in accordance with the visual flight rules, should include meteorological information covering altitudes up to flight level 100 (or up to flight level 150 in mountainous areas or higher, where necessary). Particular mention should be made of the occurrence or expected occurrence of any phenomena causing widespread reduction of visibility to less than 5 000 m, as well as the occurrence or expected occurrence of clouds which may affect the flight.

9.3.5 If the meteorological office expresses an opinion on the development of the meteorological conditions at an aerodrome which differs appreciably from the aerodrome forecast included in the flight documentation, the attention of flight 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.

9.3.6 The required briefing, consultation, display and/or flight documentation shall normally be provided by the meteorological office associated with the aerodrome of departure. At an aerodrome where these services are not available, arrangements to meet the requirements of flight crew members shall be as agreed upon between the meteorological authority and the operator concerned. In exceptional circumstances, such as an undue delay, the meteorological office associated with the aerodrome shall provide or, if that is not practicable, arrange for the provision of a new briefing, consultation and/or flight documentation as necessary.

9.3.7 **Recommendation.**— *The flight crew member or other flight operations personnel for whom briefing, consultation and/or flight documentation has been requested should visit the meteorological office at the time agreed upon between the meteorological office and the operator concerned. Where local circumstances at an aerodrome make personal briefing or consultation impracticable, the meteorological office should provide those services by telephone or other suitable telecommunications facilities.*

9.3.8 To assist the flight crew members and others concerned with the preparation of the flight and for use in briefing and consultation at the aerodrome, the meteorological office shall display the latest available:

- a) reports in the METAR and SPECI code forms;
- b) aerodrome and landing forecasts;
- c) aerodrome warnings relating to the local aerodrome;
- d) forecasts for take-off;
- e) SIGMET and AIRMET information and special air-reports not covered by a SIGMET;
- f) current and prognostic charts;
- g) meteorological satellite images or mosaics and/or nephanalyses; and
- h) ground-based weather radar information.

9.3.9 **Recommendation.**— *The material displayed should be readily accessible to the flight crew members or other flight operations personnel concerned. By agreement between the meteorological authority and the user, the display may be used in lieu of briefing and/or consultation.*

9.4 Flight documentation — general

Note.— *The requirements for the use of automated pre-flight information systems in providing flight documentation are given in 9.9.*

9.4.1 **Recommendation.**— *Flight documentation should comprise information on:*

- a) upper winds and upper-air temperatures;
- b) expected significant en-route weather phenomena and, if relevant, tropopause heights and jetstreams;
- c) aerodrome forecasts;
- d) reports in the METAR and SPECI code forms for destination aerodromes and take-off, en-route and destination alternate aerodromes;

Note.— *The requirement to specify take-off alternate aerodromes is given in Annex 6, Part I, 4.3.4.1.1.*

- e) SIGMET information and appropriate special air-reports relevant to the whole of the routes concerned; and

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

- f) AIRMET information for low-level flights.

However, in accordance with regional air navigation agreement, or in the absence thereof when agreed between the meteorological authority and operators concerned, flight documentation for flights of two hours' duration or less, after a short stop or turnaround, may be limited to the information operationally needed, but in all cases the flight documentation should at least comprise information on c), d), e) and, if appropriate, f).

9.4.2 **Recommendation.**— *Meteorological offices should, as far as practicable, provide information received within the framework of the world area forecast system for flight documentation. The flight documentation should be presented in the form of charts, tabular forms, or abbreviated plain-language texts. Aerodrome forecasts should be presented in the TAF code, or in abbreviated plain-language text using a tabular presentation.*

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.*

9.4.3 **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 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 should be clear and simple and should present the name of the regional area forecast centre, the type of chart, date and valid time and if necessary the types of units used in an unambiguous way.

9.4.4 Recommendation.— Meteorological information included in flight documentation should be represented as follows:

- a) winds on charts should be depicted by arrows with feathers and shaded pennants on a sufficiently dense grid;
- b) temperatures should 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 should be depicted in a sufficiently dense latitude/longitude grid; and
- d) wind arrows should take precedence over temperatures and either should take precedence over chart background.

9.4.5 Recommendation.— For short-haul flights charts should be prepared covering limited areas at a scale of $1:15 \times 10^6$ as required and subject to regional air navigation agreement.

9.4.6 Recommendation.— The minimum number of charts for flights between flight level 250 and flight level 450 should include a high-level significant weather chart (flight level 250 to flight level 450) and a forecast 250 hPa wind and temperature chart. The actual charts provided for pre-flight and in-flight planning and for flight documentation should be as agreed between meteorological authorities and other users and the appropriate regional area forecast centre(s) concerned within a service area.

9.4.7 Recommendation.— The set of charts to be provided under the area forecast system for flights below

flight level 250 and for flights above flight level 450 including supersonic flights should be as agreed between user States and other users and the regional area forecast centre concerned within a service area.

9.4.8 Recommendation.— Flight documentation should normally be supplied as shortly before departure as is practicable.

9.4.9 Recommendation.— Whenever necessary and possible, the flight documentation should be brought up to date, in writing or orally, before it is supplied to flight crew members. In cases where a need for amendment arises after the flight documentation has been supplied, and before take-off of the aircraft, the meteorological office should, as agreed locally, issue the necessary amendment or updated information to the operator or to the local air traffic services unit, for transmission to the aircraft.

9.4.10 Recommendation.— In flight documentation height indications should 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, should preferably be expressed in flight levels; they may also be expressed in pressure-altitude, 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, should be expressed in height above the aerodrome elevation.

9.4.11 Recommendation.— The forms and charts included in flight documentation should be printed in English, French, Russian or Spanish; they should, wherever practicable, be completed in the language requested by the operator, preferably using one of those languages. Where appropriate, approved abbreviations should be used. The units employed for each element should be indicated; they should normally be those employed by the meteorological authority concerned.

9.4.12 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.

9.5 Flight documentation — upper wind and upper-air temperature information

9.5.1 Where upper wind and upper-air temperature information is supplied in chart form to flight crew members before departure, the charts shall be fixed time prognostic charts for standard isobaric surfaces. In tropical areas, or for

short flights, current charts may be provided in lieu of prognostic charts; in such cases, the levels depicted shall correspond to the standard isobaric levels.

9.5.2 Upper wind and upper-air temperature charts for low-level flights shall be supplied 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).

9.5.3 **Recommendation.**— *Where upper wind and upper-air temperature information is supplied in tabular form, it should include data for the same flight levels as for upper-air charts. This information should be given for spot locations on a regular grid.*

Note.— *Examples of the form of presentation of tabular forecasts of upper winds and upper-air temperatures are given in Appendix 1.*

9.6 Flight documentation — significant weather charts

9.6.1 Where information on significant en-route weather phenomena is supplied in chart form to flight crew members before departure, the charts shall be significant weather charts valid for a specified fixed time. Such charts shall show, as appropriate to the flight:

- a) thunderstorms;
- b) tropical cyclone;
- c) severe squall lines;
- d) moderate or severe turbulence (in cloud or clear air);
- e) moderate or severe icing;
- f) widespread sandstorm/duststorm;
- g) for flight level 100 to flight level 250, clouds associated with a) to f);
- h) above flight level 250, cumulonimbus cloud associated with a) to f);
- i) surface position of well-defined convergence zones;
- j) surface positions, speed and direction of movement of frontal systems when associated with significant en-route weather phenomena;
- k) tropopause heights;
- l) jetstreams;
- m) information on the location of volcanic eruptions which are producing ash clouds of significance to aircraft operations, including those producing only steam, comprising:

volcanic eruption symbol at the location of the volcano and, at the side of the chart, the volcanic eruption symbol, the name of the volcano, its international number, latitude/longitude, the date and time of first eruption, if known, and a reminder to users that reference should be made to SIGMETs and NOTAM or ASHTAM issued for the area concerned; and

- n) information on the location of an accidental release of radioactive materials into the atmosphere, of significance to aircraft operations, comprising: the radioactivity symbol at the site of the accident and, at the side of the chart, the radioactivity symbol, latitude/longitude of the site of the accident, date and time of the accident and a reminder to users to check NOTAM for the area concerned.

Note 1.— *For aircraft operating above flight level 250, items a) to f) are only required if expected to be above that level, and in the case of item a), only those thunderstorms which warrant the issuance of a SIGMET as given in 7.1.1 a). Guidance on the use of term “FRQ TS” is given in Appendix 5.*

Note 2.— *The abbreviation “CB” should only be included where it refers to the occurrence or expected occurrence of an area of widespread cumulonimbus clouds or cumulonimbus along a line with little or no space between individual clouds, or to cumulonimbus embedded in cloud layers or concealed by haze. It does not refer to isolated or scattered cumulonimbus not embedded in cloud layers or concealed by haze.*

Note 3.— *Where a volcanic eruption or the accidental release of radioactive materials into the atmosphere warrants the inclusion of the volcanic activity symbol or the radioactivity symbol on significant weather charts, the symbols are to be included on all such charts (low, medium and high) irrespective of the height to which the ash column or radioactive material is reported or expected to reach.*

Note 4.— *The international volcano number is allocated by the International Association of Volcanology and Chemistry of the Earth’s Interior (IAVCEI) and is listed in the Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds (Doc 9691).*

9.6.2 **Recommendation.**— *On significant weather charts, the inclusion of “CB” or the thunderstorm symbol should be understood to include all weather phenomena normally associated with cumulonimbus or thunderstorm, namely, moderate or severe icing, moderate or severe turbulence and hail.*

9.6.3 **Recommendation.**— *Significant weather charts 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 show, as appropriate to the flight:*

- a) the phenomena warranting the issuance of a SIGMET as given in 7.1.1 and which are expected to affect low-level flights; and

- b) the elements included in area forecasts for low-level flights as given in 6.6.3, except elements r) and u) concerning upper winds and upper-air temperatures and forecast lowest QNH, respectively.

Note 1.— Examples of the form of presentation of significant weather charts are given in Appendix 1.

Note 2.— Guidance on the use of terms “ISOL”, “OCNL” and “FRQ” referring to cumulonimbus clouds and thunderstorms is given in Appendix 5.

9.7 Flight documentation — aerodrome forecasts

9.7.1 The flight documentation shall in all cases include the aerodrome forecasts for the aerodrome of departure, and for the aerodrome of intended landing. In addition, the flight documentation shall include aerodrome forecasts for one or more suitable alternate aerodromes, as needed to complete the operational flight plan and as selected by agreement between the meteorological authority and the operators, and taken from the list of aerodromes contained in the relevant regional air navigation plan.

9.7.2 **Recommendation.**— By agreement between the meteorological authority and the operator, the flight documentation should include forecasts for a limited number of alternate aerodromes en route and of aerodromes where intermediate stops are planned. In such cases use should be made of available forecasts for regular aerodromes.

9.7.3 Aerodrome forecasts received from other meteorological offices shall be included in flight documentation without change in substance.

9.7.4 **Recommendation.**— When an aerodrome forecast is not received in time, the meteorological office associated with the aerodrome of departure should make all practicable efforts to obtain the forecast but, if unobtainable, the office should, if possible, prepare a provisional forecast. The meteorological office should inform the flight crew member that the forecast is provisional and record its origin in the flight documentation.

9.7.5 **Recommendation.**— Aerodrome forecasts should be presented in the TAF code form; they may also be presented in tabular form or in the form of an abbreviated plain-language text. Where presentation in the TAF code form is used, the location indicators and the abbreviations used should be explained in the flight documentation. If several aerodrome forecasts are included in the TAF code form, they should be presented in a manner which permits the ready identification of the beginning and end of each forecast.

Note.— Examples of the form of presentation of aerodrome forecasts are given in Appendix 1.

9.8 Flight documentation — supplementary charts and other forms of presentation

9.8.1 **Recommendation.**— Where flight documentation covering the significant en-route weather conditions is not supplied in chart form, it should be presented in tabular form and/or as an abbreviated plain-language text.

Note.— Examples of the form of presentation of tabular forecasts are given in Appendix 1.

9.8.2 **Recommendation.**— Where flight documentation is supplied in the form of an abbreviated plain-language text, it should cover the whole route to be flown. If such documentation covers more than one route, it should permit ready identification by the user of the information relevant to the route to be flown.

9.8.3 **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 9.5.2; and
- c) significant weather charts as given in 9.6.3.

9.8.4 **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) information included in the area forecasts for low-level flights as given in 6.6.3 or, where the forecasts are issued in the form of an abbreviated plain-language text, the GAMET area forecasts.

Note.— An example of the GAMET area forecast is given in Chapter 6.

9.9 Automated pre-flight information systems

9.9.1 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 in accordance with 9.1.6, the information supplied and displayed shall comply with the relevant provisions in 9.1 to 9.8 inclusive.

9.9.2 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 Annex 15, 3.1.1 c).*

Note.— *The meteorological and aeronautical information services information concerned is specified in Annex 3, 9.1 to 9.8 and Annex 15, 8.1 and 8.2, respectively.*

9.9.3 Where automated pre-flight information systems are used to provide for a harmonized, common point of access to meteorological information and aeronautical information services information by operators, flight crew members and other aeronautical personnel concerned, the 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.

Note.— *The responsibilities relating to aeronautical information services information and the quality assurance of the information are given in Annex 15, Chapter 3.*

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

9.9.5 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 the WMO, or based on a menu-driven user interface, or other appropriate mechanisms as agreed between the meteorological authority and operator 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 PANS-ABC (Doc 8400) and Location Indicators (Doc 7910). Aeronautical meteorological code data-type designators are given in WMO Publication No. 386, Manual on the Global Telecommunication System.*

9.10 Information for aircraft in flight

9.10.1 Meteorological information for use by aircraft in flight shall be supplied by a meteorological office to its associated air traffic services unit and through D-VOLMET or VOLMET broadcasts. 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.

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

9.10.3 Recommendation.— *Meteorological information should be supplied through D-VOLMET or VOLMET broadcasts as determined by regional air navigation agreement, and in accordance with the specifications of Chapter 11.*

9.10.4 Recommendation.— *If, in exceptional circumstances, an aircraft in flight requests meteorological information, the meteorological office which receives the request should arrange to supply the information with the assistance, if necessary, of another meteorological office.*

9.10.5 Recommendation.— *For supersonic aircraft in flight the meteorological office serving the aerodrome of intended landing should, on request by the operator, supply a forecast covering the transonic deceleration and subsonic descent phases. This forecast should be transmitted to the area control centre or flight information centre concerned within the two hours before arrival. The operator should advise the meteorological office, in good time, of the location of the descent path and of the time at which the aircraft is expected to commence the descent.*

9.10.6 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) meteorological reports, aerodrome forecasts and landing forecasts;*
- b) SIGMET and AIRMET information and special air-reports relevant to the flight, unless the latter have been the subject of a SIGMET message; and*
- c) upper wind and upper-air temperature information.*

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

10.1 Information for air traffic services units

10.1.1 The meteorological authority shall designate a meteorological office to be associated with each air traffic services unit. The associated meteorological office shall, after coordination with the air traffic services unit, supply, or arrange for the supply of up-to-date meteorological information to the unit as necessary for the conduct of its functions.

10.1.2 **Recommendation.**— *The associated meteorological office for an aerodrome control tower or approach control office should be an aerodrome meteorological office.*

10.1.3 The associated meteorological office for a flight information centre or an area control centre shall be a meteorological watch office.

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

10.1.5 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, routine reports in the METAR code form and special reports in the SPECI code form, including current pressure data, aerodrome and landing forecasts and amendments thereto, for the aerodrome concerned;
- b) SIGMET and AIRMET information, wind shear warnings and aerodrome warnings;
- c) any additional meteorological information agreed upon locally, such as forecasts of surface wind for the determination of possible runway changes; and
- 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.

10.1.6 The following meteorological information shall be supplied, as necessary, to an approach control office by its associated aerodrome meteorological office:

- a) local routine and special reports, routine reports in the METAR code form and special reports in the SPECI

code form, including current pressure data, aerodrome and landing forecasts and amendments thereto, for the aerodrome(s) with which the approach control office is concerned;

- b) SIGMET and AIRMET information, wind shear warnings and appropriate special air-reports for the airspace with which the approach control office is concerned and aerodrome warnings;
- c) any additional meteorological information agreed upon locally; and
- 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.

10.1.7 The following meteorological information shall be supplied, as necessary, to a flight information centre or an area control centre by its associated meteorological watch office:

- a) routine reports in the METAR code form and special reports in the SPECI code form, including current pressure data for aerodromes and other locations, aerodrome forecasts and landing 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; and

- e) information received concerning the accidental release of radioactive materials into the atmosphere, as agreed between the meteorological and ATS authorities concerned.

10.1.8 Volcanic ash advisory information issued by a VAAC shall be supplied to area control centres and flight information centres concerned in its area of responsibility.

10.1.9 Information received on pre-eruption volcanic activity and/or a volcanic eruption shall be supplied, as necessary, to an ATS unit by its corresponding associated meteorological office as agreed between the meteorological and ATS authorities concerned.

10.1.10 Any meteorological information requested by an air traffic services unit in connection with an aircraft emergency shall be supplied as rapidly as possible.

10.1.11 **Recommendation.**— *The information supplied to flight information centres and area control centres for supersonic aircraft should cover the levels used for transonic and supersonic flight and should include forecasts for subsonic descent paths to aerodromes in the flight information region.*

10.1.12 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.

10.1.13 **Recommendation.**— *Local routine and special reports, routine reports in the METAR code form and special reports in the SPECI code form, aerodrome and landing forecasts, SIGMET and AIRMET information, upper wind and upper-air temperature forecasts and amendments thereto should be supplied to air traffic services units in the form in which they are prepared, disseminated to other meteorological offices or received from other meteorological offices, unless otherwise agreed locally.*

10.1.14 **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.*

10.2 Information for search and rescue services units

10.2.1 Meteorological 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 estab-

lished by mutual agreement. For that purpose, the designated meteorological office shall maintain liaison with the search and rescue services unit throughout a search and rescue operation.

10.2.2 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.

10.2.3 **Recommendation.**— *On request from the rescue coordination centre, the designated meteorological office should arrange to obtain details of the flight documentation which was supplied to the missing aircraft, together with any amendments to the forecast which were transmitted to the aircraft in flight.*

10.2.4 **Recommendation.**— *To facilitate search and rescue operations the designated meteorological office should, on request, supply:*

- a) complete and detailed information on the current and forecast meteorological conditions in the search area; and
- b) current and forecast conditions en route, covering flights by search aircraft from and returning to the aerodrome from which the search is being conducted.

10.2.5 **Recommendation.**— *On request from the rescue coordination centre the designated meteorological office should supply, or arrange for the supply of meteorological information required by ships undertaking search and rescue operations.*

10.3 Information for aeronautical information services units

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

10.3.2 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 Annex 15, Appendix 1, Part 1, 3.5 and Part 3, 2.2, 2.11, 3.2 and 3.11.

- b) information necessary for the preparation of NOTAM or ASHTAM including, in particular, information on:

- 1) 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 Annex 15, 5.1.1 and 5.1.1.1;

- 2) the occurrence of volcanic activity;

Note.— The specific information required is given in 3.4.2 and 4.14 of this Annex.

- 3) accidental release of radioactive materials into the atmosphere, as agreed between the meteorological and appropriate civil aviation authorities concerned;

Note.— The specific information required is provided in 3.5.2 g).

- c) information necessary for the preparation of aeronautical information circulars including, in particular, information on:

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

CHAPTER 11. REQUIREMENTS FOR AND USE OF COMMUNICATIONS

Introductory Note.— It is recognized that it is for each Contracting State to decide upon its own internal organization and responsibility for implementing the telecommunications facilities referred to in this Chapter.

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 offices 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 and regional area forecast centres to supply the required world area forecast system products to meteorological offices, meteorological authorities and other users.

11.1.4 **Recommendation.**— *The telecommunications facilities used for the supply of world area forecast system products should be:*

- a) for world area forecast centres, the aeronautical fixed service; and*
- b) for regional area forecast centres, the aeronautical fixed service, except as otherwise determined by regional air navigation agreement.*

11.1.5 Telecommunications facilities between meteorological offices and, as necessary, aeronautical meteorological stations and aerodrome control towers or approach control offices 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.

11.1.6 **Recommendation.**— *Telecommunications facilities between meteorological offices and flight information centres, area control centres, rescue coordination centres and aeronautical telecommunications stations should permit:*

- a) communications by direct speech, the speed with which the communications can be established being such that the required points may normally be contacted within approximately 15 seconds; and*
- b) printed communications, when a record is required by the recipients; the message transit time should not exceed 5 minutes.*

Note.— In 11.1.5 and 11.1.6 “approximately 15 seconds” refers to telephony communications involving switchboard operation and “5 minutes” refers to printed communications involving retransmission.

11.1.7 **Recommendation.**— *The telecommunications facilities required in accordance with 11.1.5 and 11.1.6 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.*

11.1.8 **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.*

11.1.9 Suitable telecommunications facilities shall be made available to permit meteorological offices to exchange operational meteorological information with other meteorological offices.

11.1.10 **Recommendation.**— *The telecommunications facilities used for the exchange of operational meteorological information should be the aeronautical fixed service.*

Note.— Circuits of the aeronautical fixed service are used for the collection and regional and inter-regional exchanges of operational meteorological information as well as for access to international operational meteorological data banks. Three aeronautical fixed service satellite distribution systems providing for global coverage are used to support the regional and inter-regional exchanges of operational meteorological information. Provisions relating to the satellite distribution systems are given in Annex 10, Volume III, Part 1, 10.1 and 10.2.

11.1.11 **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 aerodrome forecasts and corrections to aerodrome forecasts 5 minutes

Reports in the METAR code form	}	0-900 km	5 minutes
Trend-type landing forecasts		(500 NM)	
Aerodrome forecasts		more than 900 km	
Reports in the SPECI code form		(500 NM) 10 minutes	

WINTEN messages 15 minutes

Abbreviated plain-language significant weather forecast messages 15 minutes

11.1.12 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.*

11.1.13 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 or regional area forecast centre concerned, the meteorological authority and the operators.*

11.2 Use of aeronautical fixed service communications — meteorological bulletins in alphanumeric format

11.2.1 Meteorological bulletins containing operational meteorological information to be transmitted via the aeronautical fixed service 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 Annex 10, Volume II, Chapter 4, together with the relevant priorities and priority indicators.*

11.2.2 Recommendation.— *Whenever possible, exchanges of operational meteorological information should be made in consolidated bulletins of the same types of meteorological information.*

11.2.3 Recommendation.— *Meteorological bulletins required for scheduled transmissions should be filed regularly and at the prescribed scheduled times. Reports in the METAR code form should be filed for transmission not later than 5 minutes after the actual time of observation. Aerodrome forecasts should be filed for transmission at least one hour before the commencement of their period of validity, unless otherwise determined by regional air navigation agreement.*

11.2.4 Meteorological bulletins containing operational meteorological information to be transmitted via the aeronautical fixed service facilities shall contain a heading consisting of:

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

Note 1.— *Detailed specifications on format and contents of the heading are given in the WMO Manual on the Global Telecommunications System, Volume I and are reproduced in the Manual of Aeronautical Meteorological Practice (Doc 8896).*

Note 2.— *ICAO location indicators are listed in Doc 7910, Location Indicators.*

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

11.3 Use of aeronautical fixed service communications — world area forecast system products

11.3.1 Recommendation.— *World area forecast system products in grid point or chart forms should be transmitted using binary data communications or digital facsimile techniques. The method and channels used for the dissemination of the products should be as determined by regional air navigation agreement.*

11.3.2 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.*

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

11.3.4 Meteorological bulletins containing WAFS products in digital form to be transmitted via aeronautical fixed service facilities shall contain a heading as given in 11.2.4.

11.4 Use of aeronautical mobile service communications

11.4.1 The contents and format of reports, forecasts and SIGMET information transmitted to aircraft shall be consistent with the provisions of Chapters 4, 6 and 7 of this Annex.

11.4.2 **Recommendation.**— *The contents and format of air-reports transmitted by aircraft should be consistent with the provisions of Chapter 5 of this Annex and of PANS-ATM (Doc 4444), Appendix 1.*

11.4.3 The substance of a meteorological bulletin transmitted via the aeronautical mobile service shall remain unchanged from that contained in the bulletin as originated.

11.5 Use of aeronautical data link service — contents of D-VOLMET

11.5.1 D-VOLMET shall contain current reports in the METAR and SPECI code forms, together with trend forecasts where available, aerodrome forecasts, SIGMET messages, special air-reports not covered by a SIGMET and, where available, AIRMET messages.

Note.— *The requirement to provide current reports in the METAR and SPECI code forms may be met by the data link flight information service (D-FIS) application entitled “Data link-Aviation routine weather report (D-METAR) service”; the requirement to provide aerodrome forecasts 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 Manual of Air Traffic Services Data Link Applications (Doc 9694).*

11.5.2 **Recommendation.**— *The aerodromes for which reports and forecasts are to be available for uplink to aircraft in flight should be determined by regional air navigation agreement.*

11.5.3 **Recommendation.**— *The flight information regions for which SIGMET and AIRMET messages are to be available for uplink to aircraft in flight should be determined by regional air navigation agreement.*

11.5.4 **Recommendation.**— *The latest available reports in the METAR and SPECI code forms, forecasts and SIGMET and AIRMET messages should be used for uplink to aircraft in flight.*

11.5.5 **Recommendation.**— *Aerodrome forecasts included in the D-VOLMET should be amended as necessary to ensure that a forecast, when made available for uplink to aircraft in flight, reflects the latest opinion of the meteorological office concerned.*

11.5.6 **Recommendation.**— *If no SIGMET message is available for a flight information region, an indication of “NIL SIGMET” should be included in the D-VOLMET.*

11.5.7 **Recommendation.**— *The contents and format of reports, forecasts and SIGMET and AIRMET information included in D-VOLMET should be consistent with the provisions of Chapters 4, 6 and 7 of this Annex, as applicable to reports issued in the METAR /SPECI code forms.*

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 reports in the METAR and SPECI code forms, together with trend forecasts where available.

11.6.2 Scheduled VOLMET broadcasts, normally on high frequencies (HF), shall contain current reports in the METAR and SPECI code forms, with trend parts where available and, where so determined by regional air navigation agreement, aerodrome forecasts.

11.6.3 **Recommendation.**— *The aerodromes for which reports and forecasts are to be included in VOLMET broadcasts, the sequence in which they are to be transmitted and the broadcast time should be determined by regional air navigation agreement.*

11.6.4 **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.*

11.6.5 **Recommendation.**— *Aerodrome forecasts included in scheduled VOLMET broadcasts should have a period of validity of 9 hours; they should be issued every 3 hours and should, between these routine issues, be amended as necessary to ensure that a forecast, when transmitted, reflects the latest opinion of the meteorological office concerned.*

11.6.6 **Recommendation.**— *SIGMET messages should be included in scheduled VOLMET broadcasts if determined by regional air navigation agreement. Where this is done, the SIGMET message or an indication of “NIL SIGMET” should be transmitted at the beginning of the broadcast or of a five-minute time block.*

11.6.7 **Recommendation.**— *The contents and format of reports, forecasts and SIGMET information included in VOLMET broadcasts should be consistent with the provisions*

of Chapters 4, 6 and 7 of this Annex, as applicable to bulletins disseminated beyond the aerodrome of origin.

11.6.8 **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 Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services (Doc 9377), Appendix 1.*

APPENDIX 1. FLIGHT DOCUMENTATION — MODEL CHARTS AND FORMS

(See 9.4 to 9.8 of this Annex)

MODEL A	— Aerodrome forecasts Example 1 — Tabular form Example 2 — TAF code form
MODEL TA	— Tabular forecast of en-route conditions Example 1 — Low level Example 2 — Medium/high level
MODEL TB	— Tabular forecast of upper winds and upper-air temperatures Example 1 — Spot locations Example 2 — Grid mesh
MODEL IS	— Upper wind and temperature chart for standard isobaric surface Example 1 — Arrows and feathers (Mercator projection) Example 2 — Arrows and feathers (Polar stereographic projection)
MODEL SWH	— Significant weather chart (high level) Example 1 — Mercator projection Example 2 — Polar stereographic projection
MODEL SWM	— Significant weather chart (medium level)
MODEL SWL	— Significant weather chart (low level) Example 1 Example 2
MODEL VAG	— Volcanic ash advisory information in graphical format
MODEL SN	— Sheet of notations used in flight documentation

Model A. Aerodrome forecasts
Example 1 — Tabular form

ISSUED BYMETEOROLOGICAL OFFICE										DATE		TIME (UTC)	
HEIGHTS ABOVE AERODROME ELEVATION													
Aerodrome	Period of validity (UTC)	Type and time of change	Surface wind mean direction (degrees true) mean wind speed maximum wind speed	Surface visibility (minimum)	Significant weather	Cloud		Forecast temperature (degrees Celsius)	Remarks				
						Lowest layer amount, height of base (feet) and type (if CB)	Higher layers amount, height of base (feet) and type (if CB)						
MOMBASA	06–06	TEMPO 09–12	150/15 KT VRB/20 KT MAX 30 KT	10 KM 200 M	HVY SHRA	FEW 1500 SCT 1000 CB	BKN 1500	MAX 30 AT 1200Z MIN 20 AT 0400Z					
NAIROBI	03–15	PROB 40 TEMPO 03–05 BECMG 05–06	060/05 KT VRB/03 KT 060/10 KT	2 000 M 500 M 10 KM	FG NSW	OVC 0200 SCT 1500		N/A	EXTRACTED FROM TAF 00–24				
KHARTOUM	12–18	PROB 30 TEMPO 12–15	030/05 KT 030/20 KT	10 KM 100 M	MOD BLSA	SCT 2500		MAX 30 AT 1300 Z	EXTRACTED FROM TAF 06–06				
CAIRO	06–06		060/10 KT		C A V O K			MAX 25 AT 1400 Z MIN 06 AT 0500 Z					
ROME	12–06	FM 1400 FM 1800	270/10 KT 270/10 KT 330/15 KT	2 000 M 5 000 M 10 KM	HVY DZRA MOD RA NSW	BKN 500 BKN 1200 BKN 2500	OVC 1500 OVC 2000	MAX 06 AT 1500 Z MIN MS 02 AT 0400 Z	TAF 06–06 AMENDED				

Model A. Aerodrome forecasts**Example 2 — TAF code form**

ISSUED BY METEOROLOGICAL OFFICE (DATE, TIME UTC)																																												
<p>INTENSITY</p> <p>“–” (light); no indicator (moderate); “+” (heavy, or well-developed in the case of dust/sand whirls (dust devils) and funnel clouds) are used to indicate the forecast intensity of certain phenomena</p> <p>DESCRIPTORS</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">MI — shallow</td> <td style="width: 25%;">DR — low drifting</td> <td style="width: 25%;">SH — shower(s)</td> <td style="width: 25%;">FZ — freezing (supercooled)</td> </tr> <tr> <td>BC — patches</td> <td>BL — blowing</td> <td>TS — thunderstorm</td> <td></td> </tr> <tr> <td>PR — partial</td> <td></td> <td></td> <td></td> </tr> </table> <p>FORECAST WEATHER ABBREVIATIONS</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">DZ — drizzle</td> <td style="width: 33%;">BR — mist</td> <td style="width: 33%;">PO — dust/sand whirls (dust devils)</td> </tr> <tr> <td>RA — rain</td> <td>FG — fog</td> <td>SQ — squall</td> </tr> <tr> <td>SN — snow</td> <td>FU — smoke</td> <td>FC — funnel cloud(s) (tornado or waterspout)</td> </tr> <tr> <td>SG — snow grains</td> <td>VA — volcanic ash</td> <td>SS — sandstorm</td> </tr> <tr> <td>IC — ice crystals (diamond dust)</td> <td>DU — widespread dust</td> <td>DS — duststorm</td> </tr> <tr> <td>PL — ice pellets</td> <td>SA — sand</td> <td></td> </tr> <tr> <td>GR — hail</td> <td>HZ — haze</td> <td></td> </tr> <tr> <td>GS — small hail and/or snow pellets</td> <td></td> <td></td> </tr> </table> <p>EXAMPLES</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">+SHRA — heavy shower of rain</td> <td style="width: 50%;">TSSN — moderate thunderstorm with snow</td> </tr> <tr> <td>FZDZ — moderate freezing drizzle</td> <td>SNRA — moderate snow and rain</td> </tr> <tr> <td>+TSSNGR — heavy thunderstorm with snow and hail</td> <td></td> </tr> </table>			MI — shallow	DR — low drifting	SH — shower(s)	FZ — freezing (supercooled)	BC — patches	BL — blowing	TS — thunderstorm		PR — partial				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	SS — sandstorm	IC — ice crystals (diamond dust)	DU — widespread dust	DS — duststorm	PL — ice pellets	SA — sand		GR — hail	HZ — haze		GS — small hail and/or snow pellets			+SHRA — heavy shower of rain	TSSN — moderate thunderstorm with snow	FZDZ — moderate freezing drizzle	SNRA — moderate snow and rain	+TSSNGR — heavy thunderstorm with snow and hail	
MI — shallow	DR — low drifting	SH — shower(s)	FZ — freezing (supercooled)																																									
BC — patches	BL — blowing	TS — thunderstorm																																										
PR — partial																																												
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	SS — sandstorm																																										
IC — ice crystals (diamond dust)	DU — widespread dust	DS — duststorm																																										
PL — ice pellets	SA — sand																																											
GR — hail	HZ — haze																																											
GS — small hail and/or snow pellets																																												
+SHRA — heavy shower of rain	TSSN — moderate thunderstorm with snow																																											
FZDZ — moderate freezing drizzle	SNRA — moderate snow and rain																																											
+TSSNGR — heavy thunderstorm with snow and hail																																												
<p>SELECTED ICAO LOCATION INDICATORS</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">CYUL Montreal Intl/Dorval</td> <td style="width: 33%;">KJFK New York/John F. Kennedy Intl</td> <td style="width: 33%;">RJTT Tokyo Intl</td> </tr> <tr> <td>EDDF Frankfurt/Main</td> <td>LFPG Paris/Charles de Gaulle</td> <td>SBGL Rio de Janeiro Intl/Galeão</td> </tr> <tr> <td>EGLL London/Heathrow</td> <td>NZAA Auckland Intl</td> <td>YSSY Sydney/Kingsford Smith Intl</td> </tr> <tr> <td>HKNA Nairobi/Jomo Kenyatta Intl</td> <td>OBBI Bahrain Intl</td> <td>ZBAA Beijing/Capital</td> </tr> </table>			CYUL Montreal Intl/Dorval	KJFK New York/John F. Kennedy Intl	RJTT Tokyo Intl	EDDF Frankfurt/Main	LFPG Paris/Charles de Gaulle	SBGL Rio de Janeiro Intl/Galeão	EGLL London/Heathrow	NZAA Auckland Intl	YSSY Sydney/Kingsford Smith Intl	HKNA Nairobi/Jomo Kenyatta Intl	OBBI Bahrain Intl	ZBAA Beijing/Capital																														
CYUL Montreal Intl/Dorval	KJFK New York/John F. Kennedy Intl	RJTT Tokyo Intl																																										
EDDF Frankfurt/Main	LFPG Paris/Charles de Gaulle	SBGL Rio de Janeiro Intl/Galeão																																										
EGLL London/Heathrow	NZAA Auckland Intl	YSSY Sydney/Kingsford Smith Intl																																										
HKNA Nairobi/Jomo Kenyatta Intl	OBBI Bahrain Intl	ZBAA Beijing/Capital																																										
<table style="width: 100%; border: none;"> <tr> <td style="width: 15%;">RJTT</td> <td style="width: 15%;">122130Z</td> <td style="width: 70%;">130024 VRB03KT 4000 SCT025 BECMG 0305 9999 T30/12Z T20/06Z =</td> </tr> <tr> <td>EGLL</td> <td>090845Z</td> <td>091212 27010KT 9999 SCT020 BKN080 FM2100 30015KT 3000 FZDZ BKN006 OVC060 FM0000 30015KT 0800 +RASN BKN004 OVC060 BECMG 0305 33020KT 5000 NSW SCT020 BKN100 BECMG 0709 9999 =</td> </tr> <tr> <td>LFPG</td> <td>160910Z</td> <td>161212 10008KT CAVOK FM2000 VRB03KT 8000 SCT012 FM0400 VRB03KT 0800 FG FM0900 10008KT CAVOK =</td> </tr> <tr> <td>OBBI</td> <td>030300Z</td> <td>030624 03010KT 9999 SCT010 PROB30 TEMPO 0915 03030KT 0500 BLSA FM1800 VRB02KT 8000 SCT020 =</td> </tr> <tr> <td>HKNA</td> <td>280215Z</td> <td>280624 06010KT 9999 SCT025 TEMPO 1216 3000 SHRA BKN015 PROB40 TEMPO 1416 VRB20G30KT +TSRA SCT010CB BKN015 =</td> </tr> </table>			RJTT	122130Z	130024 VRB03KT 4000 SCT025 BECMG 0305 9999 T30/12Z T20/06Z =	EGLL	090845Z	091212 27010KT 9999 SCT020 BKN080 FM2100 30015KT 3000 FZDZ BKN006 OVC060 FM0000 30015KT 0800 +RASN BKN004 OVC060 BECMG 0305 33020KT 5000 NSW SCT020 BKN100 BECMG 0709 9999 =	LFPG	160910Z	161212 10008KT CAVOK FM2000 VRB03KT 8000 SCT012 FM0400 VRB03KT 0800 FG FM0900 10008KT CAVOK =	OBBI	030300Z	030624 03010KT 9999 SCT010 PROB30 TEMPO 0915 03030KT 0500 BLSA FM1800 VRB02KT 8000 SCT020 =	HKNA	280215Z	280624 06010KT 9999 SCT025 TEMPO 1216 3000 SHRA BKN015 PROB40 TEMPO 1416 VRB20G30KT +TSRA SCT010CB BKN015 =																											
RJTT	122130Z	130024 VRB03KT 4000 SCT025 BECMG 0305 9999 T30/12Z T20/06Z =																																										
EGLL	090845Z	091212 27010KT 9999 SCT020 BKN080 FM2100 30015KT 3000 FZDZ BKN006 OVC060 FM0000 30015KT 0800 +RASN BKN004 OVC060 BECMG 0305 33020KT 5000 NSW SCT020 BKN100 BECMG 0709 9999 =																																										
LFPG	160910Z	161212 10008KT CAVOK FM2000 VRB03KT 8000 SCT012 FM0400 VRB03KT 0800 FG FM0900 10008KT CAVOK =																																										
OBBI	030300Z	030624 03010KT 9999 SCT010 PROB30 TEMPO 0915 03030KT 0500 BLSA FM1800 VRB02KT 8000 SCT020 =																																										
HKNA	280215Z	280624 06010KT 9999 SCT025 TEMPO 1216 3000 SHRA BKN015 PROB40 TEMPO 1416 VRB20G30KT +TSRA SCT010CB BKN015 =																																										

Model TA. Tabular forecast of en-route conditions
Example 1 — Low level

DATE		HEIGHTS IN FEET ABOVE MSL	
ROUTE FROM BIGGIN HILL		TO AMSTERDAM VIA AIRWAYS	
VALID FOR DEPARTURE BETWEEN 1500		UTC AND 1700 UTC AND	
FOR ARRIVAL BETWEEN 1700		UTC AND 2100 UTC	
SPECIAL FEATURES OF THE METEOROLOGICAL SITUATION: ACTIVE COLD FRONT FROM HUMBER TO CHANNEL ISLES AT 1000 UTC MOVING EAST AT 20 KNOTS TO LIE NORTH/SOUTH ACROSS TRACK ABOUT 40 NM WEST OF AMSTERDAM BY 1900 UTC.			
ZONE	LONDON	02° E	AMSTERDAM
UPPER WINDS (DEGREES TRUE AND KNOTS) 10 000 ft TEMPERATURES 5 000 ft (DEGREES CELSIUS) 2 000 ft	280/30 MS 12 290/25 MS 03 290/20 PS 03		250/45 MS 09 240/35 00 230/30 PS 06
CLOUD	SCT CU <u>XXX</u> 1500		ISOL EMBD CB <u>XXX</u> 1000
	BKN SC <u>10 000</u> 2500		BKN ST <u>800</u> 500
	BKN AC LYR <u>XXX</u> 12 000		OVC SC <u>XXX</u> AS LYR 2000
SURFACE VISIBILITY	1500 M IN SHOWERS		4000 M IN MODERATE RAIN AND 1000 M IN THUNDERSTORMS
SIGNIFICANT WEATHER	MODERATE OCNL <u>10 000</u> SEVERE ICING 3500		ISOL THUNDERSTORMS MODERATE OCNL <u>XXX</u> SEVERE ICING 5000 MODERATE OCNL SEVERE TURBULENCE IN <u>XXX</u> FRONTAL ZONE 1000
HEIGHT OF 0°C ISOTHERM	3500		5000
FORECAST LOWEST QNH (hPa)	1008		1004

Issued by at UTC on 19 by Forecaster.

- Notes:**
1. Positive and negative values are indicated by the prefix "PS" (plus) and "MS" (minus) respectively.
 2. When a single numerical value of an element is given in a forecast it is to be interpreted as representing the most probable mean of a range of values which the element may assume during the period of the forecast.

Abbreviations: SKC — 0 oktas, FEW — 1 to 2 oktas, SCT — 3 to 4 oktas, BKN — 5 to 7 oktas, OVC — 8 oktas, LYR — Layered, LOC — Locally, ISOL — Isolated, OCNL — Occasional, FRQ — Frequent, EMBD — Embedded.

Model TA. Tabular forecast of en-route conditions
Example 2 — Medium/high level

DATE				HEIGHTS IN PRESSURE ALTITUDE IN HUNDREDS OF FEET			
ROUTE FROM ... BIGGIN HILL ...				TO ... AMSTERDAM ...		VIA ... AIRWAYS ...	
VALID FOR DEPARTURE BETWEEN ... 1500 ... UTC AND ... 1700 ... UTC AND				FOR ARRIVAL BETWEEN ... 1700 ... UTC AND ... 2100 ... UTC			
SPECIAL FEATURES OF THE METEOROLOGICAL SITUATION (SURFACE CENTRES AND FRONTS): ACTIVE COLD FRONT FROM HUMBER TO CHANNEL ISLES AT 1000 UTC MOVING EAST AT 20 KNOTS TO LIE NORTH/SOUTH ACROSS TRACK ABOUT 40 NM WEST OF AMSTERDAM BY 1900 UTC.							
ZONE		LONDON		02° E		AMSTERDAM	
UPPER WINDS (DEGREES TRUE AND KNOTS)	FL 300	250/50 MS 52		230/65 MS 50			
TEMPERATURES (DEGREES CELSIUS)	FL 240	260/40 MS 40		240/60 MS 36			
	FL 180	270/35 MS 26		240/50 MS 24			
	FL 100	280/30 MS 12		250/45 MS 09			
SIGNIFICANT WEATHER AND ASSOCIATED CLOUD		MODERATE TURBULENCE <u>180</u> XXX		ISOL THUNDERSTORMS <u>300</u> MODERATE TO SEVERE XXX ICING AND TURBULENCE			
* TROPOPAUSE HEIGHT		_____		_____			
* JET STREAM		_____		_____			

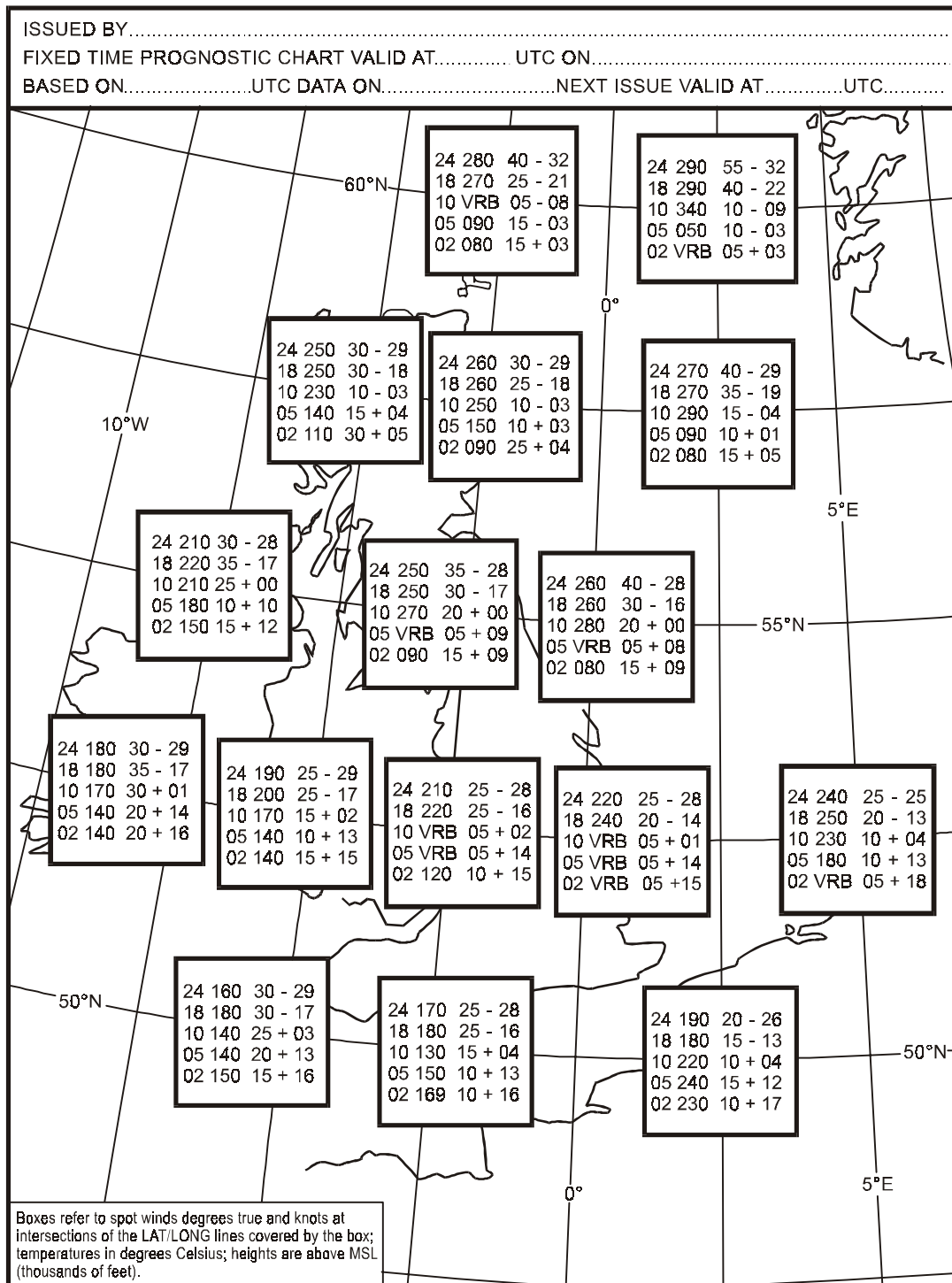
* Above planned cruise level if not specified.

Issued by at UTC on 19 by Forecaster.

- Notes:**
1. Pressure altitude is the height in feet of a level in the standard atmosphere above the datum level corresponding to a pressure of 1013.2 hPa.
 2. Positive and negative values are indicated by the prefix "PS" (plus) and "MS" (minus) respectively.
 3. Only cloud associated with significant weather is shown. Low stratus and fog, when expected, will be shown for terminal areas in appropriate aerodrome forecasts.
 4. When a single numerical value of an element is given in a forecast, it is to be interpreted as representing the most probable mean of a range of values which the element may assume during the period of the forecast.

Abbreviations: SKC — 0 oktas, FEW — 1 to 2 oktas, SCT — 3 to 4 oktas, BKN — 5 to 7 oktas, OVC — 8 oktas, Lyr — Layered, LOC — Locally, ISOL — Isolated, OCNL — Occasional, FRQ — Frequent, EMBD — Embedded.

Model TB. Tabular forecast of upper winds and upper-air temperatures
Example 1 — Spot locations

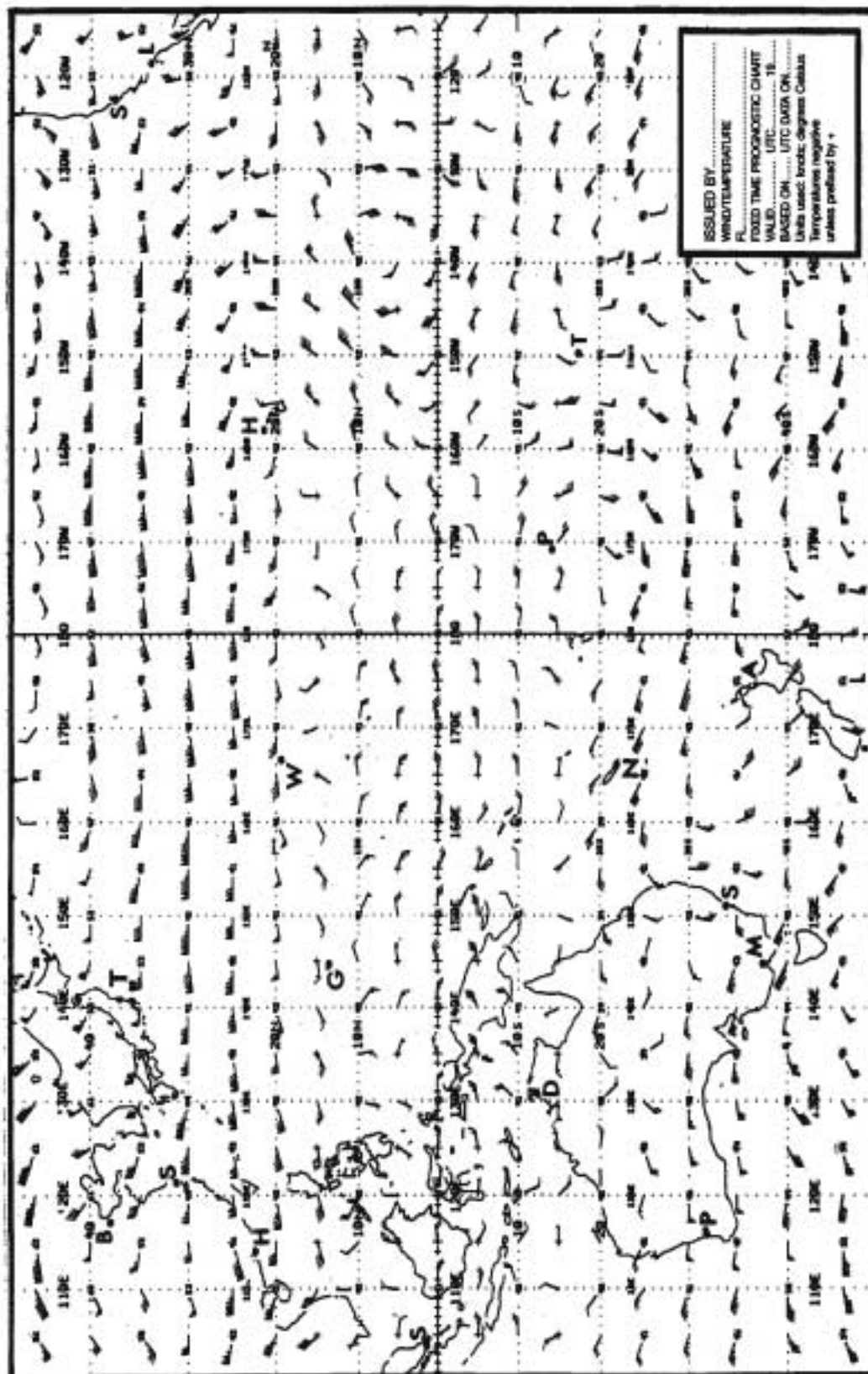


Model TB. Tabular forecast of upper winds and upper-air temperatures
Example 2 — Grid mesh (from WITEM)

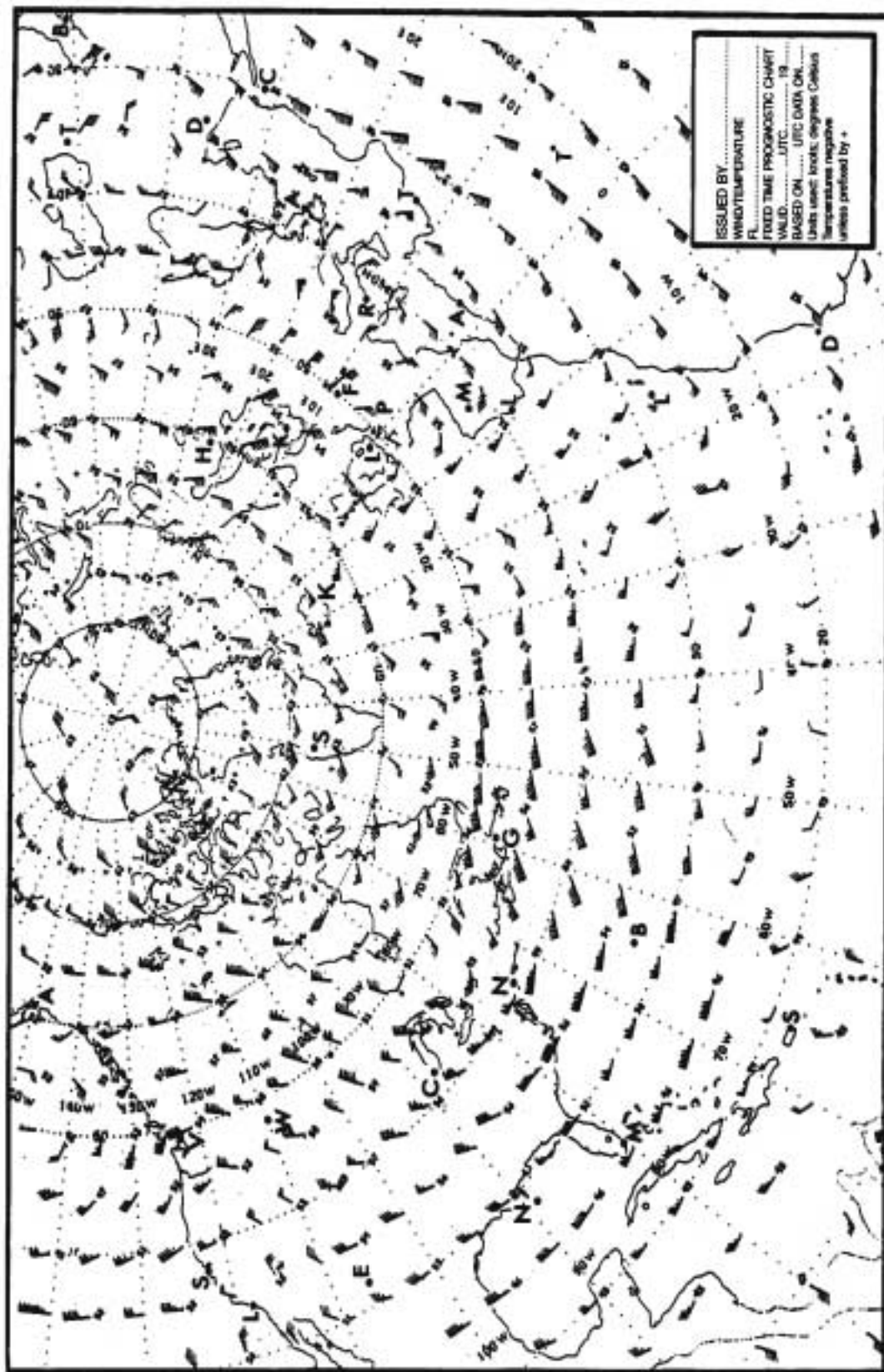
GRID POINT FORECAST		DATA PRESENTATION	
ISSUED BY		FL of tropopause	Legend
At UTC		FL, dd, fff, of maximum wind	FL = Flight level
Valid UTC		dd, fff, MTT FL450/150 hPa	dd = wind direction (tens of degrees)
Based on UTC data on		dd, fff, MTT FL390/200 hPa	fff = wind speed (knots)
		dd, fff, MTT FL340/250 hPa	TT = temperature (°C) preceded by M or P as appropriate
		dd, fff, MTT FL300/300 hPa	
		dd, fff, MTT FL240/400 hPa	
		dd, fff, MTT FL180/500 hPa	
		Forecast values apply to centre points of 5°C squares of superimposed grid	

10°S	540	540	550	550	550	540	540	530	530	10°S
	43006020	42002015	39031020	37030030	39030030	37030030	36032030	37033025	37035020	
	06015M66	08010M66	10010M66	35005M66	31010M66	18010M66	16015M66	15015M66	12015M67	
	35010M56	35010M55	31020M58	30025M57	30020M57	29020M58	32020M58	34020M59	36015M59	
	02010M44	01010M44	31015M44	31025M45	31025M45	31020M45	33020M46	33020M45	32010M45	
	33005M34	30005M34	36005M33	36010M34	29020M34	32025M34	34025M34	30020M33	28015M33	
	35005M18	35005M18	33010M18	34010M18	28020M19	28020M18	29015M19	31015M18	31010M18	
	20005M06	23005M06	21005M06	34005M07	04005M07	34005M07	32005M07	35010M06	04015M06	
	480	500	540	550	550	540	540	520	520	
	40032025	39032020	39024020	37038045	38027050	39027050	38027060	38030060	38029050	
	32020M64	29015M65	25005M66	21005M66	25010M66	26020M85	25025M65	26025M65	24015M65	
	33025M56	32020M56	29020M56	28040M57	27045M58	27050M58	28050M59	30055M58	30040M58	
	30020M44	29020M45	28020M45	28040M45	28040M45	27040M45	29050M46	30055M45	29045M42	
	29025M33	29015M33	28015M33	28050M34	28045M34	28040M34	29050M35	29055M34	28060M32	
	29020M18	28015M18	31010M18	29030M19	27025M19	27020M20	26035M19	28040M19	30040M17	
20°S	29015M07	28010M06	35010M06	32015M07	23010M08	23005M09	23030M08	26035M07	33035M06	20°S
	460	480	500	520	520	500	480	460	460	
	36029100	38032065	38030055	38028040	38028060	38028055	38025110	37027130	32027150	
	31060M61	31040M64	29040M65	26030M66	26045M66	26040M65	27050M64	27070M62	27075M61	
	31080M54	32060M57	30050M57	27035M57	26055M58	26050M58	28075M57	28095M53	27110M53	
	29095M41	30055M45	30045M46	28030M45	26050M44	27045M47	26090M43	28100M38	28100M40	
	30095M34	28060M34	29050M34	28035M34	26050M34	27050M35	26100M33	27100M31	30095M34	
	30065M20	30040M19	30035M19	29025M19	25035M20	25035M21	24080M21	27075M21	31080M20	
	31045M00	31030M08	31025M07	29020M08	25020M10	22030M10	23070M11	26055M13	30080M13	
	390	410	430	450	410	400	390	320	300	
	37031170	39031125	39031090	38028070	39026080	38024115	38022140	31026100	29030150	
	29110M56	30095M60	30065M63	27060M64	26050M63	25065M63	25080M62	25065M55	28070M51	
	29050M52	31125M54	31090M56	28065M58	26080M57	24110M58	25115M56	26085M48	30140M47	
	30155M42	30120M45	31080M47	30055M48	25070M49	24110M50	24120M43	25080M41	30145M45	
	30145M37	30115M37	30080M37	30060M36	25065M38	24105M38	24110M33	26080M37	30135M42	
	30115M26	31090M24	30060M23	29045M22	25040M24	23075M24	22085M24	24050M29	29080M31	
30°S	30090M17	32075M15	31045M12	28035M11	25020M12	22050M14	21070M14	20040M22	28040M24	30°S
	320	350	400	430	400	390	360	280	260	
	31030160	30031150	37031170	39029110	37024120	37022145	31022115	31023070	26031075	
	29105M50	30110M57	30105M61	28090M62	27080M62	26085M63	23070M60	24035M54	29035M50	
	30150M49	31140M55	30130M54	29110M57	24115M60	22140M61	23105M57	23060M48	32070M48	
	30135M44	31150M47	30135M48	29100M52	24115M54	22140M53	23110M47	23065M45	31060M49	
	30120M41	31135M41	30095M40	30070M41	23080M43	20130M41	22100M39	22065M46	31050M48	
	29085M32	32100M29	31080M27	31045M26	23040M28	20080M28	20085M29	20050M33	27015M34	
	29060M25	33080M20	31065M18	32025M15	25010M17	20045M19	18060M22	18030M24	19025M23	
	290	340	360	380	370	350	300	280	280	
	28029105	31032140	35031155	27029130	36027120	35022120	28018120	26019060	27020040	
	27045M50	30075M56	30095M59	30090M61	28085M62	26070M61	23040M59	23035M54	27025M51	
	29105M50	31135M57	31135M56	29120M60	26105M64	22105M62	22095M58	21045M52	27020M49	
	29100M51	31135M54	31120M56	31105M59	26095M60	21110M58	22105M54	21045M53	27025M49	
	29080M48	32135M47	32105M48	31080M47	25075M47	20105M47	21090M45	19045M40	22025M50	
	31035M36	33095M33	33085M33	32065M31	28040M32	20065M32	19080M32	18055M35	20030M36	
40°S	02015M26	34065M23	34070M21	33055M20	30020M21	21035M21	19065M23	18040M25	19035M25	40°S
					370	370	320	300	300	
					36027100	33024070	31020050	29016050	29014040	
					28080M60	26065M60	25045M59	26025M56	24020M53	
					28090M66	24065M64	22045M61	19020M58	19015M53	
					27070M65	23055M63	20040M59	17035M56	16020M54	
					28060M52	23045M52	20040M50	16040M52	14030M53	
					29050M35	25035M35	20035M35	16045M37	14035M38	
					31045M22	25030M23	20035M24	16045M26	15035M27	
110°E	120°E	130°E	140°E	150°E						

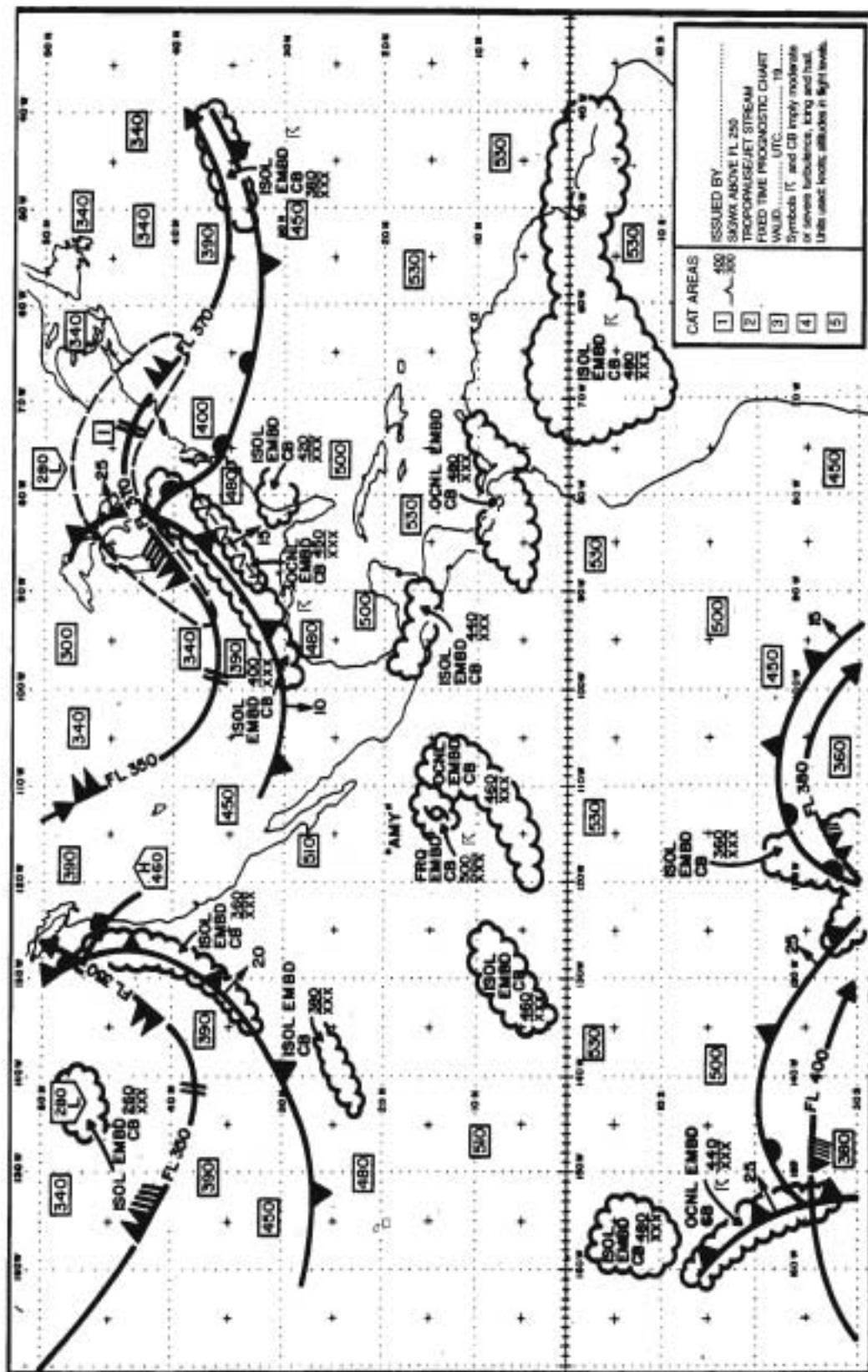
Model IS. Upper wind and temperature chart for standard isobaric surface
Example 1 — Arrows and feathers (Mercator projection)



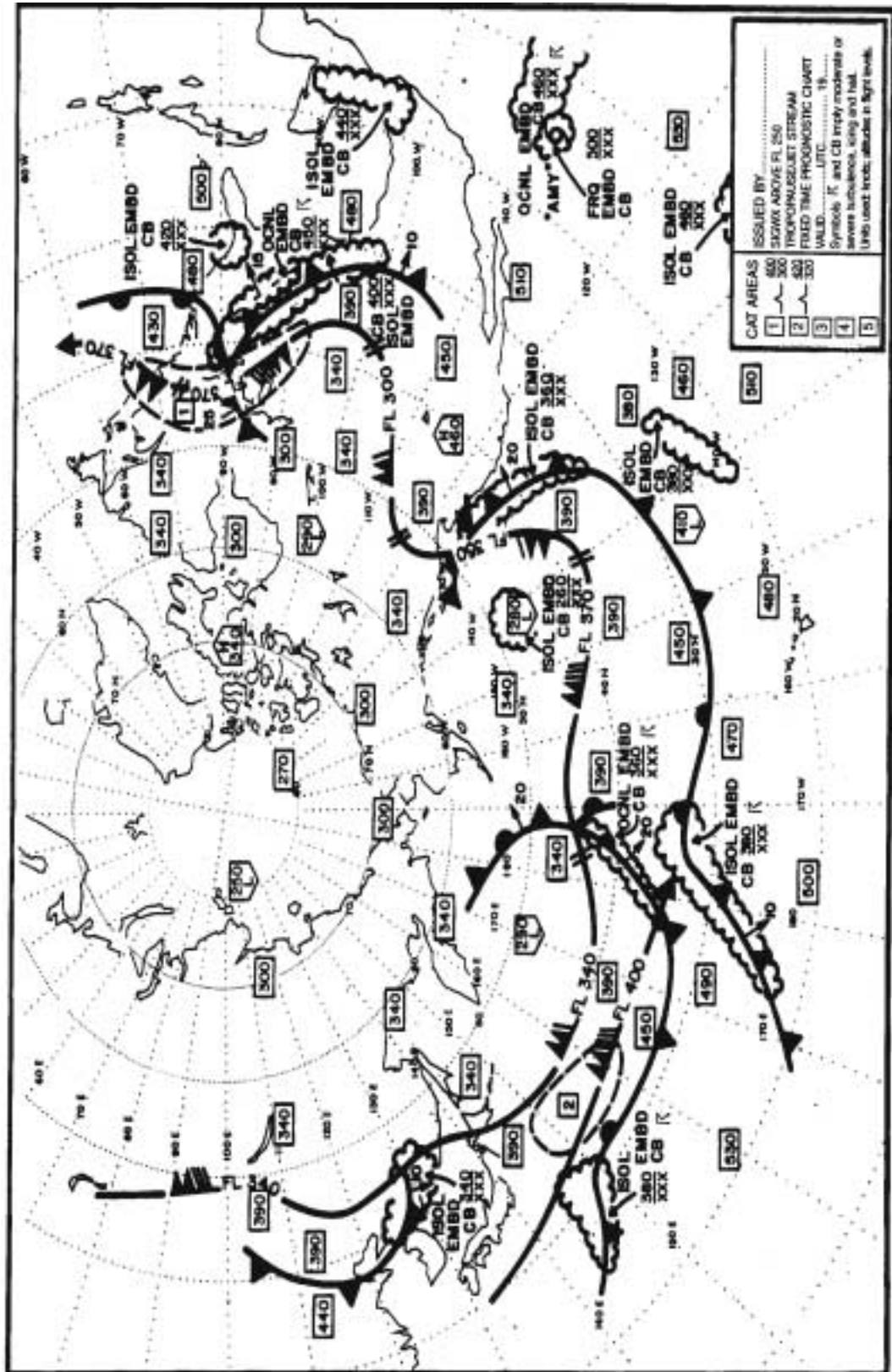
Model IS. Upper wind and temperature chart for standard isobaric surface
 Example 2 — Arrows and feathers (Polar stereographic projection)



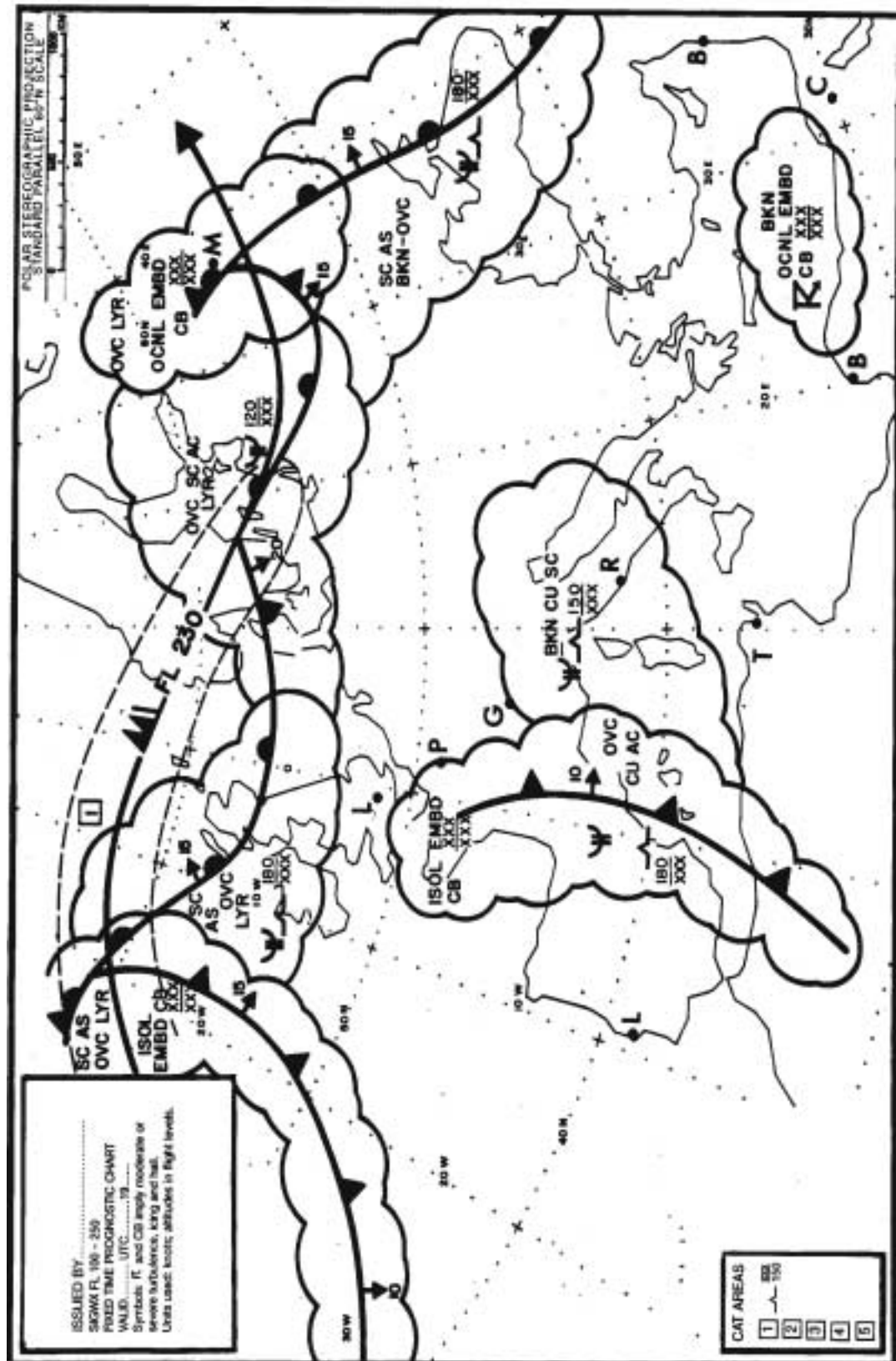
Model SWH. Significant weather chart (high level)
Example 1 — Mercator projection



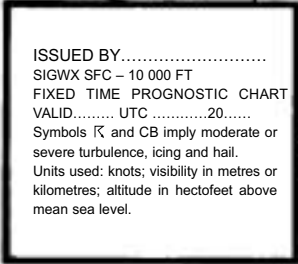
Model SWH. Significant weather chart (high level)
Example 2 — Polar stereographic projection



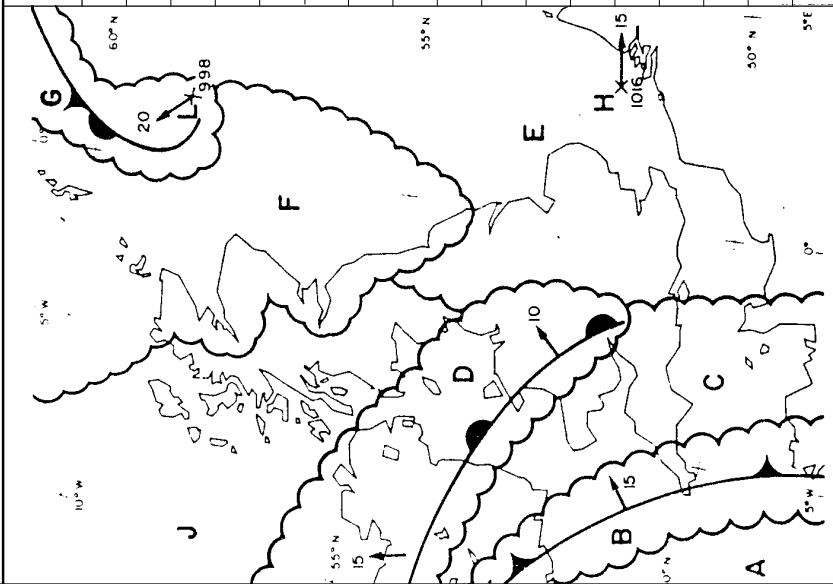
Model SWM. Significant weather chart (medium level)



Example 1

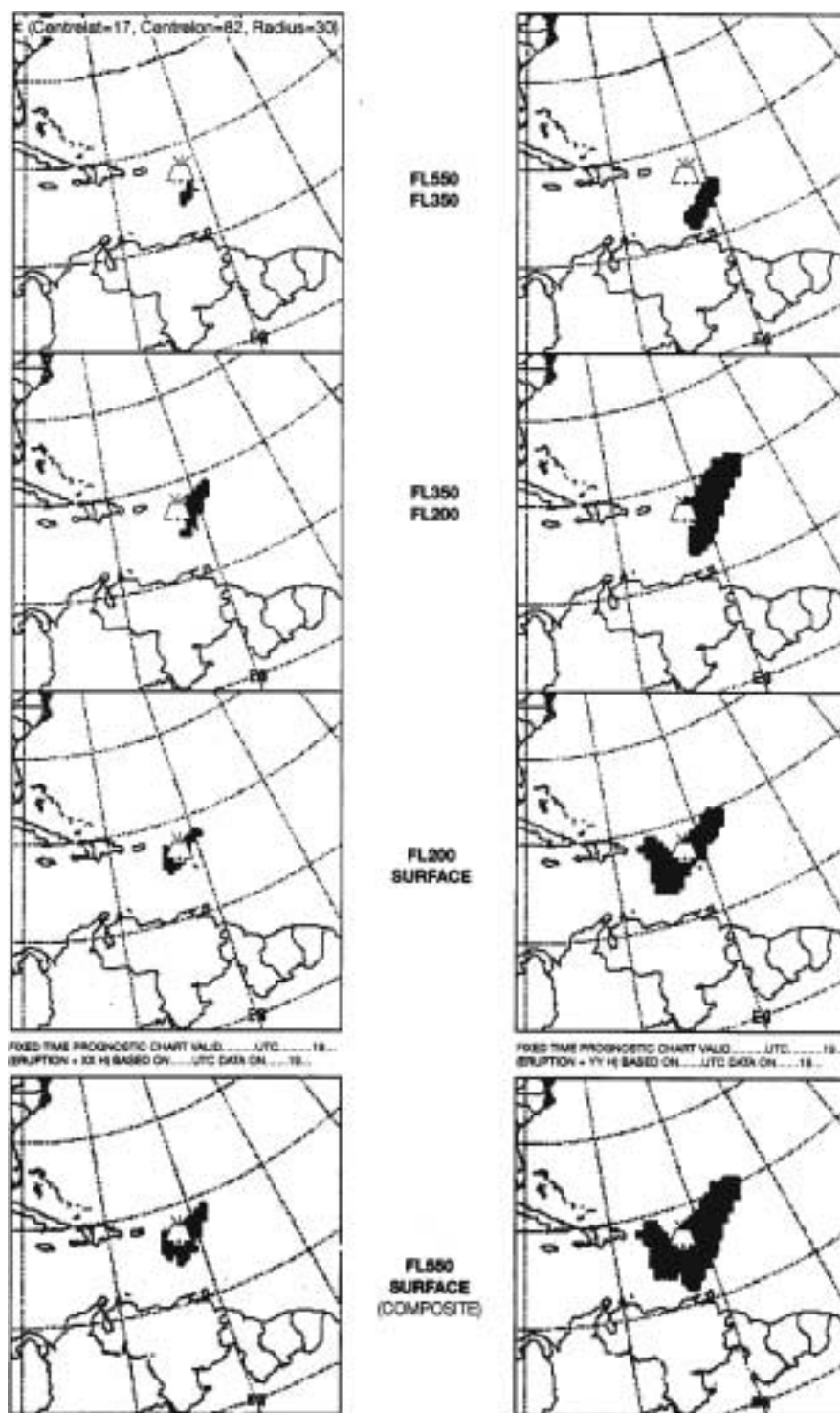


Model SWL. Significant weather chart (low level)
Example 2

FIXED TIME PROGNOSTIC CHART VALID UTC.....					20... BASED ON UTC DATA ON.....		0°C			
					VARIANT	VIS	SIGNIFICANT WEATHER	CLOUD, TURBULENCE, ICING	0°C	
					AREA A				— SCT CU 025/080	
					ISOL				— BKN CU 015/XXX ʘ 050/XXX	50
					AREA B				— OVC LVR ST NS 015/XXX ʘ 050/XXX	
					OCNL	4000	HEAVY RAIN	EMBD CB 008/XXXX	50	
					ISOL	1000	THUNDERSTORM			
					AREA C			BKN to OVC ST SC 010/040	100	
					LOC SOUTH COT HILLS	2000	DRIZZLE	OVC ST SC 003/050		
					AREA D			OVC LVR SC NS 010/XXX	90	
					LOC NORTH	4500	RAIN	OVC LVR ST NS 005/XXX ʘ 090/XXXX		
AREA E			SCT SC 020/030	40						
LOC LAND	0500	FOG								
AREA F	2000	MIST	BKN to OVC ST 002/010	30						
LOC COT HILLS	0200	FOG	OVC ST SFC/015							
AREA G	4500	RAIN	— OVC CU SC NS 010/XXX ʘ 030/XXX	30						
LOC NORTH	0500	FOG	OVC ST SFC/010							
AREA J			SCT CU SC 030/050	40						
LOC HILLS NORTH			— BLW 070							
SIGWX SFC – 10 000 FT ISSUED BY AT UTC					REMARKS: EAST TO NE GALES SHETLAND TO HEBRIDES - SEVERE MOUNTAIN WAVES NW SCOTLAND - FOG PATCHES EAST ANGLIA - WDSR 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 5000 m. M implies vis 200 m or less.
3. Altitude in hectofeet above MSL. XXX = above 10 000 ft.
4. R and CB imply MOD/SEV icing and turbulence.
5. Only significant weather and/or weather phenomena causing visibility reduction below 5000 m included.

Model VAG. Volcanic ash advisory information in graphical format



VAAC.....
 VOLCANIC ASH ADVISORY INFORMATION IN GRAPHICAL FORMAT (VAG)
 ▲ VOLCANO (NAME.....) LAT.....N (OR S) LONG.....E (OR W)
 DATE AND TIME OF FIRST ERUPTION.....UTC.....19.....
 DURATION.....HOUR(S)
 HEIGHT OF ASH COLUMN TO FL.....
 ■ VISIBLE ASH CLOUD

APPENDIX 2. TECHNICAL SPECIFICATIONS FOR LOCAL ROUTINE REPORTS, LOCAL SPECIAL REPORTS AND REPORTS IN THE METAR/SPECI CODE FORMS

(See Chapter 4 of this Annex)

Table A2-1. Template for the local routine (MET REPORT) and local special (SPECIAL) report

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

Note. — The ranges and resolutions for the numerical elements included in the local routine and special reports are shown in Table A2-4 of this appendix.

<i>Element as specified in Chapter 4</i>	<i>Detailed content</i>	<i>Template(s)</i>			<i>Examples</i>
Identification of the type of report (M)	Type of report	MET REPORT <i>or</i> SPECIAL			MET REPORT SPECIAL
Location indicator (M)	ICAO location indicator (M)	nnnn			YUDO ¹
Time of the observation (M)	Date and time of the observation in UTC	nnnnnnZ			221630Z
Surface wind (M)	Name of the element (M)	WIND			WIND 240/15KMH (WIND 240/8KT)
	Runway (O) ²	[RWY nnn]			WIND RWY 18 TDZ 190/22KMH (WIND RWY 18 TDZ 190/11KT)
	Runway section (O) ³	[TDZ]			
	Wind direction (M)	nnn/	VRB BTN nnn/ AND nnn/ <i>or</i> VRB	CALM	WIND VRB6KMH WIND CALM (WIND VRB3KT) WIND VRB BTN 350/ AND 050/6KMH (WIND VRB BTN 350/ AND 050/3KT)
	Wind speed (M)	[ABV]nn[n]KMH <i>or</i> [ABV]nnKT			WIND 270/ABV 199KMH (WIND 270/ABV 99KT)
	Significant speed variations (C) ⁴	MAX[ABV]nn[n] MNMnn			WIND 120/12KMH MAX35 MNM8 (WIND 120/6KT MAX18 MNM4)
	Significant directional variations (C) ⁵	VRB BTN nnn/ AND nnn/	—		WIND 020/20KMH VRB BTN 350/ AND 070/ (WIND 020/10KT VRB BTN 350/ AND 070/)
	Runway section (O) ³	[MID]			WIND RWY 14R MID 140/22KMH (WIND RWY 14R MID 140/11KT)
	Wind direction (M)	nnn/	VRB BTN nnn/ AND nnn/ <i>or</i> VRB	CALM	
	Wind speed (M)	[ABV]nn[n]KMH <i>or</i> [ABV]nnKT			
	Significant speed variations (C) ⁴	MAX[ABV]nn[n] MNMnn			
	Significant directional variations (C) ⁵	VRB BTN nnn/ AND nnn/	—		

Element as specified in Chapter 4	Detailed content	Template(s)			Examples
	Runway section (O) ³	[END]			WIND RWY 27 TDZ 240/32KMH MAX54 MNM20 END 250/28KMH (WIND RWY 27 TDZ 240/16KT MAX27 MNM10 END 250/14KT)
	Wind direction (M)	nnn/	VRB BTN nnn/ AND nnn/ or VRB	CALM	
	Wind speed (M)	[ABV]nn[n]KMH or [ABV]nnKT			
	Significant speed variations (C) ⁴	MAX[ABV]nn[n] MNMnn			
	Significant directional variations (C) ⁵	VRB BTN nnn/ AND nnn/	—		
Visibility (M)	Name of the element (M)	VIS			VIS 350M CAVOK VIS 7KM VIS 10KM VIS RWY 09 TDZ 800M END 1200M VIS RWY 18 TDZ 6KM RWY 27 TDZ 4000M
	Runway (O) ²	[RWY nnn]			
	Runway section (O) ³	[TDZ]			
	Visibility (M)	nnnnM or nnKM			
	Runway section (O) ³	[END]			
	Visibility (M)	nnnnM or nnKM			
RVR (C) ⁵	Name of the element (M)	RVR			RVR RWY 32 400M RVR RWY 20 500M RVR RWY 10 BLW 50M RVR RWY 14 ABV 1500M RVR RWY 10 BLW 150M RVR RWY 12 ABV 1200M RVR RWY 12 TDZ 1100M MID ABV 1400M RVR RWY 16 TDZ 600M MID 500M END 400M RVR RWY 26 500M RWY 20 800M
	Runway (C) ⁷	RWY nnn			
	Runway section (C) ⁸	TDZ			
	RVR (M)	[ABV or BLW] nnnnM			
	Runway section (C) ⁸	MID			
	RVR (M)	[ABV or BLW] nnnnM			
	Runway section (C) ⁸	END			
	RVR (M)	[ABV or BLW] nnnnM			
Present weather (C) ^{9, 10}	Intensity or proximity of present weather (C) ¹¹	FBL or MOD or HVV	—	VC	

Element as specified in Chapter 4	Detailed content	Template(s)				Examples
	Characteristics and type of present weather (M) ¹²	DZ or RA or SN or SG or PL or IC or GR or GS or DS or SS or TS or TSRA or TSSN or TSPL or TSGR or TSGS or SHRA or SHSN or SHPL or SHGR or SHGS or FZRA or FZDZ or BLSN or BLSA or BLDU or PO or FC	FG or BR or SA or DU or HZ or FU or VA or SQ or FZFG or DRSN or DRSA or DRDU or MIFG or BCFG or PRFG	FG or PO or FC or DS or SS or TS or SH or BLSN or BLSA or BLDU	MOD RA HZ VCFG HVY TSRA FG VCSH HVY DZ VA VCTS FBL SN MIFG VCBLA HVY TSRASN FBL SNRA FBL DZ FG HVY SHSN MOD BLSN	
Cloud (M) ¹³	Name of the element (M)	CLD			CLD SCT 300M OVC 600M (CLD SCT 1000FT OVC 2000FT) CLD OBSC VER VIS 150M CLD SKC (CLD OBSC VER VIS 500FT) CLD NSC CLD BKN TCU 270M (CLD BKN TCU 900FT) CLD RWY 08 BKN 60M RWY 26 BKN 90M (CLD RWY 08 BKN 200FT RWY 26 BKN 300FT)	
	Runway (O) ²	[RWY nnn]				
	Cloud amount (M) or vertical visibility (O) ⁹	FEW or SCT or BKN or OVC	OBSC	SKC or NSC		
	Cloud type (C) ⁹	CB or TCU	—			
	Height of base or the value of vertical visibility (C) ⁹	nnnnM [DIF or RAG or FLUC] or nnnnFT [DIF or RAG or FLUC]	[VER VIS nnnM or VER VIS nnnnFT]			
Air temperature (M)	Name of the element (M)	T				T17 TMS8
	Air temperature (M)	[MS]nn				
Dew-point temperature (M)	Name of the element (M)	DP				DP15 DPMS18
	Dew-point temperature (M)	[MS]nn				
Pressure values (M)	Name of the element (M)	QNH				QNH 0995HPA
	QNH (M)	nnnnHPA				QNH 1009HPA
	Name of the element (O) ¹⁴	QFE				QNH 1022HPA QFE 1001HPA
	QFE (O) ¹	[RWY nnn] nnnnHPA [RWY nnn nnnnHPA]				QNH 0987HPA QFE RWY 18 0956HPA RWY 24 0955HPA

<i>Element as specified in Chapter 4</i>	<i>Detailed content</i>	<i>Template(s)</i>				<i>Examples</i>
Supplementary information (C) ⁹	Significant meteorological phenomena (C) ⁹	CB or TS or MOD TURB or SEV TURB or WS or GR or SEV SQL or MOD ICE or SEV ICE or FZDZ or FZRA or SEV MTW or SS or DS or BLSN or FC ¹⁵				FC IN APCH WS IN APCH WIND AT 60M 360/50KMH WS RWY 12
	Location of the phenomenon (C) ⁹	IN APCH or IN CLIMB-OUT or RWYnnn				REFZRA CB IN CLIMB-OUT RETS
	Recent weather (C) ⁹	REFZDZ or REFZRA or REDZ or RE[SH]RA or RE[SH]SN or RE[SH]SG or RE[SH]PL or REIC or RE[SH]GR or RE[SH]GS or REBLSN or RESS or REDS or RETS or REFC or REVA				
Trend forecast (O) ¹⁶	Name of the element (M)	TREND				TREND NOSIG TREND BECMG FEW 600M (TREND BECMG FEW 2000FT)
	Change indicator (M)	NOSIG	BECMG or TEMPO			
	Period of change (C) ⁹		FMnnnn and/or TLnnnn or ATnnnn			
	Wind (C) ⁹		nnn/[ABV]nn[n]KMH [MAX[ABV]nn[n]] or nnn/[ABV]nnKT [MAX[ABV]nn]			
	Visibility (C) ⁹		VIS nnnnM or VIS nnKM		CAVOK	
	Weather phenomenon: intensity (C) ¹¹		FBL or MOD or HVY	—		NSW
	Weather phenomenon: characteristics and type (C) ^{9, 10, 12}	DZ or RA or SN or SG or PL or IC or GR or GS or DS or SS or TS or TSRA or TSSN or TSPL or TSGR or TSGS or SHRA or SHSN or SHPL or SHGR or SHGS or FZRA or FZDZ or BLSN or BLSA or BLDU or PO or FC	FG or BR or SA or DU or HZ or FU or VA or SQ or FZFG or DRSN or DRSA or DRDU or MIFG or BCFG or PRFG			
	Cloud amount and vertical visibility (C) ⁹	FEW or SCT or BKN or OVC	OBSC	SKC or NSC	TREND BECMG AT1130 OVC 300M (TREND BECMG AT1130 OVC 1000FT)	

<i>Element as specified in Chapter 4</i>	<i>Detailed content</i>	<i>Template(s)</i>					<i>Examples</i>
	Cloud type (C) ⁹		CB or TCU	—			TREND TEMPO TL1530 HVY SHRA BKN CB 360M (TREND TEMPO TL1530 HVY SHRA BKN CB 1200FT)
	Height of base or the value of vertical visibility (C) ⁹		nnnnM or nnnnFT	[VER VIS nnnM or VER VIS nnnnFT]			

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 if the maximum is exceeding the mean speed by 20 km/h (10 kt).
5. To be included if the directional variations $\geq 60^\circ$ but $< 180^\circ$ and the wind speed > 6 km/h (3 kt).
6. To be included if visibility or RVR $< 1\,500$ m.
7. To be included if more than one runway in use.
8. To be included if RVR is observed from more than one location along the runway.
9. To be included whenever applicable.
10. One or more, up to a maximum of three groups.
11. To be included whenever applicable; only qualifiers MOD and HVY (i.e. well-developed) to be used with PO and FC.
12. Precipitation types DZ, RA, SN, SG, PL, IC, GR and GS may be combined, where appropriate. Only moderate or heavy precipitation to be indicated in trend forecasts.
13. Up to four cloud layers.
14. Optional element.
15. Any of the phenomena, or combinations thereof. Abbreviated plain language to be used to amplify the phenomena, as necessary.
16. To be included subject to regional air navigation agreement.

Table A2-2. Template for reports in the METAR/SPECI code forms

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

Note. — The ranges and resolutions for the numerical elements included in reports in the METAR/SPECI code forms are shown in Table A2-5 of this appendix.

Element as specified in Chapter 4	Detailed content	Template(s)		Examples	
Identification of the type of report (M)	Type of report (M)	METAR or SPECI		METAR SPECI	
Location indicator (M)	ICAO location indicator (M)	nnnn		YUDO ¹	
Time of the observation (M)	Date and time of the observation in UTC (M)	nnnnnnZ		221630Z	
Surface wind (M)	Wind direction (M)	nnn	VRB	24015KMH (24008KT)	VRB06KMH (VRB03KT)
	Wind speed (M)	[P]nn[n]		19022KMH (19011KT) 00000KMH (00000KT) 140P199KMH (140P99KT)	
	Significant speed variations (C) ²	G[P]nn[n]		12012G35KMH (12006G18KT)	
	Units of measurement (M)	KMH or KT		24032G54KMH (24016G27KT)	
	Significant directional variations (C) ³	nnnVnnn	—	02020KMH 350V070 (02010KT 350V070)	
Visibility (M)	Minimum visibility (M)	nnnn	C A V O K	0350 7000 9999	CAVOK
	Direction of the minimum visibility (C) ⁴	N or NE or E or SE or S or SW or W or NW		0800E	
	Maximum visibility (C) ⁵	nnnn		1100SE 7000NW 1200S 6000W	
	Direction of the maximum visibility (C) ⁵	N or NE or E or SE or S or SW or W or NW			
RVR (C) ⁶	Name of the element (M)	R		R32/0400	
	Runway (M)	nn[n]/		R10/M0050 R14L/P1500	
	RVR (M)	[P or M]nnnn		R16L/0650 R16C/0500 R16R/0450 R17L/0450	
	RVR variations (C) ⁷	V[P or M]nnnn		R20/0700V1200 R19/0350VP1200	
	RVR past tendency (C) ⁸	U, D or N		R12/1100U R26/0550N R20/0800D R09/0375V0600U R10/M0150V0500D	

Element as specified in Chapter 4	Detailed content	Template(s)				Examples
Present weather (C) ^{9, 10}	Intensity or proximity of present weather (C) ¹¹	– or +	—	VC		
	Characteristics and type of present weather (M) ¹²	DZ or RA or SN or SG or PL or IC or GR or GS or DS or SS or TS or TSRA or TSSN or TSPL or TSGR or TSGS or SHRA or SHSN or SHPL or SHGR or SHGS or FZRA or FZDZ or BLSN or BLSA or BLDU or PO or FC	FG or BR or SA or DU or HZ or FU or VA or SQ or FZFG or DRSN or DRSA or DRDU or MIFG or BCFG or PRFG	FG or PO or FC or DS or SS or TS or SH or BLSN or BLSA or BLDU		RA HZ VCFG +TSRA FG VCSH +DZ VA VCTS –SN MIFG VCBLA +TSRASN –SNRA –DZ FG +SHSN BLSN
Cloud (M) ¹³	Cloud amount and height of base or vertical visibility (M)	FEWnnn or SCTnnn or BKNnnn or OVCnnn	VVnnn or VV///	SKC or NSC		FEW015 VV005 SKC OVC030 VV/// NSC SCT010 OVC020 BKN009TCU SCT008 BKN025CB
	Cloud type (C) ⁹	CB or TCU	—			
Air and dew-point temperature (M)	Air and dew-point temperatures (M)	[M]nn/[M]nn				17/10 02/M08 M01/M10
Pressure values (M)	Name of the element (M)	Q				Q0995 Q1009 Q1022 Q0987
	QNH (M)	nnnn				
Supplementary information (C) ⁹	Recent weather (C) ^{9, 10}	REFZDZ or REFZRA or REDZ or RE[SH]RA or RE[SH]SN or RE[SH]SG or RE[SH]PL or REIC or RE[SH]GR or RE[SH]GS or REBLSN or RESS or REDS or RETS or REFC or REVA				REFZRA RETS
	Wind shear (C) ⁹	WS RWYnn[n] or WS ALL RWY				WS RWY03 WS ALL RWY
	Sea-surface temperature and state of the sea (C) ¹⁴	W[M]nn/Sn				W15/S2
	State of the runway (C) ¹⁴	Runway designator (M)	nn	SNOCLO		99421594 SNOCLO
		Runway deposits (M)	n or /			
		Extent of runway contamination (M)	n or /			
		Depth of deposit (M)	nn or //			
		Friction coefficient or braking action (M)	nn or //			

<i>Element as specified in Chapter 4</i>	<i>Detailed content</i>	<i>Template(s)</i>				<i>Examples</i>
Trend forecast (O) ¹⁴	Change indicator (M) ¹⁵	NOSIG	BECMG or TEMPO			NOSIG BECMG FEW020
	Period of change (C) ⁹		FMnnnn <i>and/or</i> TLnnnn <i>or</i> ATnnnn			
	Wind (C) ⁹		nnn[P]nn[n][G[P]nn[n]]KMH <i>or</i> nnn[P]nn[G[P]nn]KT			TEMPO 25070G100KMH (TEMPO 25035G50KT)
	Visibility (C) ⁹		nnnn		C A V O K	BECMG FM1030 TL1130 CAVOK BECMG TL1700 0800 FG BECMG AT1800 9000 NSW BECMG FM1900 0500 +SNRA BECMG FM1100 SN TEMPO FM1130 BLSN TEMPO FM0330 TL0430 FZRA
	Weather phenomenon: intensity (C) ¹¹		– <i>or</i> +	—		
	Weather phenomenon: characteristics and type (C) ^{9,10,12}		DZ <i>or</i> RA <i>or</i> SN <i>or</i> SG <i>or</i> PL <i>or</i> IC <i>or</i> GR <i>or</i> GS <i>or</i> DS <i>or</i> SS <i>or</i> TS <i>or</i> TSRA <i>or</i> TSSN <i>or</i> TSPL <i>or</i> TSGR <i>or</i> TSGS <i>or</i> SHRA <i>or</i> SHSN <i>or</i> SHPL <i>or</i> SHGR <i>or</i> SHGS <i>or</i> FZRA <i>or</i> FZDZ <i>or</i> BLSN <i>or</i> BLSA <i>or</i> BLDU <i>or</i> PO <i>or</i> FC	FG <i>or</i> BR <i>or</i> SA <i>or</i> DU <i>or</i> HZ <i>or</i> FU <i>or</i> VA <i>or</i> SQ <i>or</i> FZFG <i>or</i> DRSN <i>or</i> DRSA <i>or</i> DRDU <i>or</i> MIFG <i>or</i> BCFG <i>or</i> PRFG		
	Cloud amount and height of base or vertical visibility (C) ⁹		FEWnnn <i>or</i> SCTnnn <i>or</i> BKNnnn <i>or</i> OVCnnn	VVnnn <i>or</i> VV///		TEMPO TL1200 0600 BECMGAT1200 8000 NSW NSC BECMG AT1130 OVC010
	Cloud type (C) ⁹		CB <i>or</i> TCU	—		TEMPO TL1530 +SHRA BKN012CB

Notes.—

1. Fictitious location.
2. To be included if the maximum is exceeding the mean speed by 20 km/h (10 kt).
3. To be included if the directional variations $\geq 60^\circ$ but $< 180^\circ$ and the wind speed > 6 km/h (3 kt).
4. To be included if the visibility in one or more directions is more than 50 per cent above the minimum visibility.
5. To be included if the minimum visibility is less than 1 500 m and the visibility in another direction is more than 5 000 m.
6. To be included if visibility or RVR < 1 500 m; for up to a maximum of four runways.

7. To be included if the one-minute RVR values during the 10-minute period immediately preceding the observation vary from the mean value more than 50 m or more than 20 per cent, whichever is greater; the one-minute mean minimum and the one-minute mean maximum values are reported (instead of the 10-minute mean value).
8. To be included if the RVR values during the 10-minute period preceding the observation have shown a distinct tendency such that the mean RVR during the first 5 minutes varies by 100 m or more from the mean during the second 5 minutes of the period. No tendency indication where not available.
9. To be included whenever applicable.
10. One or more, up to a maximum of three groups.
11. To be included whenever applicable. No qualifier for *moderate* intensity; only qualifier "+" (i.e. well-developed) to be used with PO and FC.
12. Precipitation types DZ, RA, SN, SG, PL, IC, GR and GS may be combined, where appropriate. Only moderate or heavy precipitation to be indicated in trend forecasts.
13. Up to four cloud layers.
14. To be included subject to regional air navigation agreement.
15. Number of change indicators to be kept to a minimum; normally not exceeding three groups.

Table A2-3. Use of change indicators in trend forecasts

Change indicator	Time indicator and period	Meaning	
NOSIG	—	no significant changes are forecast	
BECMG	FMn ₁ n ₁ n ₁ n ₁ TLn ₂ n ₂ n ₂ n ₂	the change is forecast to	commence at n ₁ n ₁ n ₁ n ₁ UTC and be completed by n ₂ n ₂ n ₂ n ₂ UTC
	TLnnnn		commence at the beginning of the trend forecast period and be completed by nnnn UTC
	FMnnnn		commence at nnnn UTC and be completed by the end of the trend forecast period
	ATnnnn		occur at nnnn UTC (specified time)
	—		a) commence at the beginning of the trend forecast period and be completed by the end of the trend forecast period; <i>or</i> b) the time is uncertain
TEMPO	FMn ₁ n ₁ n ₁ n ₁ TLn ₂ n ₂ n ₂ n ₂	temporary fluctuations are forecast to	commence at n ₁ n ₁ n ₁ n ₁ UTC and cease by n ₂ n ₂ n ₂ n ₂ UTC
	TLnnnn		commence at the beginning of the trend forecast period and cease by nnnn UTC
	FMnnnn		commence at nnnn UTC and cease by the end of the trend forecast period
	—		commence at the beginning of the trend forecast period and cease by the end of the trend forecast period

EXAMPLES OF REPORTS

*Example 1.— Routine report**a) METAR for YUDO (Donlon/International)*:*

METAR YUDO 221630Z 24015KMH 0600 R12/1000U FG DZ SCT010 OVC020 17/16 Q1018 BECMG TL1700 0800 FG BECMG AT1800 9999 NSW

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

MET REPORT YUDO 221630Z WIND 240/15KMH VIS 600M RVR RWY 12 TDZ 1000M FG MOD DZ CLD SCT 300M OVC 600M T17 DP16 QNH 1018 TREND BECMG TL1700 VIS 800M FG BECMG AT1800 VIS 10KM NSW

c) 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 15 kilometres per hour; visibility 600 metres; runway visual range representative of the touchdown zone for runway 12 is 1 000 metres and the runway visual range values have shown an upward tendency during previous 10 minutes (RVR tendency to be included in METAR only); fog and moderate drizzle; scattered cloud at 300 metres; overcast at 600 metres; air temperature 17 degrees Celsius; dew-point temperature 16 degrees Celsius; QNH 1018 hectopascals; trend during next two hours visibility becoming 800 metres in fog by 1700 UTC; at 1800 UTC visibility becoming 10 kilometres or more and nil significant weather.

* Fictitious location

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

*Example 2.— Special report**a) SPECI for YUDO (Donlon/International)**

SPECI YUDO 151115Z 05025G37KT NE1200 S6000 + TSRA BKN005CB 25/22 Q1008 TEMPO TL1200 0600 BECMG AT1200 8000 NSW NSC

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

SPECIAL YUDO 151115Z WIND 050/25KT MAX37 MNM10 VIS 1200M HVY TSRA CLD BKN CB 500FT T25 DP22 QNH 1008 TREND TEMPO TL1200 VIS 600M BECMG AT1200 VIS 8KM NSW NSC

c) Meaning of both reports:

Selected 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 lowest to north east at 1 200 metres, visibility 6 000 metres to south (directional variations to be included in SPECI only; visibility representative of the runway included in the local special report); heavy thunderstorm with rain; broken cumulonimbus cloud at 500 feet; air temperature 25 degrees Celsius; dew-point temperature 22 degrees Celsius; QNH 1008 hectopascals; trend during next two hours, visibility temporarily 600 metres from 1115 to 1200, becoming at 1200 UTC visibility 8 km, thunderstorm ceases and nil significant weather and nil significant cloud.

* Fictitious location

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

Example 3.— Volcanic activity report

VOLCANIC ACTIVITY REPORT YUSB* 231500 MT TROJEEN* VOLCANO N5605 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 30 000 feet and moving in a south-westerly direction.

* Fictitious locations

Table A2-4. Ranges and resolutions for the numerical elements included in the local meteorological message

<i>Element as specified in Chapter 4</i>	<i>Range</i>	<i>Resolution</i>
Runway	01 – 36	1
Wind direction: °true	010 – 360	10
Wind speed: KMH	1 – 399*	1
KT	1 – 199*	1
Visibility: M	0 – 800	50
M	800 – 5 000	100
KM	5 – 10	1
RVR: M	0 – 400	25
M	400 – 800	50
M	800 – 1 500	100
Vertical visibility: M	0 – 600	30
FT	0 – 2 000	100
Cloud: height of base: M	0 – 3 000	30
M	3 000 – 20 000	300
FT	0 – 10 000	100
FT	10 000 – 60 000	1 000
Air temperature; Dew-point temperature: °C	–80 – +60	1
QNH; QFE: hPa	0500 – 1 100	1
* There is no aeronautical requirement to report surface wind speeds of 200 km/h (100 kt) or more; however, provision has been made for reporting wind speeds up to 399 km/h (199 kt) for non-aeronautical purposes, as necessary.		

Table A2-5. Ranges and resolutions for the numerical elements included in meteorological message in the METAR/SPECI code forms

Element as specified in Chapter 4		Range	Resolution
Runway:	(no units)	01 – 36	1
Wind direction:	° true	000 – 360	10
Wind speed:	KMH	00 – 399*	1
	KT	00 – 199*	1
Visibility:	M	0000 – 0800	50
	M	0800 – 5 000	100
	M	5 000 – 9 000	1 000
	M	9 000 – 9 999	999
RVR:	M	0000 – 0400	25
	M	0400 – 0800	50
	M	0800 – 1 500	100
Vertical visibility:	30's M (100's FT)	000 – 020	1
Cloud: height of base:	30's M (100's FT)	000 – 100	1
	30's M (100's FT)	100 – 600**	10
Air temperature; Dew-point temperature:	°C	–80 – +60	1
QNH:	hPa	0850 – 1 100	1
Sea-surface temperature:	°C	–10 – +40	1
State of the sea:	(no units)	0 – 9	1
State of the runway	Runway designator:	(no units)	01 – 36; 51 – 86; 88; 99
	Runway deposits:	(no units)	0 – 9
	Extent of runway contamination:	(no units)	1; 2; 5; 9
	Depth of deposit:	(no units)	00 – 90; 92 – 99
	Friction coefficient/braking action:	(no units)	00 – 95; 99
<p>* There is no aeronautical requirement to report surface wind speeds of 200 km/h (100 kt) or more; however, provision has been made for reporting wind speeds up to 399 km/h (199 kt) for non-aeronautical purposes, as necessary.</p> <p>** 100 – 200 in trend forecasts.</p>			

APPENDIX 3. CRITERIA FOR REPORTING METEOROLOGICAL AND RELATED PARAMETERS IN AUTOMATED AIR-REPORTS

(See Chapter 5 of this Annex)

1. Wind direction

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

2. Wind speed

The wind speed shall be reported in kilometres per hour or knots, rounded to the nearest 2 km/h (1 knot). The units used shall be indicated.

3. 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.

4. Temperature

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

5. Turbulence

The turbulence shall be observed in terms of the eddy dissipation rate (EDR).

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 a turbulence index comprising seven intensity levels of EDR as indicated in Table A3-1. The time of occurrence of the peak value shall be reported as indicated in Table A3-2.

Interpretation of the turbulence index

Turbulence shall be considered:

- a) severe when the turbulence index is between 15 and 27 (i.e. the peak value of the EDR is exceeding 0.5);
- b) moderate when the turbulence index is between 6 and 14 (i.e. the peak value of the EDR is exceeding 0.3 while not exceeding 0.5);
- c) light when the turbulence index is between 1 and 5 (i.e. the peak value of the EDR is between 0.1 and 0.3); and
- d) nil when the turbulence index is 0 (i.e. the peak value of the EDR is less than 0.1).

Note.— The EDR is an aircraft-independent measure of turbulence. However, the relationship between the EDR index and the perception of turbulence is a function of aircraft type, and the mass, altitude, configuration and airspeed of the aircraft.

Special air-reports

Special air-reports on turbulence shall be made during any phase of the flight whenever the peak value exceeds the EDR value of 0.5. The special air-report on turbulence shall be made with reference to the 1-minute period immediately preceding the observation. Both the average and peak value of turbulence shall be observed. The average and peak values shall be reported in terms of a turbulence index as indicated in the shaded part of Table A3-1. Special air-reports shall be issued every minute until such time that the peak values of turbulence fall below the EDR value of 0.5.

6. 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 A3-3.

**Table A3-1. Turbulence index to be reported as a function of the average and peak value of turbulence
(Classes corresponding to severe turbulence are shaded)**

<i>Peak value of turbulence</i>								
<i>Average value of turbulence</i>	<i>EDR ($m^{2/3} s^{-1}$)</i>							<i>Nil report</i>
EDR ($m^{2/3} s^{-1}$)	< 0.1	0.1 – 0.2	0.2 – 0.3	0.3 – 0.4	0.4 – 0.5	0.5 – 0.8	> 0.8	
< 0.1	0	1	3	6	10	15	21	
0.1 – 0.2		2	4	7	11	16	22	
0.2 – 0.3			5	8	12	17	23	
0.3 – 0.4				9	13	18	24	
0.4 – 0.5					14	19	25	
0.5 – 0.8						20	26	
> 0.8							27	
Nil report								28

Table A3-2. Time of occurrence of the peak value to be reported

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

Table A3-3. Ranges and resolutions for the meteorological elements included in air-reports

<i>Element as specified in Chapter 5</i>	<i>Range</i>	<i>Resolution</i>
Wind direction: °true	000 – 360	1
Wind speed: KMH	00 – 500	2
KT	00 – 250	1
Wind quality flag: (index)*	0 – 1	1
Temperature: °C	–80 – +60	0.1
Turbulence: routine air-report: (index)*	0 – 28	1
(time of occurrence)*	0 – 15	1
Turbulence: special air-report: (index)*	15 – 27	1
Humidity: %	0 – 100	1
*Non-dimensional		

APPENDIX 4. TECHNICAL SPECIFICATIONS FOR AERODROME FORECASTS IN THE TAF CODE FORM

(See Chapter 6 of this Annex)

Table A4-1. Template for aerodrome forecasts in the TAF code form

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

Note.— The ranges and resolutions for the numerical elements included in aerodrome forecasts in the TAF code form are shown in Table A4-3 of this appendix.

<i>Element as specified in Chapter 6</i>	<i>Detailed content</i>	<i>Template(s)</i>		<i>Examples</i>
Identification of the type of report (M)	Type of report (M)	TAF <i>or</i> TAF AMD		TAF TAF AMD
Location indicator (M)	ICAO location indicator (M)	nnnn		YUDO ¹
Date and time of origin of forecast (M)	Date and time of the origin of the forecast in UTC (M)	nnnnnnZ		160000Z
Date and period of validity of forecast (M)	Date and period of the validity of the forecast in UTC (M)	nnnnnn		160624 080918
Surface wind (M)	Wind direction (M)	nnn <i>or</i> VRB ³		24015KMH; VRB06KMH (24008KT); (VRB03KT) 19022KMH (19011KT)
	Wind speed (M)	[P]nn[n]		00000KMH (00000KT) 140P199KMH (140P99KT)
	Significant speed variations (C) ²	G[P]nn[n]		12012G35KMH (12006G18KT) 24032G54KMH (24016G27KT)
	Units of measurement (M)	KMH <i>or</i> KT		
Visibility (M)	Minimum visibility (M)	nnnn		C A V O K <

<i>Element as specified in Chapter 6</i>	<i>Detailed content</i>	<i>Template(s)</i>				<i>Examples</i>		
Cloud (M) ⁸	Cloud amount and height of base or vertical visibility (M)	FEWnnn <i>or</i> SCTnnn <i>or</i> BKNnnn <i>or</i> OVCnnn	VVnnn <i>or</i> VV ///	SKC <i>or</i> NSC		FEW010 VV005 SKC OVC020 VV/// NSC SCT005 BKN012		
	Cloud type (C) ⁴	CB	—			SCT008 BKN025CB		
Temperature (O) ⁹	Name of the element (M)	TX				TX25/13Z TN09/05Z		
	Maximum temperature (M)	nn/						
	Time of occurrence of the maximum temperature (M)	nnZ						
	Name of the element (M)	TN						
	Minimum temperature (M)	nn/						
	Time of occurrence of the minimum temperature (M)	nnZ						
Expected significant changes to one or more of the above elements during the period of validity (C) ^{4, 10}	Change or probability indicator (M) ¹¹	PROB30 [TEMPO] <i>or</i> PROB40 [TEMPO]		BECMG <i>or</i> TEMPO	FM	TEMPO 1518 25070G100KMH (TEMPO 1518 25035G50KT) TEMPO 1214 17025G050KMH 1000 TSRA SCT010CB BKN020 (TEMPO 1214 17012G025KT 1000 TSRA SCT010CB BKN020)		
	Period of occurrence or change (C) ⁴	nnnn						
	Wind (C) ⁴	nnn[P]nn[n][G[P]nn[n]]KMH <i>or</i> VRBnnKMH <i>or</i> nnn[P]nn[G[P]nn]KT <i>or</i> VRBnnKT						

Element as specified in Chapter 6	Detailed content	Template(s)			Examples
	Visibility (C) ⁴	nnnn			C A V O K BECMG 1011 00000KM 2400 OVC010 (BECMG 1011 00000KT 2400 OVC010) PROB30 1214 0800 FG BECMG 1214 RA TEMPO 0304 FZRA FM1030 SN TEMPO 1215 BLSN PROB40 TEMPO 0608 0500 FG FM1230 15015KM 9999 BKN020 BKN100 (FM1230 15008KT 9999 BKN020 BKN100) BECMG 1820 8000 NSW NSC BECMG 0608 SCT015CB BKN020
	Weather phenomenon: intensity (C) ⁶	– or +	—	NSW	
	Weather phenomenon: characteristics and type (C) ^{4, 7, 10}	DZ or RA or SN or SG or PL or IC or GR or GS or DS or SS or TS or TSRA or TSSN or TSPL or TSGR or TSGS or SHRA or SHSN or SHPL or SHGR or SHGS or FZRA or FZDZ or BLSN or BLSA or BLDU or PO or FC	FG or BR or SA or DU or HZ or FU or VA or SQ or FZFG or DRSN or DRSA or DRDU or MIFG or BCFG or PRFG		
	Cloud amount and height of base or vertical visibility (C) ⁴	FEWnnn or SCTnnn or BKNnnn or OVCnnn	VVnnn or VV///	SKC or NSC	
	Cloud type (C) ⁴	CB	—		

Notes.—

1. Fictitious location.
2. To be included if the maximum is exceeding the mean speed by 20 km/h (10 kt).
3. To be used only if the wind speed ≤ 6 km/h (3 kt).
4. To be included whenever applicable.
5. One or more, up to a maximum of three groups.
6. To be included whenever applicable. No qualifier for *moderate* intensity; only qualifier "+" (i.e. well-developed) to be used with PO and FC.
7. Precipitation types DZ, RA, SN, SG, PL, IC, GR and GS may be combined, where appropriate. Only moderate or heavy precipitation should be indicated.
8. Up to four cloud layers.
9. To be included subject to regional air navigation agreement.
10. To be included when a change in some or all of the elements forecast is expected to occur; may be placed after any element forecast, as appropriate.
11. Number of change indicators to be kept to a minimum; normally not exceeding five groups.

Table A4-2. Use of change and time indicators in aerodrome forecasts in the TAF code form

Change or time indicator		Time period	Meaning	
FM		$n_h n_m n_m$	used to indicate a significant change in most weather elements occurring at $n_h n_h$ hours and $n_m n_m$ minutes (UTC); all the elements given before “FM” are to be included following “FM” (i.e. they are all superseded by those following the abbreviation)	
BECMG		$n_1 n_1 n_2 n_2$	the change is forecast to commence at $n_1 n_1$ hours (UTC) and be completed by $n_2 n_2$ hours (UTC); only those elements for which a change is forecast are to be given following “BECMG”; the time period $n_1 n_1 n_2 n_2$ should normally be less than 2 hours and in any case should not exceed 4 hours	
TEMPO		$n_1 n_1 n_2 n_2$	temporary fluctuations are forecast to commence at $n_1 n_1$ hours (UTC) and cease by $n_2 n_2$ 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 $n_1 n_1 n_2 n_2$	
PROBnn	—	$n_1 n_1 n_2 n_2$	probability of occurrence (in %) of an alternative value of a forecast element or elements; nn = 30 or nn = 40 only; to be placed after the element(s) concerned	—
	TEMPO	$n_1 n_1 n_2 n_2$		probability of occurrence of temporary fluctuations

EXAMPLE OF AN AERODROME FORECAST

TAF for YUDO (Donlon/International)*:

TAF YUDO 160000Z 160624 13018KMH 9000 BKN020 BECMG 0608 SCT015CB BKN020 TEMPO 0812 17025G40KMH 1000 TSRA SCT010CB BKN020 FM1230 15015KMH 9999 BKN020 BKN100

Meaning of the forecast:

Aerodrome forecast 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 18 kilometres per hour; visibility 9 kilometres, broken cloud at 600 metres; becoming between 0600 UTC and 0800 UTC, scattered cumulonimbus cloud at 450 metres and broken cloud at 600 metres; temporarily between 0800 UTC and 1200 UTC surface wind direction 170 degrees; wind speed 25 kilometres per hour gusting to 40 kilometres per hour; visibility 1 000 metres in a moderate thunderstorm with rain, scattered cumulonimbus cloud at 300 metres and broken cloud at 600 metres; from 1230 UTC surface wind direction 150 degrees; wind speed 15 kilometres per hour; visibility 10 km or more; broken cloud at 600 metres and broken cloud at 3 000 metres.

* Fictitious location

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

Table A4-3. Ranges and resolutions for the numerical elements included in meteorological messages in the TAF code form

<i>Element as specified in Chapter 6</i>		<i>Range</i>	<i>Resolution</i>
Wind direction:	° true	000 – 360	10
Wind speed:	KMH	00 – 399*	1
	KT	00 – 199*	1
Visibility:	M	0000 – 0800	50
	M	0800 – 5000	100
	M	5000 – 9000	1000
	M	9000 – 9999	999
Vertical visibility:	30's M (100's FT)	000 – 020	1
Cloud: height of base:	30's M (100's FT)	000 – 100	1
	30's M (100's FT)	100 – 200	10
Air temperature (maximum and minimum):	°C	–80 – +60	1
* There is no aeronautical requirement to report surface wind speeds of 200 km/h (100 kt) or more; however, provision has been made for reporting wind speeds up to 399 km/h (199 kt) for non-aeronautical purposes, as necessary.			

APPENDIX 5. TECHNICAL SPECIFICATIONS FOR SIGMET AND AIRMET MESSAGES AND SPECIAL AIR-REPORTS

(See Chapter 7 of this Annex)

Table A5-1. Template for SIGMET and AIRMET messages and special air-reports

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

Note.— The ranges and resolutions for the numerical elements included in SIGMET/AIRMET messages and in special air-reports are shown in Table A5-2 of this appendix.

Element as specified in Chapters 5 and 7	Detailed content	Template(s)				Examples
		SIGMET	SIGMET SST ¹	AIRMET	SPECIAL AIR-REPORT ²	
Location indicator of FIR/CTA (M) ³	ICAO location indicator of the ATS unit serving the FIR or CTA to which the SIGMET/AIRMET refers (M)	nnnn			—	YUCC ⁴ YUDD ⁴
Identification (M)	Message identification and sequence number ⁵ (M)	SIGMET [nn]n	SIGMET SST [nn]n	AIRMET [nn]n	ARS	SIGMET 5 SIGMET A3 SIGMET SST 1 AIRMET 2 ARS
Validity period (M)	Date-time groups indicating the period of validity in UTC (M)	VALID nnnnnn/nnnnnn			— ⁶	VALID 221215/221600 VALID 101520/101800 VALID 251600/252200
Location indicator of MWO (M)	Location indicator of MWO originating the message with a separating hyphen (M)	nnnn—				YUDO— ⁴ YUSO— ⁴
Name of the FIR/CTA or aircraft identification (M)	Name of the FIR/CTA ⁷ for which the SIGMET/AIRMET is issued or aircraft radiotelephony call sign (M)	nnnnnnnnnn FIR/[UIR] or nnnnnnnnnn CTA		nnnnnnnnnn FIR/[n]	nnnnnn	AMSWELL FIR ⁴ SHANLON FIR/UIR ⁴ AMSWELL FIR/2 ⁴ SHANLON FIR ⁴ VA812
IF THE SIGMET IS TO BE CANCELLED SEE FOR DETAILS AT THE END OF THE TEMPLATE						

Element as specified in Chapters 5 and 7	Detailed content	Template(s)				Examples
		SIGMET	SIGMET SST ¹	AIRMET	SPECIAL AIR-REPORT ²	
Phenomenon (M) ⁸	Description of phenomenon causing the issuance of SIGMET/AIRMET (C)	OBSC ⁹ TS [GR] ¹⁰ EMBD ¹² TS [GR] FRQ ¹³ TS [GR] SQL ¹⁴ TS [GR] TC nnnnnnnnnn SEV TURB ¹¹ SEV ICE ¹⁹ SEV ICE (FZRA) ²⁰ SEV MTW ²¹ HVY DS HVY SS VA[ERUPTION] [MT nnnnnnnnnn] [LOC Nnn[nn] or Snn[nn] Ennn[nn] or Wnnn[nn]] VA CLD VA[ERUPTION] [MT nnnnnnnnnn] [LOC Nnn[nn] or Snn[nn] Ennn[nn] or Wnnn[nn]] VA CLD	MOD TURB ¹¹ SEV TURB ISOL ¹⁵ CB ¹⁶ OCNL ¹⁸ CB FRQ ¹³ CB GR VA[ERUPTION] [MT nnnnnnnnnn] [LOC Nnn[nn] or Snn[nn] Ennn[nn] or Wnnn[nn]] VA CLD	SFC WSPD nn[n]KMH (SFC WSPD nn[n]KT) SFC VIS nnnnM (nn) ¹⁷ ISOL ¹⁵ TS[GR] ¹⁰ OCNL ¹⁸ TS[GR] MT OBSC BKN CLD nnn/[ABV]nnnnM (BKN CLD nnn/[ABV]nnnnFT) OVC CLD nnn/[ABV]nnnnM (OVC CLD nnn/[ABV]nnnnFT) ISOL ¹⁵ CB ¹⁶ OCNL ¹⁸ CB FRQ ¹³ CB ISOL ¹⁵ TCU ¹⁶ OCNL ¹⁸ TCU ¹⁶ FRQ ¹³ TCU MOD TURB ¹¹ MOD ICE ¹⁹ MOD MTW ²¹	TS TSGR SEV TURB SEV ICE SEV MTW HVY SS VA CLD [FL nnn/nnn] VA [MT nnnnnnnnnn] MOD TURB ¹¹ GR ¹⁰ CB ¹⁶	SEV TURB FRQ TS OBSC TS GR EMD TS GR TC GLORIA VA ERUPTION MT ASHVAL LOC 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
Observed or forecast phenomenon (M)	Indication whether the information is observed and expected to continue, or forecast (M)	OBS [AT nnnnZ] FCST OBS [AT nnnnZ] AND FCST			OBS AT nnnnZ	OBS AT 1210Z OBS
					—	OBS AND FCST OBS AT 2245Z
Location (C)	Location (referring to latitude and longitude (in degrees and minutes) or locations or geographic features well known internationally)	[N OF, NE OF, E OF, SE OF, S OF, SW OF, W OF, NW OF] [Nnn[nn]][Wnnn[nn]] or [N OF, NE OF, E OF, SE OF, S OF, SW OF, W OF, NW OF] [Nnn[nn]][Ennn[nn]] or [N OF, NE OF, E OF, SE OF, S OF, SW OF, W OF, NW OF] [Snn[nn]][Wnnn[nn]] or [N OF, NE OF, E OF, SE OF, S OF, SW OF, W OF, NW OF] [Snn[nn]][Ennn[nn]] or [N OF, NE OF, E OF, SE OF, S OF, SW OF, W OF, NW OF] nnnnnnnnnnnn			NnnnnWnnnnn or NnnnnWnnnnn or SnnnnWnnnnn or SnnnnEnnnnn	S OF N54 N OF N50 N2020 W07005 YUSB ⁴ N2706 W07306 N48 E010

Element as specified in Chapters 5 and 7	Detailed content	Template(s)				Examples
		SIGMET	SIGMET SST ¹	AIRMET	SPECIAL AIR-REPORT ²	
Level (C)	Flight level and extent ²² (C)	FLnnn or FLnnn/nnn or TOP FLnnn or [TOP] ABV FLnnn or [TOP] BLW FLnnn ^{or} ²³ CB TOP [ABV] FLnnn WI nnnKM OF CENTRE (CB TOP [ABV] FLnnn WI nnnNM OF CENTRE) or CB TOP [BLW] FLnnn WI nnnKM OF CENTRE (CB TOP [BLW] FLnnn WI nnnNM OF CENTRE) ^{or} ²⁴ FLnnn/nnn [APRX nnnKM BY nnnKM] [Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] [TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn]] [TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn]] (FLnnn/nnn [APRX nnnNM BY nnnNM] [Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] [TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn]] [TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn]])			FLnnn	FL180 FL050/080 TOP FL390 BLW FL200 TOP ABV FL100 FL310/450 CB TOP FL500 WI 270KM OF CENTRE (CB TOP FL500 WI 150NM OF CENTRE) FL310/350 APRX 220KM BY 35KM FL390
Movement or expected movement (C)	Movement or expected movement with reference to one of the eight points of compass, or stationary (C)	MOV N [nnKMH] or MOV NE [nnKMH] or MOV E [nnKMH] or MOV SE [nnKMH] or MOV S [nnKMH] or MOV SW [nnKMH] or MOV W [nnKMH] or MOV NW [nnKMH] or (MOV N [nnKT] or MOV NE [nnKT] or MOV E [nnKT] or MOV SE [nnKT] or MOV S [nnKT] or MOV SW [nnKT] or MOV W [nnKT] or MOV NW [nnKT]) or STNR			—	MOV E 40KMH (MOV E 20KT) MOV SE STNR
Changes in intensity (C)	Expected changes in intensity (C)	INTSF or WKN or NC			—	WKN
Forecast position (C) ²²	Forecast position of volcanic ash cloud or the centre of the TC at the end of the validity period of the SIGMET message (C)	FCST nnnnZ TC CENTRE Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] or FCST nnnnZ VA CLD Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] [TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn]] [TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn]]		—	—	FCST 2200Z TC CENTRE N2740 W07345 FCST 1700Z VA CLD S15 E075 TO S15 E081 TO S17 E083 TO S18 E079 TO S15 E75

Element as specified in Chapters 5 and 7	Detailed content	Template(s)				Examples
		SIGMET	SIGMET SST ¹	AIRMET	SPECIAL AIR-REPORT ²	
Outlook ²² (C)	Outlook providing information beyond the period of validity of the trajectory of the volcanic ash cloud and positions of the tropical cyclone centre (C)	OTLK nnnnnn TC CENTRE Nnnnn or SnnnnWnnnnn or Ennnnn nnnnnn TC CENTRE Nnnnn or SnnnnWnnnnn or Ennnnn or OTLK nnnnn VA CLD APRX [Flnnn/nnn] ²⁵ Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] [TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn]] [TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn]] nnnnnn VA CLD APRX Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn] [TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn]] [TO Nnn[nn] or Snn[nn]Wnnn[nn] or Ennn[nn]]		—		OTLK 260400 TC CENTRE N28030 W07430 261000 TC CENTRE N3100 W07600 OTLK 212300 VA CLD APRX S16 E078 TO S17 E084 TO S18 E089 TO S19 E081 TO S16 E078 220300 VA CLD APRX S17 E81 TO S18 E86 TO S20 E92 TO S21 E84 TO S17 E81

OR

Cancellation of SIGMET/AIRMET ²⁶ (C)	Cancellation of SIGMET/AIRMET referring to its identification	CNL SIGMET [nn]n nnnnnn/nnnnnn	CNL SIGMET SST [nn]n nnnnnn/nnnnnn	CNL AIRMET [nn]n nnnnnn/nnnnnn	—	CNL SIGMET 2 101200/101600 ²⁶ CNL SIGMET SST 1 212330/220130 ²⁶ CNL AIRMET 151520/ 151800 ²⁶
---	---	-----------------------------------	---------------------------------------	-----------------------------------	---	--

Notes.—

- Only for transonic and supersonic flights.
- Automated special air-reports also include information on wind and temperature which does not need to be uplinked to other aircraft in flight.
- In cases where the airspace is divided into a flight information region (FIR) and an upper flight information region (UIR), the SIGMET is identified by the location indicator of the air traffic services unit serving the FIR; nevertheless, 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.
- Fictitious location.
- Corresponding with the number of SIGMET/AIRMET messages issued for the FIR/CTA since 0001 UTC on the day concerned.
- Special air-reports are to be uplinked for 60 minutes after their issuance.
- Or a sub-area thereof in the case of AIRMET messages.
- Only one of the weather phenomena listed should be selected and included in each SIGMET.
- Obscured (OBSC) indicates that the thunderstorm (including, if necessary, cumulonimbus cloud which is not accompanied by a thunderstorm) is obscured by haze or smoke or cannot be readily seen due to darkness.
- Hail (GR) may be used as a further description of the thunderstorm as necessary.
- Severe and moderate turbulence (TURB) refers only to: low-level turbulence associated with strong surface winds; rotor streaming; or turbulence whether in cloud or not in cloud (CAT) near to jet streams. Turbulence is not required to be used in connection with convective clouds. Turbulence is considered:
 - severe whenever the turbulence index is between 15 and 27 (i.e. the peak value of the eddy dissipation rate (EDR) exceeds 0.5); and
 - moderate whenever the turbulence index is between 6 and 14 (i.e. the peak value of the eddy dissipation rate (EDR) exceeds 0.3 while not exceeding 0.5).
- Embedded (EMBD) indicates that the thunderstorm (including cumulonimbus cloud which is not accompanied by a thunderstorm) is embedded within cloud layers and cannot be readily recognized.
- Frequent (FRQ) indicates 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 affected, or forecast to be affected, by the phenomenon (at a fixed time or during the period of validity).
- Squall line (SQL) indicates thunderstorm along a line with little or no space between individual clouds.
- Isolated (ISOL) indicates an area of individual cumulonimbus and/or thunderstorms with a maximum spatial coverage less than 50 per cent of the area affected, or forecast to be affected, by the phenomenon (at a fixed time or during the period of validity).

16. The use of cumulonimbus, CB, is restricted to AIRMETs and SIGMETs related to SST flight during transonic and supersonic cruise; the use of towering cumulus, TCU, is restricted to AIRMETs.
17. The weather phenomenon causing the reduction in visibility in brackets; choose one from the following list: DZ, RA, SN, SG, PL, IC, GR, GS, FG, BR, SA, DU, HZ, FU, VA, PO, SQ, FC, DS or SS.
18. Occasional (OCNL) indicates an area of well-separated cumulonimbus and/or thunderstorms with a maximum spatial coverage between 50 and 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).
19. Severe and moderate icing (ICE) refers to severe icing in other than convective clouds.
20. Freezing rain (FZRA) refers to severe icing conditions caused by freezing rain.
21. A mountain wave (MTW) is 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;
 - 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.
22. Only for SIGMET messages for volcanic ash cloud and tropical cyclones.
23. Only for SIGMET messages for tropical cyclones.
24. Only for SIGMET messages for volcanic ash.
25. Up to four layers (or levels) to be included in the SIGMET outlook for volcanic ash.
26. End of the message (as the SIGMET/AIRMET message is being cancelled).

General Note.— 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.

EXAMPLES

SIGMET

YUDD SIGMET 2 VALID 101200/101600 YUSO-SHANLON FIR/UIR OBSC TS FCST TOP FL390 S OF N54 MOV E WKN

AIRMET

YUDD AIRMET 1 VALID 151520/151800 YUSO-SHANLON FIR ISOL TS OBS TOP ABV FL100 N OF S50 STNR WKN

Cancellation of SIGMET

YUDD SIGMET 3 VALID 101345/101600 YUSO-SHANLON FIR/UIR CNL SIGMET 2 101200/101600

Cancellation of AIRMET

YUDD AIRMET 2 VALID 151650/151800 YUSO-SHANLON FIR CNL AIRMET 1 151520/151800

EXAMPLES

ADVISORY MESSAGE FOR TC**TC ADVISORY**

DTG: 19970925/1600Z
 TCAC: YUFO
 TC: GLORIA
 NR: 01
 PSN: N2706 W07306
 MOV: NW 20KMH
 C: 965HPA
 MAX WIND: 90KMH
 FCST PSN + 12 HR: 260400 N2830 W07430
 FCST MAX WIND + 12 HR: 90KMH
 FCST PSN + 18 HR: 261000 N2852 W07500
 FCST MAX WIND + 18 HR: 85KMH
 FCST PSN + 24 HR: 261600 N2912 W07530
 FCST MAX WIND + 24 HR: 80KMH
 NXT MSG: 19970925/2000Z

ADVISORY MESSAGE FOR VA**VOLCANIC ASH ADVISORY**

ISSUED: 20000402/0700Z
 VAAC: TOKYO
 VOLCANO: USUZAN 805-03
 LOCATION: N4230E14048
 AREA: JAPAN
 SUMMIT ELEVATION: 732M
 ADVISORY NUMBER: 2000/432
 INFORMATION SOURCE: GMS — JMA
 AVIATION COLOUR CODE: RED
 ERUPTION DETAILS: ERUPTED 20000402/0614Z ERUPTION OBS ASH TO ABV FL300
 OBS ASH DATE/TIME: 02/0645Z
 OBS ASH CLD: FL150/350 N4230E14048-N4300E14130-N4246E14230-N4232E14150-N4230E14048
 SFC/FL150 MOV NE 25KT FL150/350 MOV E 30KT
 FCST ASH CLD + 6 HR: 02/1245Z SFC/FL200 N4230E14048-N4232E14150-N4238E14300-N4246 E14230
 FL200/350 N4230E14048-N4232E14150N4238E14300-N4246E14230 FL350/600 NO
 ASH EXP
 FCST ASH CLD + 12 HR: 02/1845Z SFC/FL300 N4230E14048-N4232E14150-N4238E14300-N4246E14230
 FL300/600 NO ASH EXP
 FCST ASH CLD + 18 HR: 03/0045Z SFC/FL600 NO ASH EXP
 NEXT ADVISORY: 20000402/1300Z
 REMARKS: ASH CLD CAN NO LONGER BE DETECTED ON SATELLITE IMAGE

SIGMET FOR TC

YUCC SIGMET 3 VALID 251600/252200 YUDO
 AMSWELL FIR TC GLORIA OBSN2706 W07306 AT 1600Z CB TOP FL500 WI 150NM OF CENTRE MOV NW 10KT
 NC FCST 2200Z TC CENTRE N2740 W07345
 OTLK TC CENTRE 260400 N2830 W07430 261000N2912 W07530

SIGMET FOR VA

YUDD SIGMET 2 VALID 211100/211700 YUSO-
SHANLON FIR/UIR VA ERUPTION MT ASHVAL LOC E S1500 E07348 VA CLD OBS AT 1100Z FL310/450 APRX
220KM BY 35KM S1500 E07348E TO S1530 E07642 MOV ESE 65KMH FCST 1700Z VA CLD APRX S1506 E07500
TO S1518 E08112 TO S1712 E08330 TO S1824 E07836
OTLK 212300Z VA CLD APRX S1600 E07806 TO S1642 E08412 TO S1824 E08900 TO S1906 E08100 220500ZVA CLD
APRX S1700 E08100 TO S1812 E08636 TO S2000 E09224 TO S2130 E08418

EXAMPLE OF SIGMET MESSAGE

YUCC SIGMET 5 VALID 221215/221600 YUDO-
AMSWELL FIR SEV TURB OBS AT 1210Z YUSB FL250 MOV E 40KMH WKN

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

* Fictitious locations

EXAMPLE OF AIRMET MESSAGE

YUCC AIRMET 2 VALID 221215/221600 YUDO-
AMSWELL FIR MOD MTW OBS AT 1205Z AND FCST N48 E10 FL080 STNR NC

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

* Fictitious locations

Table A5-2. Ranges and resolutions for the numerical elements included in SIGMET/AIRMET messages

<i>Element as specified in Chapter 7</i>		<i>Range</i>	<i>Resolution</i>
Surface wind speed:	KMH KT	60 – 199 30 – 99	1 1
Surface visibility:	M M	0000 – 0800 0800 – 5 000	50 100
Cloud: height of base:	M FT	000 – 300 000 – 1 000	30 100
Cloud: height of top:	M M FT FT	000 – 3 000 3 000 – 20 000 000 – 10 000 10 000 – 60 000	30 300 100 1 000
Latitudes:	° (degrees) ' (minutes)	00 – 90 00 – 60	1 1
Longitudes:	° (degrees) ' (minutes)	000 – 180 00 – 60	1 1
Flight levels		000 – 650	10
Movement:	KMH KT	0 – 100 0 – 50	10 5

ATTACHMENT A. GUIDANCE ON AREA FORECASTS IN ABBREVIATED PLAIN LANGUAGE

(See 3.2.14, 3.2.15, 3.3.1 and 3.3.9 of this Annex)

PART 1 — FORMAT FOR ABBREVIATED PLAIN-LANGUAGE SIGNIFICANT WEATHER FORECAST MESSAGES AND AMENDMENTS THERETO TO SERVE INTERNATIONAL CIVIL AVIATION IN OPERATIONS ABOVE FLIGHT LEVEL 250

1. Specifications

1.1 For the purpose of these instructions, “abbreviated plain language” refers to a language conveying to aeronautical personnel a directly intelligible meaning through the use of abbreviations (except signals of the Q code) approved by ICAO and numerical values of self-explanatory nature supplemented, if suitable ICAO-approved abbreviations are not available, by other words taken with their usual meaning in aviation.

Note.— ICAO-approved abbreviations are published in the PANS-ABC (Doc 8400). Signals of the Q code should not be used in abbreviated plain-language significant weather area forecast messages.

1.2 In abbreviated plain-language significant weather forecast messages, the term “CB” should be understood to include pertinent weather phenomena normally associated with cumulonimbus, namely thunderstorms, moderate or severe turbulence, moderate or severe icing, and hail.

1.3 An abbreviated plain-language significant weather forecast message should be consistent with the significant weather forecast chart from which it was derived.

1.4 The format should be as follows:

- a) World Meteorological Organization abbreviated heading.
- b) *Type of message; applicable vertical range; valid time; area to which the forecast message relates.* Describe the forecast area by reference to latitude, to longitude, to latitude/longitude coordinates, to major geographical features, or to any combination thereof. Describe, in the same manner, any part of the area for which a significant weather forecast cannot be given because of lack of data.
- c) *Synopsis.* Include descriptions of significant weather features, such as tropical cyclones, surface positions of frontal systems and well-defined convergence zones; their forecast positions; their speed and direction of movement; and intensification or weakening, if considered significant. Give forecast positions as in b). Describe direction of movement in terms of eight points

of the compass related to true north; give speed of movement in kilometres per hour or knots.

- d) *Significant weather phenomena.* Describe areas as in b). Describe the amount of cumulonimbus as ISOL EMBD CB (individual embedded cumulonimbus with a maximum spatial coverage of cumulonimbus less than 50 per cent of the area affected, or forecast to be affected, by the phenomenon) or ISOL CB IN HAZE (individual cumulonimbus concealed in haze with a maximum spatial coverage less than 50 per cent of the area affected, or forecast to be affected, by the phenomenon); OCNL EMBD CB (well separated embedded cumulonimbus with a maximum spatial coverage of cumulonimbus between 50 and 75 per cent of the area affected, or forecast to be affected, by the phenomenon) or OCNL CB IN HAZE (well separated cumulonimbus concealed in haze with a maximum spatial coverage between 50 and 75 per cent of the area affected, or forecast to be affected, by the phenomenon); or FRQ CB (cumulonimbus clouds with little or no separation with a maximum spatial coverage greater than 75 per cent of the area affected, or forecast to be affected, by the phenomenon). Describe cumulonimbus clouds contained in layers of other clouds as EMBD. Give bases and tops of significant weather phenomena as flight level (FL). If no significant weather is forecast, enter the term “SIGWX NIL”.

Note.— Give bases of significant weather phenomena only if expected to be at or above the lowest level of the atmosphere for which the forecast is prepared. Similarly, give the tops of significant weather phenomena only if expected to be at or below the highest level of the atmosphere for which the forecast is prepared.

- e) *Turbulence.* This should include turbulence, other than that associated with cumulonimbus, if expected to be moderate or severe, and the intensity thereof. Describe areas as in b). Give bases and tops of phenomenon as FL. If no turbulence in this category is forecast, no entry for turbulence should be given.

Note.— See Note under 1.4 d) for similar application.

- f) *Volcanic eruptions.* Include information on the location of volcanic eruptions which are producing ash clouds of significance to aircraft operations, including those producing only steam, comprising: the name of the volcano, its international number, latitude/longitude, the date and time of first eruption, if known, together with a reminder to users that reference should be made to SIGMETs and NOTAM or ASHTAM issued for the area concerned.

materials into the atmosphere, of significance to aircraft operations, comprising: latitude/longitude of the site of the accident, date and time of accident and a reminder to users to check NOTAM for the area concerned.

- g) *Radioactive materials in the atmosphere.* Information on the location of an accidental release of radioactive

Examples of abbreviated plain-language significant weather messages are given below.

2. Examples

Example 1

FAPN13 KWBC 101200

AREA FCST FL250 TO FL450 VALID 110000 FOR AREA N37E135 N48W108 N28W130 N28E158 N37E135.

SYNOPSIS. COLD FRONT N45W179 N33W179 MOV E 20 KT. COLD FRONT N43W152 N44W140 N35W131 N29W134 MOV NE 15 KT INTSF.

SIGWX NIL

TURB. MOD CAT FL260 TO FL340 N36E140 N36E150 N34E141 N36E140. MOD CAT FL280 TO FL380 N41W133 N45W125 N42W117 N40W120 N41W133.

Example 2

FAEWI EJJJ 101300

AREA FCST FL250 TO FL450 VALID 110000 FOR AREA N50W20 N50E20 N30E20 N30W20 N50W20.

SYNOPSIS. NO MAJOR WX SYSTEM.

SIGWX NIL.

Example 3

FANT10 KWBC 101200

AREA FCST FL250 TO FL600 VALID 110000 FOR AREA N55W88 N50E42 N33E13 N27W59 N55W88.

SYNOPSIS. WARM FRONT N42W84 N43W79 N39W62 MOV NE 30 KT. OCCLUDED FRONT N63W40 N60W25 N50W29 MOV E 35 KT. COLD FRONT N50W29 N40W43 N31W60 MOV SE 10 KT INTSF.

SIGWX AND ASSOCIATED CLD. ISOL EMBD CB TOPS FL340 N55E20 N55E30 N46E34 N44E24 N55E20.

TURB. MOD CAT FL250 TO FL340 N46W41 N53W40 N56W28 N50W32 N46W41. MOD CAT FL250 TO FL350 N62W30 N67W13 N63W08 N61W20 N62W30.

Example 4

FANT10 KWBC 101400 AMD
AMD AREA FCST FL250 TO FL600 VALID 110000 FOR AREA N55W88 N50E42 N33E13 N27W59 N55W88.

SYNOPSIS. NO MAJOR WX SYSTEM.

SIGWX AND ASSOCIATED CLD. FRQ CB TOPS FL480 N48W80 N46W65 N41W65 N45W79 N48W80.

OTHER AMD NIL.

Example 5

FAXT1 KWBC 101200
AREA FCST FL250 TO FL600 VALID 110000 FOR AREA N50W160 N50W43 S20W43 S20W160 N50W160. FCST NIL
FOR AREA SOUTH OF EQUATOR DUE LACK OF DATA.

SYNOPSIS. WARM FRONT N41W85 N43W80 N39W70 N39W61 MOV NE 30 KT. COLD FRONT N41W85 N29W94
MOV SE 25 KT. STNR FRONT N40W43 N30W63. COLD FRONT N49W132 N45W130 N40W133 N30W144 MOV NE
15 KT INTSF.

SIGWX NIL.

TURB. MOD CAT FL280 TO FL380 N41W116 N44W120 N45W125 N43W130 N42W133 N41W130 N39W116
N41W116. MOD CAT FL280 TO FL380 N44W105 N41W109 N39W105 N44W105. MOD CAT FL240 TO FL350
N50W70 N50W81 N44W87 N42W85 N45W75 N48W70 N50W70.

PART 2 — FORMAT FOR ABBREVIATED PLAIN-LANGUAGE SIGNIFICANT WEATHER FORECAST MESSAGES AND AMENDMENTS THERETO TO SERVE INTERNATIONAL CIVIL AVIATION IN OPERATIONS BETWEEN FLIGHT LEVELS 100 AND 250

1. Specifications

1.1 For the purpose of these instructions, “abbreviated plain language” refers to a language conveying to aeronautical personnel a directly intelligible meaning through the use of abbreviations (except signals of the Q code) approved by ICAO and numerical values of self-explanatory nature supplemented, if suitable ICAO-approved abbreviations are not available, by other words taken with their usual meaning in aviation.

Note.— ICAO-approved abbreviations are published in the PANS-ABC (Doc 8400). Signals of the Q code should not be used in abbreviated plain-language significant weather area forecast messages.

1.2 In abbreviated plain-language significant weather forecast messages, the term “CB” should be understood to include pertinent weather phenomena normally associated with cumulonimbus, namely thunderstorms, moderate or severe turbulence, moderate or severe icing, and hail.

1.3 An abbreviated plain-language significant weather forecast message should be consistent with the significant weather forecast chart from which it was derived.

1.4 The format should be as follows:

- a) World Meteorological Organization abbreviated heading.
- b) *Type of message; applicable vertical range; valid time; area to which the forecast message relates.* Describe the forecast area by reference to latitude, to longitude, to latitude/longitude coordinates, to major geographical features, or to any combination thereof. Describe, in the same manner, any part of the area for which a significant weather forecast cannot be given because of lack of data.
- c) *Synopsis.* Include descriptions of significant weather features, such as tropical cyclones, surface positions of frontal systems and well-defined convergence zones; their forecast positions; their speed and direction of movement; and intensification or weakening, if considered significant. Give forecast positions as in b). Describe direction of movement in terms of eight points of the compass related to true north; give speed of movement in kilometres per hour or knots.
- d) *Significant weather phenomena and associated clouds.* Describe areas as in b). Give cloud amounts, except for cumulonimbus clouds, in terms of FEW (1 to 2 oktas), SCT (3 to 4 oktas), BKN (5 to 7 oktas), or OVC (8 oktas). Describe the amount of cumulonimbus as

ISOL EMBD CB (individual embedded cumulonimbus with a maximum spatial coverage of cumulonimbus less than 50 per cent of the area affected, or forecast to be affected, by the phenomenon) or ISOL CB IN HAZE (individual cumulonimbus concealed in haze with a maximum spatial coverage less than 50 per cent of the area affected, or forecast to be affected, by the phenomenon); OCNL EMBD CB (well separated embedded cumulonimbus with a maximum spatial coverage of cumulonimbus between 50 and 75 per cent of the area affected, or forecast to be affected, by the phenomenon) or OCNL CB IN HAZE (well separated cumulonimbus concealed in haze with a maximum spatial coverage between 50 and 75 per cent of the area affected, or forecast to be affected, by the phenomenon); or FRQ CB (cumulonimbus clouds with little or no separation with a maximum spatial coverage greater than 75 per cent of the area affected, or forecast to be affected, by the phenomenon). Describe cumulonimbus clouds contained in layers of other clouds as EMBD. Give bases and tops of significant weather phenomena and associated clouds as flight level (FL). If no significant weather is forecast, enter the term “SIGWX NIL”.

- e) *Turbulence.* This should include turbulence, other than that associated with cumulonimbus, if expected to be moderate or severe, and the intensity thereof. Describe areas as in b). Give bases and tops of phenomenon as FL. If no turbulence in this category is forecast, no entry for turbulence should be given.
- f) *Icing.* This should include icing, other than that associated with cumulonimbus, if expected to be moderate or severe, and the intensity thereof. Should also include icing in area(s) of forecast, freezing precipitation. Describe areas as in b). Give bases and tops of phenomenon as FL. If aircraft icing, other than that associated with cumulonimbus, is not forecast, no entry for icing should be given.
- g) *Volcanic eruptions.* Include information on the location of volcanic eruptions which are producing ash clouds of significance to aircraft operations, including those producing only steam, comprising: the name of the volcano, its international number, latitude/longitude, the date and time of first eruption, if known, together with a reminder to users that reference should be made to SIGMETs and NOTAM or ASHTAM issued for the area concerned.

Note.— Give bases of significant weather phenomena (and associated clouds, if any) only if expected to be at or above the lowest level of the atmosphere for which the forecast is

prepared. Similarly, give the tops of significant weather phenomena (and associated clouds, if any) only if expected to be at or below the highest level of the atmosphere for which the forecast is prepared.

the accident, date and time of accident and a reminder to users to check NOTAM for the area concerned.

- h) *Radioactive materials in the atmosphere.* Information on the location of an accidental release of radioactive materials into the atmosphere, of significance to aircraft operations, comprising: latitude/longitude of the site of

2. Examples

Examples of abbreviated plain-language significant weather messages are given below.

Example 1

FAPN16 KWBC 101200

AREA FCST FL100 TO FL250 VALID 110000 FOR AREA N37E135 N48W108 N28W130 N28E158 N37E135.

SYNOPSIS. COLD FRONT N45W179 N33W179 MOV E 20 KT. COLD FRONT N43W152 N44W140 N35W131 N29W134 MOV NE 15 KT INTSF.

SIGWX NIL

ICE. MOD ICE INC FL100 TO FL180 N42W140 N46W145 N47W138 N42W140.

Example 2

FANT14 KWBC 101200

AREA FCST FL100 TO FL250 VALID 110000 FOR AREA N55W88 N50E42 N33E13 N27W59 N55W88.

SYNOPSIS. WARM FRONT N42W84 N43W79 N39W62 MOV NE 30 KT. OCCLUDED FRONT N63W40 N60W25 N50W29 MOV E 35 KT. COLD FRONT N40W29 N40W43 N31W60 MOV SE 10 KT INTSF.

SIGWX AND ASSOCIATED CLD. ISOL EMBD CB N44E20 N55E30 N46E34 N44E24 N44E20.

TURB. MOD CAT BASE FL240 N47W41 N53W40 N56W28 N50W32 N47W41. MOD CAT BASE FL250 N62W30 N67W13 N63W08 N61W20 N62W30.

ICE. MOD ICE INC FL100 TO FL130 N55W03 N49W08 N43W00 N44E10 N50E14 N55E03.

Example 3

FANT14 KWBC 101400 AMD

AMD AREA FCST FL100 TO FL250 VALID 110000 FOR AREA N55W88 N40E42 N33E13 N27W59 N55W88.

SYNOPSIS. WARM FRONT N42W84 N43W79 N39W62 MOV NE 10 KT INTSF.

SIGWX AND ASSOCIATED CLD. FRQ CB N48W80 N46W65 N41W65 N45W79 N48W80 INTSF.

OTHER AMD NIL.

PART 3 — FORMAT FOR MESSAGES CONTAINING ABBREVIATED PLAIN-LANGUAGE AMENDMENTS TO UPPER-AIR FORECASTS

1. Specifications

1.1 For the purpose of these instructions, “abbreviated plain language” refers to a language conveying to aeronautical personnel a directly intelligible meaning through the use of abbreviations (except signals of the Q code) approved by ICAO and numerical values of self-explanatory nature supplemented, if suitable ICAO-approved abbreviations are not available, by other words taken with their usual meaning in aviation.

Note.— ICAO-approved abbreviations are published in the PANS-ABC (Doc 8400). Signals of the Q code should not be used in abbreviated plain-language messages issued as amendments to relevant upper-air wind and temperature forecasts.

1.2 Abbreviated plain-language amendments to upper-air forecasts should be understood to apply to all relevant forecasts prepared by world and regional area forecast centres for any specified area, level and valid time(s). Such forecasts could include meteorological charts, grid point data in numerical form and grid point data in digital form.

1.3 The area and levels for which amendments to upper-air forecasts are to be issued should be described with regard to horizontal dimensions by applicable latitude/longitude coordinates and with regard to vertical dimensions by applicable ICAO flight levels related to standard constant pressure surfaces.

1.4 To minimize the possibility of misinterpretation of the amendments, the procedures given below should be followed:

- a) amendments should be issued in abbreviated plain language as an amended area forecast under a World Meteorological Organization abbreviated heading, using as date time group the standard time of observation in UTC on which the original forecast was based;
- b) the amendment criteria given by Annex 3, 3.2.12 should be followed;

- c) the valid time(s) to which an amendment is intended to apply should be given in terms of 12, 18, 24 and/or 30 hours following the standard time in UTC on which the original forecast was based;
- d) the area to which an amendment to be issued is intended to apply should be described as a four-sided polygon in terms of latitude/longitude intersections giving corner coordinates of the polygon. To minimize the risk of misinterpretation, the corner coordinates should be given in a clockwise or counter-clockwise sequence. Latitude should be given in whole degrees (two digits) followed by N (north) or S (south). Longitude should be given in whole degrees (three digits) followed by E (east) or W (west);
- e) the ICAO flight levels to which an amendment is intended to apply should be given in the text of the amendment messages;
- f) amendments to forecasts of wind speed should be given in terms of percentage increase, using three digits (010, 020, 030, 120 and so forth) preceded by PS (plus) or of percentage decrease (010, 020, 030 and so forth up to a maximum decrease of 099) preceded by MS (minus);
- g) amendments to forecasts of wind direction should be given in terms of clockwise or counter-clockwise rotation from the forecast being amended, using three digits (010, 020 and so forth up to 180) preceded by CW (for clockwise) or CC (for counter-clockwise); and
- h) amendments to upper-air temperature forecasts should be given in three digits as absolute increases or decreases, in degrees Celsius, preceded by PS (plus) or MS (minus).

Note.— No entry should be made for any feature for which an amendment is not being issued.

2. Examples

Examples of messages containing amendments to upper-air forecasts are given below.

Example 1

FXPA1 KWBC 241200 AMD
AMD AREA FCST

SPEED CHANGE PER CENT INCR (PS) OR DECR (MS).
DIRECTION CHANGE CLOCKWISE (CW) OR COUNTER-CLOCKWISE (CC).
TEMPERATURE CHANGE ABSOLUTE INCR (PS) OR DECR (MS).

AMEND WIND AND TEMPERATURE FORECAST IN AREA N38E160 N46E160 N47W178 N35W178.
AMENDMENT VALID 18 HR 24 HR AND 30 HR AFTER 241200.

AMENDMENT FOR	FL250	FL300	FL340	FL390
WIND SPEED/PER CENT	PS035	PS035	PS035	PS035
WIND DIRECTION/DEG	CC020	CC020	CC020	CC020
TEMPERATURE/DEG C	PS005	PS005	PS005	PS005

AMEND WIND AND TEMPERATURE FORECAST IN AREA N47W177 N40W161 N30W161 N35W177.
AMENDMENT VALID 18 HR 24 HR AND 30 HR AFTER 241200.

AMENDMENT FOR	FL250	FL300	FL340	FL390
WIND SPEED/PER CENT	MS025	MS040	MS050	MS040

Example 2

FXPA2 KWBC 241200 AMD
AMD AREA FCST

SPEED CHANGE PER CENT INCR (PS) OR DECR (MS).
DIRECTION CHANGE CLOCKWISE (CW) OR COUNTER-CLOCKWISE (CC).
TEMPERATURE CHANGE ABSOLUTE INCR (PS) OR DECR (MS).

AMEND WIND AND TEMPERATURE FORECAST IN AREA N33E143 N43E147 N45E159 N33E159.
AMENDMENT VALID 18 HR AND 24 HR AFTER 241200.

AMENDMENT FOR	FL250	FL300	FL340	FL390
WIND SPEED/PER CENT	PS040	PS050	PS070	PS050
WIND DIRECTION/DEG	CW020	CW020	CW020	CW020
TEMPERATURE/DEG C	MS005	MS008	MS010	MS008

ATTACHMENT B. OPERATIONALLY DESIRABLE AND CURRENTLY ATTAINABLE ACCURACY OF MEASUREMENT OR OBSERVATION

*Note.— The guidance contained in this table relates to Chapter 4 —
Meteorological observations and reports, in particular to 4.1.13*

<i>Element to be observed</i>	<i>Operationally desirable accuracy of measurement or observation*</i>	<i>Attainable accuracy** of measurement or observation (1994)</i>
Mean surface wind	Direction: $\pm 10^\circ$ Speed: ± 2 km/h (1 kt) up to 19 km/h (10 kt) $\pm 10\%$ above 19 km/h (10 kt)	Direction: $\pm 5^\circ$ Speed: ± 2 km/h (1 kt) up to 37 km/h (20 kt) $\pm 5\%$ above 37 km/h (20 kt)
Variations from the mean surface wind	± 4 km/h (2 kt), in terms of longitudinal and lateral components	as above
Visibility	± 50 m up to 600 m $\pm 10\%$ between 600 m and 1 500 m $\pm 20\%$ above 1 500 m	± 50 m up to 500 m $\pm 10\%$ between 500 m and 2 000 m $\pm 20\%$ above 2 000 m up to 10 km
Runway visual range	± 10 m up to 400 m ± 25 m between 400 m and 800 m $\pm 10\%$ above 800 m	± 25 m up to 150 m ± 50 m between 150 m and 500 m $\pm 10\%$ above 500 m up to 2 000 m
Cloud amount	± 1 okta	In daylight an observer can attain an accuracy of ± 1 okta at the point of observation. In darkness, and when atmospheric phenomena limit the viewing of low cloud, there will be difficulty in attaining that accuracy.
Cloud height	± 10 m (33 ft) up to 100 m (330 ft) $\pm 10\%$ above 100 m (330 ft)	± 10 m (33 ft) up to 1 000 m (3 300 ft) ± 30 m (100 ft) above 1 000 m (3 300 ft) up to 3 000 m (10 000 ft)
Air temperature and dew point temperature	$\pm 1^\circ\text{C}$	$\pm 0.2^\circ\text{C}$
Pressure value (QNH, QFE)	± 0.5 hPa	± 0.3 hPa

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

** The accuracy stated refers to assessment by instruments (except for cloud amount); it is not normally attainable in observations made without the aid of instruments.

ATTACHMENT C. SELECTED CRITERIA APPLICABLE TO
AERODROME REPORTS

(The guidance in this table relates to Chapter 4 — Meteorological observations and reports, 4.5 to 4.12 inclusive)

	Surface wind			Visibility (VIS)			RVR ¹ A B C (OBS TIME) -10 -5 (Time, MIN)			Present weather	Cloud					Temperature	Pressure (QNH, QFE)		Supplementary information	
							Amount				Type ²									
Specifications	Directional variations ³		Speed variations ³	Directional variations ⁴			Past tendency ⁵		Variations ⁵	No general criteria applicable to all the WX phenomena (for specific criteria see 4.8.4-4.8.7)	Layers reported if coverage				Identification	No criteria	Parameters reported	Updated if changes > agreed magnitude	Parameter to be included	
	≥ 6 0°		Exceeding the mean speed by ≥ 20 km/h (10 kt)	General rule	Special cases		$\bar{R}_{5(AB)} - \bar{R}_{5(BC)}$		$\bar{R}_1 - \bar{R}_{10}$ > MAX [50 m or 20% × \bar{R}_{10}]		Lowest layer	Next layer >	Next higher layer >	CB ⁶ or TCU						
	Mean speed				VIS ≥ 1.5 × Minimum VIS in one or more directions	Minimum VIS < 1 500 m and VIS > 5 km in another direction														
	≤ 6 km/h (3 kt)	> 6 km/h (3 kt)					< 100 m	≥ 100 m												
Local routine and special report	2 min ⁷	2 min	2 min	N/A	N/A	N/A	1 min	N/A ⁸	N/A	1 min	Always	2/8	4/8	Always	CB TCU	QNH QFE ⁹	Yes	All ¹⁰		
	2 extreme directions ¹¹	2 extreme directions ¹¹	Minimum and maximum speed				N/A													
METAR/ SPECI	10 min	10 min	10 min	Minimum VIS	Minimum VIS + direction	Minimum VIS + direction, and higher VIS + direction	10 min	No tendency observed ("N")	Upward ("U") or downward ("D")	1 min	Always	2/8	4/8	Always	CB TCU	QNH	No	Recent WX of operational significance and wind shear ¹³		
	VRB ¹¹ (no extremes)	2 extreme directions ¹¹	Maximum speed ¹²				No tendency available, the tendency is to be omitted													
Relevant reporting scales for all messages	Direction in three figures <i>rounded</i> off to the nearest 10 degrees (degrees 1-4 down, degrees 5-9 up)		Speed in 1 km/h or 1 kt Speed < 2 km/h (1 kt) indicated as CALM	<i>If Step applicable</i> VIS < 800 m : 50 m 800 m ≤ VIS < 5 000 m : 100 m 5 000 m ≤ VIS < 10 km : 1 km VIS ≥ 10 km : None, given as 10 km or covered under CAVOK			<i>If Step applicable</i> RVR < 400 m : 25 m 400 ≤ RVR ≤ 800 m : 50 m 800 < RVR < 1 500 m : 100 m ¹⁴			N/A	<i>If Step applicable</i> Base ≤ 3 000 m (10 000 ft) : 30 m (100 ft) Base > 3 000 m (10 000 ft) : 300 m (1 000 ft) (Reference level: Aerodrome elevation ¹⁵ or mean sea level for off-shore structures)				Rounded off to whole degrees: up (down) for decimals 5-9 (1-4)	In whole hPa ¹⁶ <i>rounding</i> down for decimals 1-9 ¹⁷		N/A		

Notes.—

1. Considered for the past 10 minutes (exception: if the 10-minute period includes a *marked discontinuity* (i.e. RVR changes or passes 150, 350, 600 or 800 m, lasting ≥ 2 minutes), only data after the discontinuity to be used). A simple diagrammatic convention is used to illustrate those parts of the 10-minute period prior to the observation relevant to RVR criteria, i.e. AB, BC and AC.
2. Layer composed of CB and TCU *with a common base* should be reported as "CB".
3. Considered for the past 10 minutes (exception: if the 10-minute period includes a *marked discontinuity* (i.e. the direction changes ≥ 30° with a speed ≥ 20 km/h or the speed changes ≥ 20 km/h 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}_1 = any 1-minute mean RVR-value during period AC, \bar{R}_{10} = 10-minute mean RVR-value during period AC, $\bar{R}_{5(AB)}$ = 5-minute mean RVR-value during period AB and $\bar{R}_{5(BC)}$ = 5-minute mean RVR-value during period BC.
6. CB (cumulonimbus) and TCU (towering cumulus = cumulus congestus of great vertical extent) if not already indicated as one of the other layers.
7. Time averaging, if applicable, indicated in the upper left-hand corner.
8. N/A = not applicable.
9. QFE is to be included if required.

10. As listed in 4.12.1 to 4.12.4, and 4.12.7.
11. Indicate as "VRB" where variations in wind direction are 180° or more or where it is not possible to report a mean wind direction (e.g. a thunderstorm passing over the aerodrome).
12. 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."
13. Also sea-surface temperature and state of the sea from off-shore structures. Other information may only be inserted in accordance with regional air navigation agreement.
14. Report if RVR and/or VIS < 1 500 m, limits for assessments 50 and 1 500 m.
15. 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.
16. Measured in 0.1 hPa.
17. 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 aerodrome elevation, where the reference level should be the relevant threshold elevation.

ATTACHMENT D. CONVERSION OF INSTRUMENTED READINGS INTO RUNWAY VISUAL RANGE AND VISIBILITY

(See 4.7.10 of this Annex)

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 4.

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.

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

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

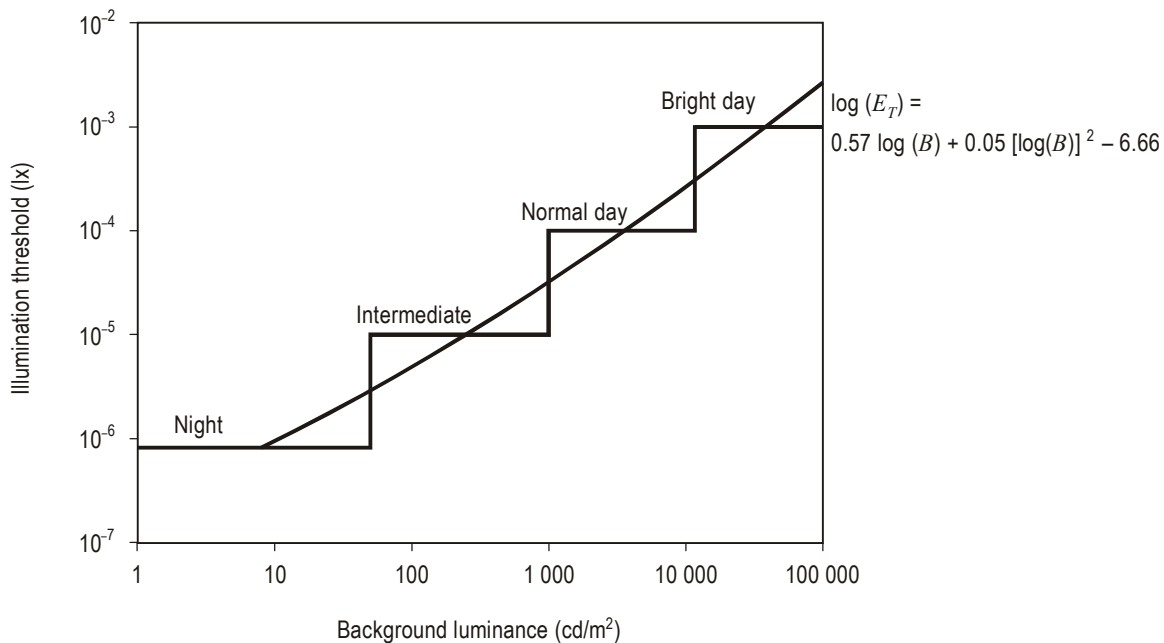


Figure D-1. Relationship between the illumination threshold E_T (lx) and background luminance B (cd/m^2)

Table D-1. Illumination threshold steps

<i>Condition</i>	<i>Illumination threshold (lx)</i>	<i>Background luminance (cd/m²)</i>
Night	8×10^{-7}	≤ 50
Intermediate	10^{-5}	51 – 999
Normal day	10^{-4}	1 000 – 12 000
Bright day (sunlit fog)	10^{-3}	> 12 000

ATTACHMENT E. OPERATIONALLY DESIRABLE ACCURACY OF FORECASTS

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

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

<i>Element to be forecast</i>	<i>Operationally desirable accuracy of forecasts</i>	<i>Minimum percentage of cases within range</i>
AERODROME FORECAST		
Wind direction	± 30°	80% of cases
Wind speed	± 9 km/h (5 kt) up to 46 km/h (25 kt) ± 20% above 46 km/h (25 kt)	80% of cases
Visibility	± 200 m up to 700 m ± 30% between 700 m and 10 km	80% of cases
Precipitation	Occurrence or non-occurrence	80% of cases
Cloud amount	± 2 oktas	70% of cases
Cloud height	± 30 m (100 ft) up to 120 m (400 ft) ± 30% between 120 m (400 ft) and 3 000 m (10 000 ft)	70% of cases
Air temperature	± 1°C	70% of cases
LANDING FORECAST		
Wind direction	± 30°	90% of cases
Wind speed	± 9 km/h (5 kt) up to 46 km/h (25 kt) ± 20% above 46 km/h (25 kt)	90% of cases
Visibility	± 200 m up to 700 m ± 30% between 700 m and 10 km	90% of cases
Precipitation	Occurrence or non-occurrence	90% of cases
Cloud amount	± 2 oktas ± 30% between 700 m and 10 km	90% of cases
Cloud height	± 30 m (100 ft) up to 120 m (400 ft) ± 30% between 120 m (400 ft) and 3 000 m (10 000 ft)	90% of cases

<i>Element to be forecast</i>	<i>Operationally desirable accuracy of forecasts</i>	<i>Minimum percentage of cases within range</i>
FORECAST FOR TAKE-OFF		
Wind direction	$\pm 30^\circ$	90% of cases
Wind speed	± 9 km/h (5 kt) up to 46 km/h (25 kt) $\pm 20\%$ above 46 km/h (25 kt)	90% of cases
Air temperature	$\pm 1^\circ\text{C}$	90% of cases
Pressure value (QNH)	± 1 hPa	90% of cases
AREA, FLIGHT AND ROUTE FORECASTS		
Upper-air temperature	$\pm 3^\circ\text{C}$ (Mean for 900 km/500 NM)	90% of cases
Upper wind	± 28 km/h (15 kt) up to flight level 250 ± 37 km/h (20 kt) above flight level 250 (Modulus of vector difference for 900 km/500 NM)	90% of cases
Significant en-route weather phenomena and cloud	Occurrence or non-occurrence	80% of cases
	Location: ± 100 km/60 NM	70% of cases
	Vertical extent: ± 600 m/2 000 ft	70% of cases

— END —