Civil Aviation Safety Authority
of Papua New Guinea

Advisory Circular

AC175-3

Aeronautical Charts

Initial Issue

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GENERAL

Civil Aviation Authority Advisory Circulars (AC) contain information about standards, practices and procedures that the Director has found to be an Acceptable Means of Compliance (AMC) with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices or procedures are found to be acceptable, they will be added to the appropriate Advisory Circular.

PURPOSE

This Advisory Circular provides methods, acceptable to the Director, for showing compliance with the aerodrome certification exposition requirements of Part 175 and explanatory material to assist in showing compliance.

RELATED CAR

This AC relates specifically to Civil Aviation Rule 175.301 – Subpart G – Aeronautical Charts.

CHANGE NOTICE

There was no previous issue of this AC, consequently no change is in effect.

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CHAPTER 1 – AERONAUTICAL CHARTING REQUIREMENTS

1.1 General Standards and Specifications of Charts

1.1.1 The aeronautical charts required in CAR 175 shall be produced in accordance with international standards, recommended practices, and take into account relevant guidance material.

1.1.2 Aeronautical charts should be produced in accordance with the specifications contained in ICAO Annex 4, Amendment No.61.

1.1.3 Guidance on the productions of aeronautical charts is contained in ICAO DOC 8697-Aeronautical Chart Manual.

1.2 Operational requirements for charts

1.2.1 For the purpose of this AC, the total flight is divided into the following phases:

Phase 1 — Taxi from aircraft stand to take-off point
Phase 2 — Take-off and climb to en-route ATS route structure
Phase 3 — En-route ATS route structure
Phase 4 — Descent to approach
Phase 5 — Approach to land and missed approach
Phase 6 — Landing and taxi to aircraft stand.

1.2.2 **Titles**

T**h**e title of a chart or chart series prepared in accordance with the specifications contained in rule 175.301 and intended to satisfy the function of the chart shall be that of the relevant chapter heading as modified by application of any Standard contained therein, except that such title shall not include “ICAO” unless the chart conforms with all Standards specified in Annex 4 and any specified for the particular chart;

1.2.3 **Miscellaneous Information**

(a) The following information shall be shown on the face of each chart unless otherwise stated in the specification of the chart concerned:

(1) designation or title of the chart series;
(2) name and reference of the sheet;
(3) on each margin an indication of the adjoining sheet (when applicable).
Note. — The title may be abbreviated.

(b) A legend to the symbols and abbreviations used shall be provided. The legend shall be on the face or reverse of each chart except that, where it is impracticable for reasons of space, a legend may be published separately.

(c) The name and adequate address of the producing agency shall be shown in the margin of the chart except that, where the chart is published as part of an aeronautical document, this information may be placed in the front of that document.

1.2.4 **Symbols**

(a) Symbols used shall conform to those shown in Appendix C — ICAO Chart Symbols, except that where it is desired to show on an aeronautical chart special features or items of importance to civil aviation for which no ICAO symbol is at present provided any appropriate symbol may be chosen for this purpose, provided that it does not cause confusion with any existing chart symbol or impair the legibility of the chart;

(b) To represent ground-based navigation aids, intersections and waypoints, the same basic symbol shall be used on all charts on which they appear, regardless of chart purpose;

(c) The symbol used for significant points shall be based on a hierarchy of symbols and selected in the following order: ground-based navigation aid, intersection, waypoint symbol. A waypoint symbol shall be used only when a particular significant point does not already exist as either a ground-based navigation aid or intersection;

1.2.5 **Units of measurements**

(a) The geodesic distances used for the linear dimensions on aerodromes and short distances shall be expressed in meters.

(b) The order of resolution of distances dimensions, elevation and heights shall be that as specified for a particular chart;

(c) The units of measurement used to express distances, altitude, elevation and heights shall be conspicuously stated on the face of each chart;

(d) Conversion scales (kilometers/nautical miles, meters/feet) shall be provided on each chart on which distances, elevations or altitude are shown. The conversion scales shall be placed on the face of each chart.

1.2.6 **Scale and projection**

For charts of large areas, the name and basic parameters and scale of the projection shall be indicated. For charts of small areas, a linear scale only shall be indicated.

1.2.7 **Date of validity of aeronautical information**

The date of validity of aeronautical information shall be clearly indicated on the face of each chart.

1.2.8 **Spelling of geographical names**

(a) The names of places and of geographical features in countries which officially use varieties of the Roman alphabet shall be accepted in their official spelling, including the accents and diacritical marks used in the respective alphabets;

(b) Where a geographical term such as “cape”, “point”, “gulf”, “river” is abbreviated on any particular chart that word shall be spelt out in full in the language used by the publishing agency, in respect of the most important example of each type. Punctuation marks shall not be used in abbreviations within the body of a chart.

(c) The symbols of the Roman alphabet shall be used for all writing.

1.2.9 **Abbreviations**

Abbreviations shall be used on aeronautical charts whenever they are appropriate.

1.2.10 **Political boundaries**

(a) International boundaries shall be shown, but may be interrupted if data more important to the use of the chart would be obscured;

(b) Where the territory of more than one State appears on a chart, the names identifying the countries shall be indicated.

1.2.11 **Colours**

Colours used on charts should conform to Appendix 2 — Colour Guide.

1.2.12 **Relief**

(a) Relief, where shown, shall be portrayed in a manner that will satisfy the users' need for:

(1) orientation and identification;

(2) safe terrain clearance;

(3) clarity of aeronautical information when shown;

(4) planning.

(b) Where spot elevations are used, they shall be shown for selected critical points;

(c) The value of spot elevations of doubtful accuracy shall be followed by the sign ±.

1.2.13 **Prohibited, restricted and danger areas**

When prohibited, restricted or danger areas are shown, the reference or other identification shall be included, except that the nationality letters may be omitted.

1.2.14 **Air Traffic Services airspaces**

When ATS airspace is shown on a chart, the class of airspace, the type, name or call sign, the vertical limits and the radio frequency(ies) to be used shall be indicated and the horizontal limits depicted in accordance with Appendix C— Chart Symbols.

1.2.15 **Magnetic variation**

True North and magnetic variation shall be indicated. The order of resolution of magnetic variation shall be that as specified for a particular chart;

1.2.16 **Typography**

Samples of type suitable for use on aeronautical charts are included in the Aeronautical Chart Manual *(Doc 8697).*

1.2.17 **Aeronautical Data**

(a) An applicant for an aeronautical information service certificate shall take all necessary measures to introduce a properly organized quality system containing procedures, processes and resources necessary to implement quality management at each function stage as outlined in CAR 175.71.

(b) The execution of such quality management shall be made demonstrable for each function stage, when required. In addition, States shall ensure that established procedures exist in order that aeronautical data at any moment is traceable to its origin

so to allow any data anomalies or errors, detected during the production/maintenance phases or in the operational use, to be corrected.

(c) The chart resolution of aeronautical data shall be that as specified for a particular chart

(d) Contracting States shall ensure that integrity of aeronautical data is maintained throughout the data process from origination to distribution to the next intended user.

(e) Digital data error detection techniques shall be used during the transmission and/or storage of aeronautical data and digital data sets.

1.2.18 **Common reference system**

(a) Horizontal reference system

(i) World Geodetic System – 1984 (WGS-84) shall be used as the horizontal (geodetic) reference system. Published aeronautical geographical coordinates (indicating latitude and longitude) shall be expressed in terms of the WGS-84 geodetic reference datum;

(ii) Geographical coordinates which have been transformed into WGS-84 coordinates but whose accuracy of original field work does not meet the requirements in Annex 11, Chapter 2, and Annex 14, Volumes I and II, Chapter 2, shall be identified by an asterisk.

(iii) The chart resolution of geographical coordinates shall be that specified for a particular chart series;

(b) Vertical reference system

(i) Mean sea level (MSL) datum, shall be used as the vertical reference system for international air navigation;

(ii) In addition to the elevations referenced to MSL, for the specific surveyed ground position, geoid undulation (referenced to the WGS-84 ellipsoid) for those positions shall also be published as specified for a particular chart;

(iii) The chart resolution of elevation and geoid undulation shall be that specified for a particular chart series.

(c) Temporal reference system

(i) The Gregorian calendar and Coordinated Universal Time (UTC) shall be used as the temporal reference system.

(ii) When a different temporal reference system is used for charting, this shall be indicated in GEN 2.1.2 of the Aeronautical Information Publication (AIP).

CHAPTER 2 — SPECIFICATIONS OF CHARTS

2.1 Aerodrome Obstacle chart Type A

2.1.1 **Function**

This chart, in combination with the relevant information published in the AIP, shall provide the

data necessary to enable an operator to comply with the Aeroplane performance operating limitations.

2.1.2 **Availability**

Where a chart is not required because no obstacles exist in the take-off flight path area, a notification to this effect shall be published in the AIP.

(a) Units of measurement

(i) Elevations shall be shown to the nearest half-metre or to the nearest foot.

(ii) Linear dimensions shall be shown to the nearest half-metre.

(b) Coverage and scale

(i) The extent of each plan shall be sufficient to cover all obstacles and the horizontal scale shall be within the range of 1:10,000 to 1: 15,000;

(ii) The vertical scale shall be ten times the horizontal scale;

(iii) *Linear scales.* Horizontal and vertical linear scales showing both metres and feet shall be included in the charts.

(c) Format

(i) The chart shall depict a plan and profile of each runway, any associated stopway or clearway, the take-off flight path area and obstacles;

(ii) The profile for each runway, stopway, clearway and the obstacles in the take-off flight path area shall be shown above its corresponding plan;

(iii) The profile of an alternative take-off flight path area shall comprise a linear projection of the full take-off flight path and shall be disposed above its corresponding plan in the manner most suited to the ready interpretation of the information;

(iv) The profile grid shall be ruled over the entire profile area exclusive of the runway. The zero for vertical coordinates shall be mean seal level. The zero for horizontal coordinates shall be the end of the runway furthest from the take-off flight path area concerned. Graduation marks shall be shown along the base of the grid and along the vertical margins;

(v) The chart shall include:

a) a box for recording the operational data for declared distances;

b) a box for recording amendments and dates thereof.

(d) Identification

The chart shall be identified by the name of the country in which the aerodrome is located, the name of the city or town or area which the aerodrome serves, the name of the aerodrome and the designator(s) of the runway(s).

(e) Magnetic variation

The magnetic variation to the nearest degree and date of information shall be indicated.

(f) Aeronautical data

Obstacles

(i) Objects in the take-off flight path area which project above a plane surface having a 1.2per cent slope and having a common origin with the take-off flight path area shall be regarded as obstacles, except that obstacles lying wholly below the shadow of other obstacles as defined in sub-para (16) need not be shown,

(ii) Mobile objects such as boats, trains and trucks, which may project above 1.2 percent plane, shall be considered obstacles but shall not be considered as being capable of creating a shadow;

(iii) The shadow of an obstacle is considered to be a plane surface origination at a horizontal line passing through the top of the obstacle at right angle to the centre line of the take-off flight path area. The plane covers the complete width of the take-off flight path area and extends to the plane defined in sub-para (14) or to the next higher obstacle if it occurs first. For the first 300m (1000 ft) of the take-off flight path area, the shadow planes are horizontal and beyond this point such planes have an upward slope of 1.2 per cent;

(iv) If the obstacle creating a shadow is likely to be removed, objects that would become obstacles by its removal shall be shown.

(g) Take-off flight path area

(i) The take-off flight path area consists of a quadrilateral area on the surface of the earth lying directly below, and symmetrically disposed about, the take-off flight path. This area has the following characteristics:

(a) it commences at the end of the area declared suitable for take-off (i.e. at the end of the runway or clearway as appropriate);

(b) its width at the point of origin is 180m (600 ft) and this width increases at the rate of 0,25D to a maximum of 1800m (6000 ft), where D is the distance from the point of origin;

(c) it extends to the point beyond which no obstacles exist or to a distance of 10.0 km (5.4NM) whichever is the lesser;

(ii) For runways serving aircraft having operating limitation which do not preclude the use of a take-off flight path gradient of less than 1.2 per cent,the extent of the take-off flight path area specified in sub-para (18) (iii) shall be increased to not less than 12.0 km (6.5NM) and the slope of the plane surface specified in sub-para (14) & (16) shall be reduced to 1.0 per cent of less.

(h) Declared distances

(i) The following information for each direction of each runway shall be entered in the space provided:

(a) take-off run available;

(b) accelerate-stop distance available;

(c) take-off distance available;

(d) landing distance available.

(i) Plan and profile views

(i) The plan view shall show:

(a) the outline of the runway by a solid line, including the length and width, the magnetic bearing to the nearest degree, and the runway number;

(b) The outline of the clearway by a broken line, including the length and identification as such;

(c) Take-off flight path areas by a dashed line and the centre line by a fine line consisting of short and long dashes;

(d) Alternative take-off flight path areas not centered on the extension of the runway centre line are shown, notes shall be provided explaining the significance of such areas;

(e) Obstacles, including:

(1) The exact location of each obstacle together with a symbol indicative of its type;

(2) The elevation and identification of each obstacle;

(3) The limits of penetration of obstacles of large extent in a distinctive manner identified in the legend;

(f) When stopways are shown, the length of each stopway shall be indicated.

(ii) The profile view shall show:

(a) the profile of the centre line of the runway by a solid line and the profile of the centre line of any associated stopways and clearway by a broken line;

(b) the elevation of the runway centre line at each end of the runway, at the stopway and at the origin of each take-off flight path area, and at each significant change in slope of runway and stopway;

(c) Obstacles, including:

(1) each obstacle by a solid vertical line extending from a convenient grid line over at least one other grid line to the elevation of the top of the obstacle;

(2) identification of each obstacle;

(3) the limits of penetration of obstacles of large extent in distinctive manner identified in the legend.

(j) Accuracy

(i) The order of accuracy attained shall be shown on the chart.

(ii) Where no accurate datum for vertical references is available, the elevation of the datum used shall be stated and shall be identified as assumed.

2.2 Enroute chart

2.2.1 Function

This chart shall provide flight crews with information to facilitate navigation along ATS routes in compliance with air traffic services procedures.

2.2.2 Availability

Where different air traffic services routes, position reporting requirements or lateral limits of flight information regions or control areas exist in different layers of airspace and cannot be shown with sufficient clarity on one chart, separate charts shall be provided.

(a) Coverage and scale

(i) Large variations of scale between adjacent charts showing a continuous route structure shall be avoided.

(ii) An adequate overlap of charts shall be provided to ensure continuity of navigation.

(b) Projection

(i) Parallels and meridians shall be shown at suitable intervals.

(ii) Graduation marks shall be placed at consistent intervals along selected parallels and meridians.

(c) Identification

(i) Each sheet shall be identified by chart series and number.

(d) Culture and topography

(i) Generalized shore lines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart.

(ii) Within each quadrilateral formed by the parallels and meridians, the are minimum altitude shall be shown.

(iii) Where charts are not True North orientated, this fact and the selected orientation used shall be clearly indicated

(e) Magnetic variation

(i) Isogonals should be indicated and the date of the isogonic information given.

(f) Bearings, tracks and radials

(i) Bearings, tracks and radials shall be magnetic. Where bearings and tracks are additionally provided as true values for RNAV segments, they shall be shown in parentheses to the nearest tenth of a degree, e.g. 290° (294.9°T).

(ii) Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used, its reference grid meridian shall be identified.

(g) Aeronautical data

(i) Aerodromes

All aerodromes used by international civil aviation to which an instrument approach can be made shall be shown.

(ii) Prohibited, restricted and danger areas

Prohibited, restricted and danger areas relevant to the layer of airspace shall be depicted with their identification and vertical limits;

(iii) Air Traffic services system

Where appropriate, the components of the established air traffic services system shall be shown. The components shall include the following:

(a) the radio navigation aids associated with the air traffic services system together with their names, identifications, frequencies and geographical coordinates in degrees, minutes and seconds;

(b) in respect of DME, additionally the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft);

(c) an indication of all designated airspace, including lateral and vertical limits and the appropriate class of airspace;

(d) All ATS routes for en-route flight including route designators, the track to the nearest degree in both directions along each segment of the routes and, where established, the designation of the navigation specification(s) including any limitations and the direction of traffic flow;

(e) all significant points which define the ATS routes and are not marked by the position of a radio navigation aid, together with their name-codes and geographical coordinates in degrees, minutes and seconds;

(f) in respect of waypoints defining VOR/DME area navigation routes, additionally,

(1) the station identification and radio frequency of the reference VOR/DME;

(2) the bearing to the nearest tenth of a degree and the distance to the nearest two-tenths of a kilometre (tenth of a nautical mile) from the reference VOR/DME, if the waypoint is not collocated with it;

(g) an indication of all compulsory and “on-request” reporting points and ATS/MET reporting points;

(h) the distances to the nearest kilometre or nautical mile between significant points constituting turning points or reporting points;

(i) change-over points on route segments defined by reference to very high frequency omnidirectional radio ranges, indicating the distances to the nearest kilometre or nautical mile to the navigation aids;

(j) minimum en-route altitudes and minimum obstacle clearance altitudes, on ATS routes to the nearest higher 50 metres or 100 feet (see Annex 11, 2.22);

(k) communication facilities listed with their channels and, if applicable, logon

address and satellite voice communications (SATVOICE) number; and

(l) air defence identification zone (ADIZ) properly identified.

(iv) Supplementary information

(a) Details of departure and arrival routes and associated holding patterns in terminal areas shall be shown unless they are shown on an Area Chart, a Standard Departure Chart — Instrument (SID) or a Standard Arrival Chart —Instrument (STAR);

(b) Where established, altimeter setting regions shall be shown and identified.

2.3 Standard Departure Chart – Instrument (SID)

2.3.1 Function

This chart shall provide the flight crew with information to enable it to comply with the designated standard departure route — instrument from take-off phase to the en-route phase.

2.3.2 Availability

The Standard Departure Chart — Instrument (SID) shall be made available wherever a standard departure route — instrument has been established and cannot be shown with sufficient clarity on the Area Chart.

(a) Coverage and scale

(i) The coverage of the chart shall be sufficient to indicate the point where the departure route begins and the specified significant point at which the en-route phase of flight along a designated air traffic services route can be commenced.

(ii) If the chart is drawn to scale, a scale-bar shall be shown.

(iii) When the chart is not drawn to scale, the annotation “NOT TO SCALE” shall be shown and the symbol for scale-break shall be used on tracks and other aspects of the chart which are too large to be drawn to scale.

(b) Projection

(i) A conformal projection on which a straight line approximates a great circle shall be used.

(ii) Graduation marks shall be placed at consistent intervals along the neat lines.

(e) Identification

(i) The chart shall be identified by the name of the city or town or area which the aerodrome serves, the name of the aerodrome and the identification of the standard departure route(s) — instrument as established in accordance with the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS*,* Doc 8168), Volume II, Part I, Section 3, Chapter 5.

(f) Culture and topography

(i) Where the chart is drawn to scale, generalized shore lines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart.

(g) Magnetic variation

(i) Magnetic variation used in determining the magnetic bearings, tracks and radials shall be shown to the nearest degree.

(h) Bearings, tracks and radials

(i) Bearings, tracks and radials shall be magnetic. Where bearings and tracks are additionally provided as true values for RNAV segments, they shall be shown in parentheses to the nearest tenth of a degree, e.g. 290° (294.9°T);

Note. — A note to this effect may be included on the chart.

(ii) Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used, its reference grid meridian shall be identified.

(i) Aeronautical data

(a) Aerodromes

1) The aerodrome of departure shall be shown by the runway pattern.

2) All aerodromes which affect the designated standard departure route instrument shall be shown and identified. Where appropriate, the aerodrome runway patterns shall be shown.

(b) Prohibited, restricted and danger areas

Prohibited, restricted and danger areas which may affect the execution of the procedures shall be shown with their identification and vertical limits.

(c) Minimum sector altitude

1) The established minimum sector altitude shall be shown with a clear indication of the sector to which it applies;

2) Where the minimum sector altitude has not been established, the chart shall be drawn to scale and area minimum altitudes shall be shown within quadrilaterals formed by the parallels and meridians. Area minimum altitudes shall also be shown in those parts of the chart not covered by the minimum sector altitude.

(d) Air traffic services system

1) The components of the established relevant air traffic services system shall be shown. The components shall comprise the following:

(a) a graphic portrayal of each standard departure route — instrument, including:

i) for departure procedures designed specifically for helicopters, the term “CAT H” shall be depicted in the departure chart plan view;

ii) route designator;

iii) significant points defining the route;

iv) track or radial to the nearest degree along each segment of the route;

v) distances to the nearest kilometre or nautical mile between significant points;

vi) minimum obstacle clearance altitudes, along the route or route segments and altitudes required by the procedure to the nearest higher 50 m or 100 ft and flight level restriction where established;

vii) where the chart is drawn to scale and vectoring on departure is provided, established minimum vectoring altitudes to the nearest higher 50 m or 100 ft, clearly identified;

(b) the radio navigation aid(s) associated with the route(s) including:

i) plain language name;

ii) identification;

iii) frequency;

iv) geographical coordinates in degrees, minutes and seconds;

v) for DME, the channel and the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft);

(c) the name-codes of the significant points not marked by the position of a radio navigation aid, their geographical coordinates in degrees, minutes and seconds and the bearing to the nearest tenth of a degree and distance to the nearest two-tenths of a kilometre (tenth of a nautical mile) from the reference radio navigation aid;

(d) applicable holding patterns;

(e) transition altitude/height to the nearest higher 300 m or 1 000 ft;

(f) the position and height of close-in obstacles which penetrate the obstacle identification surface (OIS). A note shall be included whenever close-in obstacles penetrating the OIS exist but which were not considered for the published procedure design gradient;

(g) area speed restrictions, where established;

(h) the designation of the navigation specification(s) including any limitations, where established;

(i) all compulsory and “on-request” reporting points;

(j) radio communication procedures, including:

1) call sign(s) of ATS unit(s);

2) frequency and, if applicable, SATVOICE number;

3) transponder setting, where appropriate;

(k) an indication of “flyover” significant points.

(2) A textual description of standard departure route(s) — instrument (SID) and relevant communication failure procedures shall be provided and shall, whenever feasible, be shown on the chart or on the same page which contains the chart.

(e) Aeronautical database requirements

Appropriate data to support navigation database coding shall be published in accordance with the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS, Doc 8168), Vol II, Part III, Section 5, Chapter 2, 2.1, on the verso of the chart or as a separate properly referenced sheet.

2.4 Standard Arrival Chart – Instrument (STAR)

2.4.1 Function

This chart shall provide the flight crew with information to enable it to comply with the designated standard arrival route—instrument from the en-route phase to the approach phase;

2.4.2 Availability

The Standard Arrival Chart — Instrument (STAR) shall be made available wherever a standard arrival route —instrument has been established and cannot be shown with sufficient clarity on the Area Chart;

(a) Coverage and scale

(i) The coverage of the chart shall be sufficient to indicate the points where the en-route phase ends and the approach phase begins;

(ii) The chart should be drawn to scale and a scale-bar shall be shown;

(iii) When the chart is not drawn to scale, the annotation “NOT TO SCALE” shall be shown and the symbol for scale break shall be used on tracks and other aspects of the chart which are too large to be drawn to scale.

(b) Projection

(i) A conformal projection on which a straight line approximates a great circle shall be used.

(ii) When the chart is drawn to scale, parallels and meridians shall be shown at suitable intervals.

(iii) Graduation marks shall be placed at consistent intervals along the neat lines.

(c) Identification

(i) The chart shall be identified by the name of the city or town or area which the aerodrome serves, the name of the aerodrome, and the identification of the standard arrival route(s) — instrument as established in accordance with the *Procedures for Air Navigation Services* — Aircraft Operations (PANS-OPS, Doc

8168), Volume II, Part I, Section 4, Chapter 2.

(d) Culture and topography

(i) Where the chart is drawn to scale, generalized shore lines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart.

(e) Magnetic variation

(i) Magnetic variation used in determining the magnetic bearings, tracks and radials shall be shown to the nearest degree.

(f) Bearings, tracks and radials

(i) Bearings, tracks and radials shall be magnetic. Where bearings and tracks are additionally provided as true values for RNAV segments, they shall be shown in parentheses to the nearest tenth of a degree, e.g. 290° (294.9°T);

(ii) Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used, its reference grid meridian shall be identified.

(g) Aeronautical data

Aerodromes

(i) The aerodrome of landing shall be shown by the runway pattern;

(II) All aerodromes which affect the designated standard departure route — instrument shall be shown and identified. Where appropriate, the aerodrome runway patterns shallbe shown.

Prohibited, restricted and danger areas

(i) Prohibited, restricted and danger areas which may affect the execution of the procedures shall be shown with their identification and vertical limits.

Minimum sector altitude

(i) The established minimum sector altitude shall be shown with a clear indication of the sector to which it applies.

(ii) Where the minimum sector altitude has not been established, the chart shall be drawn to scale and area minimum altitudes shall be shown within quadrilaterals formed by the parallels and meridians. Area minimum altitudes shall also be shown in those parts of the chart not covered by the minimum sector altitude.

Air traffic services system

(i) The components of the established relevant air traffic services system shall be shown. The components shall comprise the following:

1) a graphic portrayal of each standard arrival route — instrument, including:

a) route designator;

b) significant points defining the route;

c) track or radial to the nearest degree along each segment of the

route;

d) distances to the nearest kilometre or nautical mile between significant points;

e) minimum obstacle clearance altitudes, along the route or route segments and altitudes required by the procedure to the nearest higher 50 m or 100 ft and flight level restrictions where established;

f) where the chart is drawn to scale and vectoring on arrival is provided, established minimum vectoring altitudes to the nearest higher 50 m or 100 ft, clearly identified;

Note — Where ATS surveillance systems are used to vector aircraft to or from significant points on a published standard arrival route or to issue clearance for descent below the minimum sector altitude during arrival, the relevant procedures may be shown on the Standard Arrival Chart —Instrument (STAR) unless excessive chart clutter will result.

(2) the radio navigation aid(s) associated with the route(s) including:

a) plain language name;

b) identification;

c) frequency;

d) geographical coordinates in degrees, minutes and seconds;

e) for DME, the channel and the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft);

(3) the name-codes of the significant points not marked by the position of a radio navigation aid, their geographical coordinates in degrees, minutes and seconds and the bearing to the nearest tenth of a degree and distance to the nearest two-tenths of a kilometre (tenth of a nautical mile) from the reference radio navigation aid;

(4) applicable holding patterns;

(5) transition altitude/height to the nearest higher 300 m or 1 000 ft;

(6) area speed restrictions, where established;

(7) the designation of the navigation specification(s) including any limitations, where established;

(8) all compulsory and “on-request” reporting points;

(9) radio communication procedures, including:

i) call sign(s) of ATS unit(s);

ii) frequency and, if applicable, SATVOICE number;

iii) transponder setting, where appropriate;

(10) an indication of “flyover” significant points; and

(11) for arrival procedures to an instrument approach designed specifically for helicopters, the term “CAT H” shall be depicted in the arrival chart

plan view.

(12) A textual description of standard arrival route(s) — instrument (STAR) and relevant communication failure procedures shall be provided and should, whenever feasible, be shown on the chart or on the same page which contains the chart. Aeronautical database requirements

(i) Appropriate data to support navigation database coding shall be published in accordance with the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS, Doc 8168).

2.5 Instrument Approach Chart

2.5.1 This chart shall provide flight crews with information which will enable them to perform an approved instrument approach procedure to the runway of intended landing including the missed approach procedure and, where applicable, associated holding patterns;

2.5.2 Instrument Approach Charts shall be made available for all aerodromes used by international civil aviation where instrument approach procedures have been established by the State concerned;

2.5.3 A separate Instrument Approach Chart shall normally be provided for each precision approach procedure established by the State;

2.5.4 A separate Instrument Approach Chart shall normally be provided for each non-precision approach procedure established by the State;

Note. — A single precision or non-precision approach procedure chart may be provided to portray more than one approach procedure when the procedures for the intermediate approach, final approach and missed approach segments are identical.

2.5.5 When the values for track, time or altitude differ between categories of aircraft on other than the final approach segment of the instrument approach procedures and the listing of these differences on a single chart could cause clutter or confusion, more than one chart shall be provided.

2.5.6 Instrument Approach Charts shall be revised whenever information essential to safe operation becomes out of date.

2.5.7 The coverage of the chart shall be sufficient to include all segments of the instrument approach procedure and such additional areas as may be necessary for the type of approach intended;

(a) The scale selected shall ensure optimum legibility consistent with:

(i) the procedure shown on the chart;

(ii) sheet size.

(b) A scale indication shall be given

(c) Except where this is not practicable, a distance circle with a radius of 20 km (10 NM) centred on a DME located on or close to the aerodrome, or on the aerodrome reference point where no suitable DME is available, shall be shown; its radius shall be indicated on the circumference;

(d) A distance scale shall be shown directly below the profile;

(e) The sheet size should be 210 x 148 mm (8.27 x 5.82 in);

(f) A conformal projection on which a straight line approximates a great circle shall be used;

(g) The chart shall be identified by the name of the city or town or area which the aerodrome serves, the name of the aerodrome and the identification of the instrument approach procedure as established in accordance with the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume II, Part I, Section 4, Chapter 9;

(h) Culture and topographic information pertinent to the safe execution of the instrument approach procedure, including the missed approach procedure, associated holding procedures and visual manoeuvring (circling) procedure when established, shall be shown. Topographic information shall be named, only when necessary, to facilitate the understanding of such information, and the minimum shall be a delineation of land masses and significant lakes and rivers;

(i) Relief shall be shown in a manner best suited to the particular elevation characteristics of the area. In areas where relief exceeds 1 200 m (4 000 ft) above the aerodrome elevation within the coverage of the chart or 600 m (2 000 ft) within 11 km (6 NM) of the aerodrome reference point or when final approach or missed approach procedure gradient is steeper than optimal due to terrain,all relief exceeding 150 m (500 ft) above the aerodrome elevation shall be shown by smoothed contour lines, contour values and layer tints printed in brown. Appropriate spot elevations, including the highest elevation within each top contour line, shall also be shown printed in black;

(j) In areas where relief is lower than specified in (16), all relief exceeding 150 m (500 ft) above the aerodrome elevation shall be shown by smoothed contour lines, contour values and layer tints printed in brown. Appropriate spot elevations, including the highest elevation within each top contour line, shall also be shown printed in black;

(k) When shown, the value of the variation, indicated to the nearest degree, shall agree with that used in determining magnetic bearings, tracks and radials;

(i) Bearings, tracks and radials shall be magnetic. Where bearings and tracks are additionally provided as true values for RNAV segments, they shall be shown in parentheses to the nearest tenth of a degree, e.g. 290° (294.9°T);

(m) Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used, its reference grid meridian shall be identified;

(n) All aerodromes which show a distinctive pattern from the air shall be shown by the appropriate symbol. Abandoned aerodromes shall be identified as abandoned;

(o) The runway pattern, at a scale sufficiently large to show it clearly, shall be shown for:

(i) the aerodrome on which the procedure is based;

(ii) aerodromes affecting the traffic pattern or so situated as to be likely, under adverse weather conditions, to be mistaken for the aerodrome of intended landing.

(p) The aerodrome elevation shall be shown to the nearest metre or foot in a prominent position on the chart;

(q) The threshold elevation or, where applicable, the highest elevation of the touchdown zone shall be shown to the nearest metre or foot;

(r) Obstacles shall be shown on the plan view of the chart;

(s) The elevation of the top of obstacles shall be shown to the nearest (next higher) metre or foot;

(t) The heights of obstacles above a datum other than mean sea level (26) shall be shown. When shown, they shall be given in parentheses on the chart;

(u) When the heights of obstacles above a datum other than mean sea level are shown, the datum shall be the aerodrome elevation except that, at aerodromes having an instrument runway (or runways) with a threshold elevation more than 2 m (7 ft) below the aerodrome elevation, the chart datum shall be the threshold elevation of the runway to which the instrument approach is related;

(v) Where a datum other than mean sea level is used, it shall be stated in a prominent position on the chart;

(w) Where an obstacle free zone has not been established for a precision approach runway Category I, this shall be indicated;

(x) Obstacles that penetrate the visual segment surface shall be identified on the chart;

Note. — Guidance on the charting of visual segment surface (VSS) penetrations can be found in the Aeronautical Chart Manual (Doc 8697).

(y) Prohibited areas, restricted areas, and danger areas which may affect the execution of the procedures shall be shown with their identification and vertical limits;

(z) Radio navigation aids required for the procedures together with their frequencies, identifications and track-defining characteristics, if any, shall be shown. In the case of a procedure in which more than one station is located on the final approach track, the facility to be used for track guidance for final approach shall be clearly identified. In addition, consideration shall be given to the elimination from the approach chart of those facilities that are not used by the procedure;

(aa) The initial approach fix (IAF), the intermediate approach fix (IF), the final approach fix (FAF) (or final approach point (FAP) for an ILS approach procedure), the missed approach point (MAPt), where established, and other essential fixes or points comprising the procedure shall be shown and identified;

(bb) Radio navigation aids that might be used in diversionary procedures together with their track-defining characteristics, if any, shall be shown or indicated on the chart;

(cc) Radio communication frequencies, including call signs, that are required for the execution of the procedures;

(dd) When required by the procedures, the distance to the aerodrome from each radio navigation aid concerned with the final approach shall be shown to the nearest kilometre or nautical mile. When no track-defining aid indicates the bearing of the aerodrome, the bearing shall also be shown to the nearest degree;

(ee) The minimum sector altitude or terminal arrival altitude established by the competent authority shall be shown, with a clear indication of the sector to which it applies;

(ff) The plan view shall show the following information in the manner indicated:

(i) the approach procedure track by an arrowed continuous line indicating the direction of flight;

(ii) the missed approach procedure track by an arrowed broken line;

(iii) any additional procedure track, other than those specified in a) and b), by an arrowed dotted line;

(iv) bearings, tracks, radials to the nearest degree and distances to the nearest two-tenths of a kilometre or tenth of a nautical mile or times required for the procedure;

(v) where no track-defining aid is available, the magnetic bearing to the nearest degree to the aerodrome from the radio navigation aids concerned with the final approach;

(vi) the boundaries of any sector in which visual manoeuvring (circling) is prohibited;

(vii) where specified, the holding pattern and minimum holding altitude/height associated with the approach and missed approach;

(viii) caution notes where required, prominently displayed on the face of the chart;

(ix) an indication of “flyover” significant points.

(gg) A profile shall be provided normally below the plan view showing the following data:

(i) the aerodrome by a solid block at aerodrome elevation;

(ii) the profile of the approach procedure segments by an arrowed continuous line indicating the direction of flight;

(iii) the profile of the missed approach procedure segment by an arrowed broken line and a description of the procedure;

(iv) the profile of any additional procedure segment, other than those specified in (ii) and (iii), by an arrowed dotted line;

(v) bearings, tracks, radials to the nearest degree and distances to the nearest two-tenths of a kilometre or tenth of a nautical mile or times required for the procedure;

(vi) altitudes/heights required by the procedures, including transition altitude, procedure altitudes/heights and heliport crossing height (HCH), where established;

(vii) limiting distance to the nearest kilometre or nautical mile on procedure turn, when specified;

(viii) the intermediate approach fix or point, on procedures where no course reversal is authorized;

(ix) a line representing the aerodrome elevation or threshold elevation, as appropriate, extended across the width of the chart including a distance scale with its origin at the runway threshold.

(hh) Aerodrome operating minima when established by the State shall be shown;

(i) The obstacle clearance altitudes/heights for the aircraft categories for which the procedure is designed shall be shown; for precision approach procedures, additional OCA/H for Cat DL aircraft (wing span between 65 m and 80 m and/or vertical distance between the flight path of the wheels and the glide path antenna between 7 m and 8 m) shall be published, when necessary;

(kk) When the missed approach point is defined by a distance from the final approach fix, or facility or a fix and the corresponding distance from the final approach fix, the distance to the nearest two-tenths of a kilometre or tenth of a nautical mile and a table showing ground speeds and times from the final approach fix to the missed approach point shall be shown;

(i) When DME is required for use in the final approach segment, a table showing altitudes/heights for each 2 km or 1 NM, as appropriate, shall be shown. The table shall not include distances which would correspond to altitudes/heights below the OCA/H;

(mm) For non-precision approach procedures with a final approach fix, the final approach descent gradient to the nearest one-tenth of a per cent and, in parentheses, descent angle to the nearest one-tenth of a degree shall be shown;

(nn) For precision approach procedures and approach procedures with vertical guidance, the reference datum height to the nearest half metre or foot and the glide path/elevation/vertical path angle to the nearest one-tenth of a degree shall be shown;

(oo) When a final approach fix is specified at the final approach point for ILS, a clear indication shall be given whether it applies to the ILS, the associated ILS localizer only procedure, or both. In the case of MLS, a clear indication shall be given when an FAF has been specified at the final approach point;

(pp) If the final approach descent gradient/angle for any type of instrument approach procedure exceeds the maximum value specified in the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168).

(qq) Appropriate data to support navigation database coding shall be published in accordance with the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168).

2.6 Visual Approach Chart

2.6.1 This chart shall provide flight crews with information which will enable them to transit from the en-route/descent to approach phases of flight to the runway of intended landing by means of visual reference.

(a) The Visual Approach Chart shall be made available for all aerodromes used by international civil aviation where:

(i) only limited navigation facilities are available; or

(ii) radio communication facilities are not available; or

(iii) no adequate aeronautical charts of the aerodrome and its surroundings at 1:500 000 or greater scale are available; or

(iv) visual approach procedures have been established.

(b) The scale shall be sufficiently large to permit depiction of significant features and indication of the aerodrome layout;

(c) A conformal projection on which a straight line approximates a great circle shall be used;

(d) The chart shall be identified by the name of the city or town which the aerodrome serves and the name of the aerodrome;

(e) Natural and cultural landmarks shall be shown (e.g. bluffs, cliffs, sand dunes, cities, towns, roads, railroads, isolated lighthouses);

(f) Shore lines, lakes, rivers and streams shall be shown;

(g) Relief shall be shown in a manner best suited to the particular elevation and obstacle characteristics of the area covered by the chart;

(h) The figures relating to different reference levels shall be clearly differentiated in their presentation;

(i) Bearings, tracks and radials shall be magnetic; except as provided for in (14);

(j) Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used, its reference grid meridian shall be identified;

(k) All aerodromes shall be shown by the runway pattern. Restrictions on the use of any landing direction shall be indicated. Where there is any risk of confusion between two neighbouring aerodromes, this shall be indicated. Abandoned aerodromes shall be identified as abandoned;

(l) The aerodrome elevation shall be shown in a prominent position on the chart;

(m) Obstacles shall be shown and identified;

(n) The elevation of the top of obstacles shall be shown to the nearest (next higher) metre or foot;

(o) When the heights of obstacles are shown, the height datum shall be stated in a prominent position on the chart and the heights shall be given in parentheses on the chart;

(p) Prohibited areas, restricted areas, and danger areas shall be depicted with their identification and vertical limits;

(q) Where applicable, control zones and aerodrome traffic zones shall be depicted with their vertical limits and the appropriate class of airspace;

(r) Visual approach procedures shall be shown where applicable;

(s) Visual aids for navigation shall be shown as appropriate;

(t) Location and type of the visual approach slope indicator systems with their nominal approach slope angle(s), minimum eye height(s) over the threshold of the on-slope signal(s), and where the axis of the system is not parallel to the runway centre line, the angle and direction of displacement, i.e. left or right, shall be shown;

(u) Radio navigation aids together with their frequencies and identifications shall be shown as appropriate;

(v) Radio communication facilities with their frequencies shall be shown as appropriate.

2.7 Aerodrome/Heliport Chart

2.7.1 This chart shall provide flight crews with information which will facilitate the ground movement of aircraft:

(i) from the aircraft stand to the runway; and
(ii) from the runway to the aircraft stand; and helicopter movement:

(iii) from the helicopter stand to the touchdown and lift-off area and to the final approach and take-off area;
(iv) from the final approach and take-off area to the touchdown and lift-off area and to the helicopter stand;
(v) along helicopter ground and air taxiways; and
(vi) along air transit routes; it shall also provide essential operational information at the aerodrome/heliport;

2.7.2 The Aerodrome/Heliport Chart shall be made available for all aerodromes/heliports regularly used by international civil aviation;

2.7.3 The coverage and scale shall be sufficiently large to show clearly all the elements listed in (6) A linear scale shall be shown;

2.7.4 The chart shall be identified by the name of the city or town or area which the aerodrome/heliport serves and the name of the aerodrome/heliport;

2.7.5 True and Magnetic North arrows and magnetic variation to the nearest degree and annual change of the magnetic variation shall be shown;

2.7.6 This chart shall show:

(i) (geographical coordinates in degrees, minutes and seconds for the aerodrome/heliport reference point;
(ii) elevations, to the nearest metre or foot, of the aerodrome/heliport and apron (altimeter checkpoint locations) where applicable; and for non-precision approaches, elevations and geoid undulations of runway thresholds and the geometric centre of the touchdown and lift-off area;
(iii) elevations and geoid undulations, to the nearest half-metre or foot, of the precision approach runway threshold, the geometric centre of the touchdown and lift-off area, and at the highest elevation of the touchdown zone of a precision approach runway;
(iv) all runways including those under construction with designation number, length and width to the nearest metre, bearing strength, displaced thresholds, stopways, clearways, runway directions to the nearest degree magnetic, type of surface and runway markings;
(v) all aprons, with aircraft/helicopter stands, lighting, markings and other visual guidance and control aids, where applicable, including location and type of visual docking guidance systems, type of surface for heliports, and bearing strengths or aircraft type restrictions where the bearing strength is less than that of the associated runways;
(vi) geographical coordinates in degrees, minutes and seconds for thresholds, geometric centre of touchdown and lift-off area and/or thresholds of the final approach and take-off area (where appropriate);
(vii) all taxiways, helicopter air and ground taxiways with type of surface, helicopter air transit routes, with designations, width, lighting, markings (including runway-holding positions and, where established, intermediate holding positions), stop bars, other visual guidance and control aids, and bearing strength or aircraft type restrictions where the bearing strength is less than that of the associated runways;

Note.— Bearing strengths or aircraft type restrictions may be shown in tabular form on the face or verso of the chart.

(viii) where established, hot spot locations with additional information properly annotated;

Note.— Additional information regarding hot spots may be shown in tabular form on the face or verso of the chart.

(ix) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for appropriate taxiway centre line points and aircraft stands;
(x) where established, standard routes for taxiing aircraft with their designators;
(xi) the boundaries of the air traffic control service;
(xii) position of runway visual range (RVR) observation sites;
(xiii) approach and runway lighting;
(xiv) location and type of the visual approach slope indicator systems with their nominal approach slope angle(s), minimum eye height(s) over the threshold of the on-slope signal(s), and where the axis of the system is not parallel to the runway centre line, the angle and direction of the displacement, i.e. left or right;
(xv) relevant communication facilities listed with their channels and, if applicable, logon address and SATVOICE number;
(xvi) obstacles to taxiing;
(xvii) aircraft servicing areas and buildings of operational significance;
(xviii) VOR checkpoint and radio frequency of the aid concerned;
(xix) any part of the depicted movement area permanently unsuitable for aircraft, clearly identified as such.

2.7.7 In addition to the items in (6) relating to heliports, the chart shall show:

(i) heliport type;

Note.— Heliport types are identified in Annex 14, Volume II, as surface-level, elevated or helideck.

(ii) touchdown and lift-off area including dimensions to the nearest metre, slope, type of surface and bearing strength in tonnes;
(iii) final approach and take-off area including type, true bearing to the nearest degree, designation number (where appropriate), length and width to the nearest metre, slope and type of surface
(iv) safety area including length, width and type of surface;
(v) helicopter clearway including length and ground profile;
(vi) obstacles including type and elevation of the top of the obstacles to the nearest (next higher) metre or foot;
(vii) visual aids for approach procedures, marking and lighting of final approach and take-off area, and of touchdown and lift-off area;
(viii) declared distances to the nearest metre for heliports, where relevant, including:

1) take-off distance available;

2) rejected take-off distance available.

3) landing distance available.

2.8 Aircraft Parking/Docking Chart

2.8.1 This supplementary chart shall provide flight crews with detailed information to facilitate the ground movement of aircraft between the taxiways and the aircraft stands and the parking/docking of aircraft;

2.8.2 The coverage and scale shall be sufficiently large to show clearly all the elements listed in (4);

2.8.3 The chart shall be identified by the name of the city or town or area which the aerodrome serves and the name of the aerodrome;

(a) This chart shall show in a similar manner all the information on the Aerodrome/Heliport Chart —ICAO and the Aerodrome Ground Movement Chart — ICAO relevant to the area depicted, including:

(i) apron elevation to the nearest metre or foot;

(ii) aprons with aircraft stands, bearing strengths or aircraft type restrictions, lighting, marking and other visual guidance and control aids, where applicable, including location and type of visual docking guidance systems;

(iii) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for aircraft stands;

(iv) taxiway entries with designations, including runway-holding positions and, where established, intermediate holding positions, and stop bars;

(v) where established, hot spot locations with additional information properly annotated;

Note.— Additional information regarding hot spots may be shown in tabular form on the face or verso of the chart.

(vi) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for appropriate taxiway centre line points;

(vii) the boundaries of the air traffic control service;

(viii) relevant communication facilities listed with their channels and, if applicable, logon address;

(ix) obstacles to taxiing;

(x) aircraft servicing areas and buildings of operational significance;

(xi) VOR checkpoint and radio frequency of the aid concerned;

(xii) any part of the depicted movement area permanently unsuitable for aircraft, clearly identified as such.

2.9 ATC Surveillance Minimum Altitude Chart

2.9.1 This supplementary chart shall provide information that will enable flight crews to monitor and cross-check altitudes assigned by a controller using an ATS surveillance system;

2.9.2 A note indicating that the chart may only be used for cross-checking of altitudes assigned while the aircraft is identified shall be prominently displayed on the face of the chart;

2.9.3 The coverage of the chart shall be sufficient to effectively show the information associated with vectoring procedures;

2.9.4 The chart shall be drawn to scale;

2.9.5 A conformal projection on which a straight line approximates a geodesic line shall be used;

2.9.6 Graduation marks shall be placed at consistent intervals along the neat lines, as appropriate;

2.9.7 The chart shall be identified by the name of the aerodrome for which the vectoring procedures are established or, when procedures apply to more than one aerodrome, the name associated with the airspace portrayed;

2.9.8 Generalized shorelines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart;

2.9.9 Appropriate spot elevations and obstacles shall be shown;

2.9.10 The average magnetic variation of the area covered by the chart shall be shown to the nearest degree;

2.9.11 Bearings, tracks and radials shall be magnetic;

2.9.12 Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used, its reference grid meridian shall be identified;

2.9.13 All aerodromes that affect the terminal routings shall be shown. Where appropriate, a runway pattern symbol shall be used;

2.9.14 The elevation of the primary aerodrome to the nearest metre or foot shall be shown;

2.9.15 Prohibited, restricted and danger areas shall be depicted with their identification;

2.9.16 The chart shall show components of the established air traffic services system including:

(i) relevant radio navigation aids together with their identifications;

(ii) lateral limits of relevant designated airspace;

(iii) relevant significant points associated with standard instrument departure and arrival procedures;

Note. — Routes used in the vectoring of aircraft to and from the significant points may be shown.

(iv) transition altitude, where established;

(v) information associated with vectoring including:

1) minimum vectoring altitudes to the nearest higher 50 m or 100 ft, clearly identified;

2) lateral limits of minimum vectoring altitude sectors normally defined by bearings and radials to/from radio navigation aids to the nearest degree or, if not practicable, geographical coordinates in degrees, minutes and seconds and shown by heavy lines so as to clearly differentiate between established sectors;

Note. — In congested areas, geographical coordinates may be omitted in the interest of legibility.

3) distance circles at 20-km or 10-NM intervals or, when practicable, 10-km or 5-NM intervals shown as fine dashed lines with the radius indicated on the circumference and centred on the identified aerodrome main VOR radio navigation aid or, if not available, on the aerodrome/heliport reference point;

4) notes concerning correction for low temperature effect, as applicable;

(vi) communications procedures including call sign(s) and channel(s) of the ATC unit(s) concerned.