



CIVIL AVIATION AUTHORITY, BANGLADESH.

Head Quarters, Kurmitola, Dhaka-1229.

MANUAL OF AVIATION CARTOGRAPHY.

First Edition October 2013.

FOREWORD

Bangladesh as a contracting state of International Civil Aviation Organization has an obligation to the international community to ensure the civil aviation activities under the jurisdiction to carry out in strict compliance with the Standard and Recommendation Practices contained in the eighteen Annexes. To maintain the standard and recommendation practices contained in Annex 4, aviation cartography service have to work to prepare relevant aeronautical maps and charts in accordance with ANO (Aeronautical Chart) A-1 and CAR 84, Part iv for safe and efficient conduct of flight. This Manual of Aviation Cartography for regulatory body is prepared to regulate the service provider related to cartographic service.

Any inquires regarding this Manual should be addressed to the Director (FS&R), Civil Aviation Authority of Bangladesh, Headquarters, Kurmitola, Dhaka-1229, Bangladesh.

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(Air Vice Marshal Mahmud Hussain)

Chairman

Civil Aviation Authority, Bangladesh.

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1. Introduction :

Cartography or mapmaking (in Greek Charties= map and graphein = write) is the study and practice of making representations of the Earth on a flat surface. Hence **Cartography means the art and science of expressing graphically, usually through maps the natural and social features of the earth.** Cartographers measure, map, and chart the earth's surface. Their work involves everything from performing geographical research and compiling data to actually producing maps. Cartographers collect, analyze, and interpret both spatial data – such as latitude, longitude, elevation and distance- and non spatial – for example, population density, land use patterns, annual precipitation levels and demographic characteristics. Their maps may give both physical and social characteristics of the land. They prepare maps in either digital or graphic form, using information provided by geodetic surveys, aerial photographs and satellite data. Additionally Cartographers can become GEOINT Analysts easily. GEOINT Analysts analyze and exploit worldwide aeronautical source and imagery in support of safety of navigation. This manual is one of the manual of Civil Aviation Authority of Bangladesh for internal documentation set. It is a directive upon all service provider/personal responsible for conducting all sorts of aviation Cartographic service.

2. Scope :

This document is aimed at providing guidance to design procedure, aeronautical charts and all other concerned aviation cartographic drawing and design a per ICAO standard for validation with in CAAB.

3. Purpose :

The purpose of this manual is to provide guidance to cartography personnel in the performance of their duties. It is written to ensure that standards are applied that promote the safe conduct of Civil Aviation and enhance the values of the CAAB.

4. Record of amendments:

[illegible]

5. Abbreviation :

ABBREVIATION	DESCRIPTION
ATC	Air Traffic Control
ATS	Air Traffic Service
CRC	Cyclic Redundancy Check
FIR	Flight Information Region
FMS	Flight management System
FS&R	Flight Safety and Regulation
GNSS	Global Navigation Satellite System
GPWS	Ground Proximity Working System
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rule
NAVAIDS	Navigational Aids
PANS-OPS	Procedure for Air Navigation Operation
PDP	Procedure Design Package
RADAR	Radar
RNP AR	Required Navigation Procedure – Authorization Required
RWY	Runway
CAAB	Civil Aviation Authority of Bangladesh
SOP	Standard Operation Procedure
SP	Service Provider
VFR	Visual Flight Rule

CHAPTER 1.

Document Identifications & Control.

1.1 Title of the document:

This document is identified as Manual of Aviation Cartography, Bangladesh, issued by CAAB as the regulatory body with respect to provision given in ANO (Aeronautical Chart) A-1, CAR 84, Part IV and ICAO Annex IV in Bangladesh.

1.2 Purpose of this chapter:

This chapter details the procedures for writing, approving, controlling and amending documentation in Manual of Aviation Cartography.

1.3 Purpose of the document:

- 1.3.1 The purpose of this document is to establish procedures of mapping and different aeronautical charts on the basis of information and instructions collected from the concern authority which are essential for the provision of safe and efficient air traffic services at airports of Bangladesh and within Dhaka FIR where air traffic services are provided by CAA, Bangladesh. It is published for use and guidance of Cartographic Service provider and Cartographer.
- 1.3.2 The concern service provider under his jurisdiction is to ensure that the cartographic work done in compliance with the processes, procedures and instructions contained in this manual.
- 1.3.3 The Manual of Aviation Cartography contains instructions and information for the guidance of aviation cartographic job and it may also be of general interest to other persons or organizations concerned with civil aviation in Bangladesh.
- 1.3.4 Cartographic personal shall not deviate from the procedures laid down in this document unless specific authorization is received from Service Provider.
- 1.3.4 Service Provider is to prepare their own manual in accordance with this document and to be approved by the Chairman, Civil Aviation Authority of Bangladesh.

1.4 Responsibility for documentation and publication:

- 1.4.1 This Manual of Aviation Cartography has been prepared by Director (FS&R), endorsed by Member (Operations) and finally approved by the Chairman, CAAB. The Director (FS&R) is responsible to publish and maintain this Manual on behalf of the Chairman.

1.5 Authority / Responsibility for changes:

- 1.5.1 The Director (FS&R), CAAB, is responsible for incorporating amendments to the Manual of Aviation Cartography, when necessary, after endorsement by Member (Operations) and approval of the Chairman CAAB
- 1.5.2 Holders of hard-copies of this Manual are responsible for ensuring that the Manual is kept up to date. This includes inserting new chapters or chapter amendments in a timely manner and complying with any instructions on amendment advice.
- 1.5.3 The user of this Manual will be responsible for verifying the currency of documentation in the Manual

1.6 Terminology of Words:

- 1.6.1 To avoid any misunderstanding within the Manual of Aviation Cartography, certain words are to be interpreted as having specific meanings when they are the operative words in an instruction.

Words Meanings

'shall', 'is to', 'are to' and 'must' the instruction is mandatory.

'will ' It is only used for informative or descriptive writing.

'may' It means that the instruction is permissive, optional or alternative.

'should' It means that it is strongly advisable that an instruction is carried out; it is

recommended or discretionary. It is applied where the more positive 'shall' is unreasonable but nevertheless a controller would have to have a good reason for not doing so.

'miles' It always refers to nautical miles

- 1.6.2 In the interests of simplicity, any reference to the masculine gender can be taken to mean either male or female.

1.7 FORMAT:

- 1.7.1 Each page has a unique number indicating the chapter and chapter page. In addition reader can also refer the chapter and main subject heading number.
- 1.7.2 Main paragraphs are numbered and contain capital bold headings. Sub-paragraphs are also numbered and contain bold headings.

1.8 AMENDMENTS:

- 1.8.1 When an amendment is issued, the amended text will be annotated by an arrow (→) in the left margin of the text if it is short and by a (|) in the left margin if it is large.

1.9 EFFECTIVE DATE:

1.9.1 The effective date of each page is stated at the foot of the page.

1.10 Distribution of the Manual:

Directorate of FS&R may produce hard copies and control the distribution of these copies, as they deem appropriate.

1.11 Master Copy:

An electronic and a hard Master Copy of that Manual will be held and maintained by the Director (FS&R).

1.12 Checking Currency of the Manual:

A current copy of the Manual will be published on CAAB

web site: www.caab.gov.bd

1.13 Enquiries

Enquiries / clarifications / suggestions, if any, should be addressed to:

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Bangladesh

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CHAPTER 2

DEFINITIONS, APPLICABILITY AND AVAILABILITY.

2.1 Definitions:

When the following terms are used in this Manual, 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 elevation: The elevation of the highest point of the landing area.

Aerodrome operating minima: The limits of usability of an aerodrome for:

- a) take-off, expressed in terms of runway visual range and/or visibility and, if necessary, cloud conditions;
- b) landing in precision approach and landing operations, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H) as appropriate to the category of the operation; and
- c) landing in approach and landing operations with vertical guidance, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H); and
- d) landing in non-precision approach and landing operations, expressed in terms of visibility and/or runway visual range, minimum descent altitude/height (MDA/H) and, if necessary, cloud conditions.

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

Aeronautical chart: A representation of a portion of the Earth, its culture and relief, specially designated to meet the requirements of air navigation. Aircraft stand. A designated area on an apron intended to be used for parking an aircraft.

Aircraft stand: A designated area on an apron intended to be used for parking an aircraft.

Air defence identification zone: Special designated airspace of defined dimensions within which aircraft are required to comply with special identification and/or reporting procedures additional to those related to the provision of air traffic services (ATS).

Air taxiway: A defined path on the surface established for the air taxiing of helicopters.

Air traffic service: A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Air transit route: A defined path on the surface established for the air transiting of helicopters.

Airway: A control area or portion thereof established in the form of corridor.

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

Application: Manipulation and processing of data in support of user requirements (ISO 19104*).

Apron: A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fuelling, parking or maintenance.

Area minimum altitude (AMA): The minimum altitude to be used under instrument meteorological condition (IMC) that will provide a minimum obstacle clearance within a specified area, normally formed by parallels and meridians.

Arrival routes: Routes identified in an instrument approach procedure by which aircraft may proceed from the en-route phase of flight to an initial approach fix.

ATS route: A specified route designed for channeling the flow of traffic as necessary for the provision of air traffic services.

Note 1. - The term ATS route is used to mean variously, airways, advisory route, controlled or uncontrolled route, arrival or departure route, etc..

Note 2.- An ATS route is defined by route specifications that include an ATS route designator, the track to or from significant points (waypoints), distance between significant points, reporting requirements and, as determined by the appropriate ATS authority, the lowest safe altitude.

Bare Earth: Surface of the Earth including bodies of water and permanent ice and snow, and excluding vegetation and man-made objects.

Calendar: Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).

Canopy: Bare Earth supplemented by vegetation height.

Change-over point: The point at which an aircraft navigating on an ATS route segment defined by reference to very high frequency omnidirectional radio ranges is expected to transfer its primary navigational reference from the facility behind the aircraft to the next facility ahead of the aircraft.

Note.- Change-over points are established to provide the optimum balance in respect of signal strength and quality between facilities at all levels to be used and to ensure a common source of azimuth guidance for all aircraft operating along the same portion of a route segment.

Clearway: A defined rectangular area on the ground or water under the control of the appropriate authority selected or prepared as a suitable area over which an aeroplane may make a portion of its initial climb to specified height.

Contour line: A line on a map or chart connecting points of equal elevation.

Culture: All man-made features constructed on the surface of the Earth, such as cities, railways and canals.

Cyclic redundancy checks (CRC): A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data

Danger area: An airspace of defined dimension within which activities dangerous to the flight of aircraft may exist at specified times.

Data product specification: Detailed description of a data set or data set series together with additional information that will enable it to be created, supplied to and used by another party (ISO 19131*).

Data quality: A degree or level of confidence that the data provided meet the requirements of the data user in terms of accuracy, resolution and integrity.

Data set: Identical collection of data (ISO 19101*).

Data set series: Collection of data sets sharing the same product specification (ISO 19115*).

Datum: Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104*).

Digital Elevation Model. (DEM): The representation of terrain surface by continuous elevation values at all intersection of a defined grid, referenced to common datum.

Displaced threshold: A threshold not located at the extremity of a runway.

Electronic aeronautical chart display: An electronic device by which flight crews are enabled to execute, in a convenient and timely manner, route planning, route monitoring and navigation by displaying required information.

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

Ellipsoid height (Geodetic height): The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.

Feature: Abstraction of real world phenomena (ISO 19101*).

Final approach: That part of an instrument approach procedure which commences at the specified final approach fix or point, or where such a fix or point is not specified,

- a) at the end of the last procedure turn, base turn or inbound turn of a racetrack procedure, if specified; or
- b) at the point of interception of the last track specified in the approach procedure; and ends at a point in the vicinity of an aerodrome from which:
 - 1) a landing can be made; or
 - 2) a missed approach procedure is initiated.

Final approach and take-off area (FATO): A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced. Where the FATO is to be used by performance Class 1 helicopters, the defined area includes the rejected take-off area available.

Final approach fix or point: That fix or point of an instrument approach procedure where the final approach segment commences.

Final approach segment: That segment of an instrument approach procedure in which alignment and descent for landing area accomplished.

Flight information region: An airspace of defined dimension 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, 1013.2 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;
- c) when set to a pressure of 1013.2hPa, may be used to indicate flight levels.

Note 2. - The terms “height” and “altitude”, used in Note 1 above, indicate altimetric rather than geometric heights and altitudes.

Geodesic distance: The shortest distance between any two points on a mathematically defined ellipsoidal surface.

Geodic datum: A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Geoid: The equipotential surface in the gravity field of the Earth which coincide with the undisturbed mean sea level (MSL) extended continuously through the continents.

Note. - The geoid is irregular in shape because of local gravitational disturbances (wind tides, salinity, current, etc.) and the direction of gravity is perpendicular to the geoid at every point.

Geoid undulation: The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid.

Note,- in respect to the World Geodetic System- 1984 (WGS-84) defined ellipsoid, the difference between the WGS-84 ellipsoidal height and orthometric height represents WGS-84 geoid undulation.

Glide path: A descent profile determined for vertical guidance during a final approach.

Gregorian calendar: Calendar in general use ; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar (ISO 19108*).

Note. - In the Gregorian calendar, common years have 365 days and leap years 366 days divided into twelve sequential months.

Height: The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

Helicopter stand: An aircraft stand which provides for parking a helicopter and, where air taxiing operations are contemplated, the helicopter touchdown and liftoff.

Heliport: An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Holding procedure: A predetermined manoeuvre which keeps an aircraft within a specified airspace while awaiting further clearance.

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.

Hypsometric tints: A succession of shades or colour gradations used to depict ranges of elevation.

Initial approach segment: That segment of an instrument approach procedure between the initial approach fix and the intermediate approach fix or, where applicable, the final approaches fix or point.

Instrument approach procedure: A series of predetermined manoeuvres by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en-route obstacle clearance criteria apply.

Intermediate approach segment: That segment of an instrument approach procedure between either the intermediate approach fix and the final approach fix or point, or between the end of a reversal, racetrack or dead reckoning track procedure and the final approach fix or point, as appropriate.

Intermediate holding position: A designated position intended for traffic control at which taxiing aircraft and vehicles shall stop and hold until further cleared to proceed, when so instructed by the aerodrome control tower.

Isogonal: A line on a map or chart on which all points have the same magnetic variation for a specified epoch.

Isogrive: A line on a map or chart which joins points of equal angular difference between the North of the navigation grid and Magnetic North.

Landing area: That part of a movement area intended for the landing or take-off of aircraft.

Landing direction indicator: A device to indicate visually the direction currently designated for landing and for take-off.

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

Logon address: A specified code used for data link logon to an ATS unit.

Magnetic variation: The angular difference between True North and Magnetic North.

Note. - The value given indicates whether the angular difference is East or West of True North.

Manoeuvring area: That part of an aerodrome to be used for take-off, landing and taxiing of aircraft, excluding aprons.

Marking: A symbol or group of symbols displayed on the surface of the movement area in order to convey aeronautical information.

Metadata: Data about data (ISO 19115*).

Note,- Data that describes and documents data.

Minimum en-route altitude (MEA): The altitude for an en-route segment that provides adequate reception of relevant navigation facilities and ATS communications complies with the airspace structure and provides the required obstacle clearance.

Minimum obstacle clearance altitude (MOCA): The minimum altitude for a defined segment of flight that provides the required obstacle clearance.

Minimum sector altitude: The lowest altitude which may be used which will provide a minimum clearance of 300m (1000 ft) above all objects located in an area contained within a sector of a circle of 46 km (25 NM) radius centered on a radio aid to navigation.

Minimum approach point (MAPt): That point in an instrument approach procedure at or before which the prescribed missed approach procedure must be initiated in order to ensure that the minimum obstacle clearance is not infringed.

Missed approach procedure: The procedure to be followed if the approach cannot be continued.

Movement area: That part of an aerodrome to be used for take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron(s).

Obstacle: All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

Note. - the term obstacle is used in this Annex solely for the purpose of specifying the charting of objects that are considered a potential hazard to the safe passage of aircraft in the type of operation for which the individual chart series is designed.

Obstacle clearance altitude (OCA) or obstacle clearance height (OCH): The lowest altitude or the lowest height above the elevation of the relevant runway threshold or the aerodrome elevation as applicable, used in establishing compliance with appropriate obstacle clearance criteria.

Note 1. - Obstacle clearance altitude is referenced to mean sea level and obstacle clearance height is referenced to the threshold elevation or in the case of non-precision approaches to the aerodrome elevation or the threshold elevation if that is more than 2m (7 ft) below the aerodrome elevation. An obstacle clearance height for a circling approach is referenced to the aerodrome elevation.

Note 2. – For convenience when both expressions are used they may be written in the form “obstacle clearance altitude/height” and abbreviated “OCA/H”.

Note 3. - See Procedure for Air Navigation Services- Aircraft Operations (Doc 8168), Volume I, Part III, 1.5, and Volume II, Part III, 6.4, for specific applications of this definition.

Obstacle free zone (OFZ): The airspace above the inner approach surface, inner transitional surfaces, and balked landing surface and that portion of the strip bounded by these surfaces, which is not penetrated by any fixed obstacle other than a low-mass and frangibly mounted one required for air navigation purposes.

Orthometric height: Height of a point related to the geoid, generally presented as an MSL elevation.

Point light: A luminous signal appearing without perceptible length.

Portrayal: Presentation of information to humans (ISO 19117*).

Position (geographical): Set of coordinates (latitude and longitude) referenced to the mathematical reference ellipsoid which define the position of a point on the surface of the Earth.

Precision approach procedure: An instrument approach procedure utilizing azimuth and glide path information provided by ILS or PAR.

Procedure altitude/height: A specified altitude/height flown operationally at or above the minimum altitude/height and established to accommodate a stabilized descent at a prescribed descent gradient/angle in the intermediate/final approach segment.

Procedure turn: A manoeuvre in which a turn is made away from a designated track followed by a turn in the opposite direction to permit the aircraft to intercept and proceed along the reciprocal of the designated track.

Note 1. - Procedure turns are designated “left” or “right” according to the direction of the initial turn.

Note 2. - Procedure turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual procedure.

Prohibited area: An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

Relief: The inequalities in elevation of the surface of the Earth represented on aeronautical charts by contours, hypsometric tints, shading or spot elevations.

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

Required navigation performance (RNP): A statement of the navigation performance necessary for operation within a defined airspace.

Note. - Navigation performance and requirements are defined for a particular RNP type and/or application.

Resolution: A number of units or digits to which a measured or calculated value is expressed and used.

Restricted area: An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified condition.

Reversal procedure: A procedure designed to enable aircraft to reverse direction during the initial approach segment of an instrument approach procedure. The sequence may include procedure turns or base turns.

RNP type: A containment value expressed as a distance in nautical miles from the intended position within which flights would be for at least 95 per cent of the total flying time.

Example. - RNP 4 represents a navigation accuracy of plus or minus 7.4 km (4NM) on a 95 per cent containment basis.

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

Runway-holding position: A designated position intended to protect a runway, an obstacle limitation surface, or an ILS/MLS critical/sensitive area at which taxiing aircraft and vehicles shall stop and hold, unless otherwise authorized by the aerodrome control tower.

Runway strip: A defined area including the runway and stopway, if provided, intended:

- a) to reduce the risk of damage to aircraft running off a runway; and
- b) to protect aircraft flying over it during take-off or landing operations.

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.

Shoulder: An area adjacent to the edge of a pavement so prepared as to provide a transition between the pavement and the adjacent surface.

Significant point: A specified geographical location used in defining an ATS route or the flight path of an aircraft and for other navigation and ATS purposes.

Stop-way: A defined rectangular area on the ground the end of take-off run available prepared as a suitable area in which an aircraft can be stopped in the case of an abandoned take-off.

Taxiing: Movement of an aircraft on the surface of an aerodrome under its own power, excluding take-off and landing.

Taxiway: A defined path on a land aerodrome established for the taxiing of aircraft and intended to provide a link between one part of the aerodrome and another, including:

- a) Aircraft stand taxi lane. A portion of an apron designated as a taxiway and intended to provide access to aircraft stands only.
- b) Apron taxiway. A portion of a taxiway system located on an apron and intended to provide a through taxi route across the apron.
- c) Rapid exit taxiway. A taxiway connected to a runway at an acute angle and designed to allow landing aeroplanes to turn off at higher speeds than are achieved on other exit taxiways thereby minimizing runway occupancy times.

Terminal arrival altitude (TAA): The lowest altitude that will provide a minimum clearance of 300m (1000 ft) above all objects located in an arc of a circle defined by a 46-km (25 NM) radius centred on the initial approach fix (IAF), or where there is no IAF on the intermediate approach fix (IF), delimited by straight lines joining the extremity of the IF. The combined TAAs associated with an approach procedure shall account for an area of 360 degrees around the IF.

Terrain: The surface of the Earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles.

Note.- In practical terms, depending on the method of data collection, terrain represents the continuous surface that exists at the bare Earth, the top of the canopy or something in-between, also known as “first reflective surface”.

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

Touchdown and lift-off area (TLOF): A load bearing area on which a helicopter may touchdown or lift off.

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

Track: The projection on the earth's surface of the path of an aircraft, the direction of which path at any point is usually expressed in degrees from North (true, magnetic or grid).

Transition altitude: The altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes.

Vectoring: Provision of navigational guidance to aircraft in the form of specific headings, based on the use of an ATS surveillance system.

Visual approach procedure: A series of predetermined manoeuvres by visual reference, from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, a go-around procedure can be carried out.

Waypoint: A specified geographical location used to define an area navigation route or the flight path of an aircraft employing area navigation. Waypoints are identified as either:

Fly – by waypoint: A waypoint which requires turn anticipation to allow tangential interception of the next segment of a route or procedure; or

Flyover waypoint: A waypoint at which a turn is initiated in order to join the next segment of a route or procedure.

CHAPTER-3

CARTOGRAPHIC SERVICES.

3.1 RESPONSIBILITY OF CARTOGRAPHIC SERVICES.

3.1.1 Responsibility of Aviation Cartography.

3.1.1.1 Responsible authority

The authority responsible for the overall administration of aviation cartography of regulatory body for Civil Aviation is the Member, Operation and Planning of Civil Aviation Authority.

Postal Address: Member, Operation and Planning.

Civil Aviation Authority,
Headquarters, Kurmitola,
Dhaka-1229, Bangladesh.

Telephone : 880-2-8914105(Office), 880-2-8114580(Res).

TeleFax : 880-2-8914709; 8913322.

Telex : 632210 CCAAB BJ

AFS : VGHQYAYO

Telegram : Civilair, Dhaka.

3.1.1.2 Aviation Cartography in Bangladesh is regulating by the Civil Aviation Authority administered by the Director, FS&R at Civil Aviation Authority, Headquarters.

3.1.2 Enquiries, Suggestions or complaints regarding any aviation cartographic service, should be referred to the Chairman, Civil Aviation Authority as appropriate.

3.1.3 The services are regulated in accordance with the provisions contained in the following national regulations and ICAO documents.

Annex 4 Aeronautical Charts, Doc 8168, Vol II

ANO (Aeronautical Chart) A.1

CAR 84.

3.2 Cartography:

3.2.1 Definition of Cartography:

Cartography or mapmaking (in Greek Charties = map and Graphein = write) is the study and practice of making representation of the Earth on a flat surface.

3.2.2 Nature of work:

Cartographers are part of a larger occupational group called mapping scientists. They collect geographic information from aerial photographs and survey data and use this information to prepare maps, charts, and drawings of large areas of the earth's surface. Cartographers must be skilful in reading and understanding detailed photographs and drawings. They must also know how to use manual and computerized drafting instruments, photogrammetric techniques, mathematical formulas and precision stereoploting equipment. Above all cartographers must be able to render accurate representation of the data they have collected.

3.2.3 Job description:

[Reference: ANO (Aeronautical Chart) A-1]

The following job to be done by the Cartographer and its related staffs:

1. Production of. Charts:

(Each type of chart shall provide information relevant to the function of the chart and design, information appropriate to the phase of flight to ensure the safe and expeditious operation of the aircraft. The information shall be accurate, free from distortion and clutter, unambiguous and readable).

a. Aerodrome obstacle chart- ICAO Type (Operating Limitation).

b. Aerodrome obstacle chart- ICAO Type.

c. Aerodrome Terrain and obstacle chart-ICAO (Electronic).

d. Precision Approach Terrain Chart-ICAO.

e. Air Traffic Service requirement for information.

f. Area Chart- ICAO.

g. Standard Departure Chart Instrument (SID)-ICAO.

h. Standard Arrival Chart Instrument (STAR)-ICAO.

i. Instrument Approach Chart- ICAO.

j. Visual Approach Chart- ICAO.

k. Aerodrome/Helicopter Chart-ICAO.

l. Aerodrome round Movement Chart-ICAO.

m. Aircraft Parking/ Docking Chart-ICAO.

n. World Aeronautical Chart-ICAO 1:1000000.

O. Aeronautical Chart- ICAO 1:5000000.

p. Aeronautical Navigation Chart- ICAO Small Scale.

q. Plotting Chart-ICAO.

r. Electronic Aeronautical Chart Display-ICAO.

s. ATC Surveillance Minimum Altitude Chart- ICAO.

t. Aeronautical Data quality requirements.

2. Undertake field survey and produce topographical maps, Contour maps and such other specialized drawings as may be necessary for the purpose of preparation of plans, designs and working drawings.

3. Collection of information for production of maps and charts, drawings, etc. from ICAO Annex, documents of other Section/Offices.

4. Production of drawings, maps, charts, diagram etc., according to the International Standards and Recommended practices.

5. Liaison with other offices of the Authority and other Agencies regarding drawing etc..

6. Collection, Compilation and Editing.

7. Maintenance of drawing records, materials/ instruments and drawing of specifications for procurements of the drawing section.

8. Research on Annex, Docs, and Supplements and on AIP.

9. Maintenance of maps and charts and up-dating of Plans of all Airports.

10. Reproduction of blue prints, ammonia prints, Photostats, etc...

11. Any other duties assigned from time to time.

All sorts of above mentioned job to be done according to the description given in ANO (Aeronautical Chart) A-1 and CAR 84, Part-

3.2.4 Inspection:

3.2.4.1 Inspection of Cartographic work and the documents concern to be done by the Cartography inspector as per the inspection schedule given below and they are to fill up the checklist and to submit it to the office of the Director, FS&R as early as possible.

3.2.4.2 Inspection to be carried out by the designated Cartography Inspector. The holder of this position shall be responsible for performing Safety Oversight function of Cartography service provider in Bangladesh. The purpose of this inspection is to ensure the compliance of relevant ANOs, manuals, documents, CAAB rules, regulations, directives and upgrade the safety level of Cartography service provider.

3.2.4.3 Individual seeking positions as Cartography inspector should have extensive academic and technical education and have progressed through positions of increased technical and supervisory responsibility in the civil aviation operations. A Cartography inspector will be required to have the following qualifications and professional experience:

- (a) Trained in CARTOGRAPHY basic/advance course.
- (b) Experienced and competent in CARTOGRAPHY field.
- (c) Wide knowledge in CARTOGRAPHIC field and designing.
- (d) At least 15 years of job experience in CARTOGRAPHY operations.
- (e) Adequate knowledge of ICAO Annex-4 and relevant documents.
- (f) Knowledge of Civil Aviation Ordinances, CAAB Rules and regulations.
- (g) Knowledge of State Safety Program and Safety Management System (SMS).
- (h) Knowledge of ICAO Safety Audit Program.
- (i) Knowledge of Human Factors involved in CARTOGRAPHY.
- (j) Knowledge of Quality Management System in CARTOGRAPHY.
- (k) Possess adequate knowledge of CARTOGRAPHY procedure and experienced in CARTOGRAPHY through practical field/practices.

3.2.5 Inspection Schedule:

INSPECTION SCHEDULE OF CARTOGRAPHIC INSPECTORS.

January	February	March	April	May	June	July	August	September	October	November	December
								CAAB,HQ			
									HSIA		
										SAIA	JSR
OIA											
	RAJ										
		SDP									
			CXB								
				BAR							
					TEJ						

CAAB, HQ = Civil Aviation Authority of Bangladesh, Head Quarters, Dhaka.

HSIA = Hazarath Shahjalal International Airport, Dhaka.

SAIA = Shah Amanath International Airport, Chittagong.

OIA = Osmani International Airport, Sylhet.

RAJ = Rajshahi Airport, Rajshahi.

SDP = Saidpur Airport, Saidpur.

CBX = Cox's Bazar Airport, Cox's Bazar.

BAR = Barisal Airport, Barisal.

TEJ = Tejgaon Airport, Dhaka.

Note: During the time of inspection inspectoral staffs are to check up both old and new obstructions all around the airfield to prepare/update the obstruction chart of the airfield.

3.2.6 Inspection Checklist/Report:

CARTOGRAPHIC INSPECTION CHECKLIST/REPORT.

INSPECTION CHECK LISTS.

Name of the Airport/Centre:

Date:

Time:

Inspector(s):

Use following abbreviations to indicate your observations. If the space provided for comments is not adequate use the space given in the page 3 with the reference number of the Area of Inspection.

S = Satisfactory; U = Unsatisfactory; N = Not Checked; I = Improvements Needed

1) Reference:

Area of Inspection Observation Comments:

- 1.1 Is minimum number of staff available in the Airport/ Centre?
- 1.2 Are all cartographic and its concerned working person(s) trained?
- 1.3 Are the cartographic charts and others doing as per the Job description?
- 1.4 Are the assigned cartographic working person performing their job without any difficulties?
- 1.5 Are there all required instrument available to perform their job properly and smoothly?
- 1.6 Have the cartographic working persons worked more than 24 hrs continuously?
- 1.7 Whether the bad practices have been developed among cartographic working person(s) who are safety hazards or might lead to safety hazards? (e.g. using mobile phones, Reading papers/books, listening to radios, watching TVs while working. Not following standard procedures and using shortcuts etc...)
- 1.8 Are the cartographic working person doing their job as per ICAO specified standard?

2) Observation:

Area of Inspection Observations Comments

- 2.1 Are proper procedures available/updated timely for:
 - 2.1.1 Concern Aeronautical Charts and other relevant cartographical work?
 - 2.1.2 Preparing/updating the obstruction chart at and around the airfield?
 - 2.1.3 Approach chart of the airfield?
 - 2.1.4 Communication/Co ordination to the concern unit/section?
- 2.2 Are the cartographic staffs/officers working as per the ANO (Aeronautical Chart) A-1?
- 2.3 Time frame to recover the following deficiencies found at the time of inspection:

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3. WORKING ENVIORMENT:

Area of Inspection Observations Comments

3.1 Are adequate rest facilities available for cartographic working persons?

3.2 Are the following factors existing at an acceptable level as per the judgment of the inspector?

3.2.1 Ambient Lighting

3.2.2 Ambient Temperature

3.2.3 Noise Level

3.2.4 Exterior Glare

4. EQUIPMENTS

Area of Inspection Observations Comments

4.1 Whether any defects observed in preparing concern aeronautical chart(s) in connection with Communication/Navigation/Surveillance of safety oversight?

4.2 Has concern staff taken actions to notify appropriate officers regarding any drawback/change or addition of new obstruction in the concern chart?

5. Comments:

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Inspectors (Name & Signature):

1)

Date:

2)

Date:

N.B. : This check list is changeable as per requirement.

CHAPTER 4.

GENERAL SPECIFICATION

4.1 Operational requirements of charts.

4.1.1 Each type of chart shall provide information relevant to the function of the chart and its design shall observe Human Factors principles which facilitate its optimum use.

Note. - Guidance material on the application of Human Factors principals is available in the ICAO Human Factors Training Manual (Doc. 9683).

4.1.2 Each type of chart shall provide information appropriate to the phase of flight, to ensure the safe and expeditious operation of the aircraft.

4.1.3 The presentation of information shall be accurate, free from distortion and clutter, unambiguous, and be readable under all normal operating conditions.

4.1.4 Colours or tints and type size used shall be such that the chart can be easily read and interpreted by the pilot in varying conditions of natural and artificial light.

4.1.5 The information shall be in a form which enables the pilot to acquire it in a reasonable time consistent with workload and operating conditions.

4.1.6 The presentation of information provided on each type of chart shall permit smooth transition from chart to chart as appropriate to the phase of flight.

4.1.7 The charts shall be True North orientation.

4.1.8 The basic sheet size of the charts should be 210 X 148 mm (8.27 X 5.82) (A5) or any other suitable size keeping legibility factors into account.

4.2 Titles

The title of a chart or chart series prepared in accordance with the specifications contained in this Manual and intended to satisfy the function of the chart, shall be that of the relevant para 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 this Para 2 and any specified for the particular chart.

4.3 Miscellaneous information

4.3.1 The marginal note layout shall be as given in Appendix 1, except as otherwise specified for a particular chart.

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

1) designation or title of the chart series;

Note. - The title may be abbreviated.

2) name and reference of the sheet;

3) on each margin an indication of the adjoining sheet (when applicable).

4.3.3 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.

4.3.4 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.

4.4 Symbols

Symbols used shall conform to those shown in Appendix 2 – ICAO Chart, 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 ICAO chart symbol or impair the legibility of the chart.

Note. - The size and prominence of symbols and the thickness and spacing of lines may be varied according to the scale and functions of the chart, with due regard to the importance of the information they convey.

4.5 Units of measurement

4.5.1 Distance shall be derived as geodesic distances.

4.5.2 Distance shall be expressed either kilometers or nautical miles or both, provided the units are clearly differentiated.

4.5.3 Altitudes, elevations and heights shall be expressed in either meters or feet or both, provided the units are clearly differentiated.

4.5.4 Linear dimensions on aerodromes and short distances shall be expressed in meters.

4.5.5 The order of resolution of distances, dimensions, elevations and heights shall be that as specified for a particular chart.

4.5.6 The units of measurement used to express distances, altitudes, elevations and heights shall be conspicuously stated on the face of each chart.

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

4.6 Scale and projection

4.6.1 For charts of large areas, the name and basic parameters and scale of the projection shall be indicated.

4.6.2 For charts of small areas, a linear scale only shall be indicated.

4.7 Date of validity of aeronautical information

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

4.8 Spelling of geographical names

4.8.1 The symbols of the Roman alphabet shall be used for all writing.

4.8.2 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 English language, in respect of the most important example of each type. Punctuation marks shall not be used in abbreviations within the body of a chart.

4.9 Abbreviations

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

4.9.2 Where applicable, abbreviations shall be selected from the Procedures for Air Navigation Services – ICAO Abbreviations and Codes (Doc 8400).

4.10 Political boundaries

4.10.1 International boundaries shall be shown, but may be interrupted if data more important to the use of the chart would be obscured.

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

Note.- In the case of a dependent territory, the name of the sovereign State may be added in brackets.

4.11 Colours: Colours used on charts shall conform to Appendix 3 – Colour Guide.

4.12 Relief

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

- a) orientation and identification;
- b) safe terrain clearance;
- c) clarity of aeronautical information when shown;
- d) planning.

Note.—Relief is usually portrayed by combinations of contours, hypsometric tints, spot elevations and hill shading, the choice of method being affected by the nature and scale of the chart and its intended use.

4.12.2 Where relief is shown by hypsometric tints, the tints used shall be based on those shown in the Hypsometric Tint Guide in Appendix 4.

4.12.3 Where spot elevations are used they shall be shown for selected critical points.

4.12.3.1 The value of spot elevations of doubtful accuracy shall be followed by the sign $\pm$.

4.13 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.

4.14 Air traffic services airspaces.

4.14.1 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 2 -ICAO Chart Symbols.

4.14.2 On charts used for visual flight, those parts of the ATS Airspace Classifications table in CAR Section 4 Series 'E' Part II applicable to the airspace depicted on the chart shall be on the face or reverse of each chart.

4.15 Magnetic variation

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

4.15.2 When magnetic variation is shown on a chart, the values shown shall be those for the year nearest to the date of publication that is divisible by 5, i.e. 1980, 1985, etc. In exceptional cases where the current value would be more than one degree different, after applying the calculation for annual change, an interim date and value should be quoted.

Note. -- The date and the annual change may be shown.

4.16 Typography

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

4.17 Aeronautical data

4.17.1 All necessary measures shall be taken to introduce a properly organized quality system containing procedures, processes and resources necessary to implement quality management at each function stage. The execution of such quality management shall be made demonstrable for each function stage, when required. In addition, it shall be ensured 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.

4.17.2 It shall be ensured that the order of chart resolution of aeronautical data shall be that as specified for a particular chart and as presented in a tabular form in Appendix 6.

4.17.3 It shall be ensured that integrity of aeronautical data is maintained throughout the data process from survey/origin to the next intended user. Aeronautical data integrity requirements shall be based upon the potential risk resulting from the corruption of data and upon the use to which the data item is put. Consequently, the following classification and data integrity level shall apply:

- a) critical data, integrity level 1×10^{-8} : there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;
- b) essential data, integrity level 1×10^{-5} : there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and
- c) routine data, integrity level 1×10^{-3} : there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

4.17.4 Aeronautical data quality requirements related to the integrity and data classification shall be as provided in Tables 1 to 5 in Appendix 6.

4.17.5 Protection of electronic aeronautical data while stored or in transit shall be totally monitored by the Cyclic Redundancy Check (CRC). To achieve protection of the integrity level of critical and essential aeronautical data as classified in 4.17.3, a 32- or 24-bit CRC algorithm shall apply respectively.

4.17.6 To achieve protection of the integrity level of routine aeronautical data as classified in 4.17.3, a 16-bit CRC algorithm shall apply.

4.18 Common reference systems.

4.18.1 Horizontal reference system.

4.18.1.1 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.

4.18.1.2 Geographical coordinates which have been transformed into WGS-84 coordinates but whose accuracy of original field work does not meet the requirements in ANO (ATS) A.1, Chapter 2, and (AD) A.1 shall be identified by an asterisk.

4.18.1.3 The order of chart resolution of geographical coordinates shall be that specified for a particular chart series and in accordance with Appendix 6, Table 1.

4.18.2 Vertical reference system.

4.18.2.1 Mean sea level (MSL) datum, which gives the relationship of gravity-related height (elevation) to a surface known as the geoid, shall be used as the vertical reference system.

Note 1. -- The geoid globally most closely approximates MSL. It is defined as the equipotential surface in the gravity field of the Earth that coincides with the undisturbed MSL extended continuously through the continents.

Note 2. -- Gravity-related heights (elevations) are also referred to as orthometric heights while distances of points above the ellipsoid are referred to as ellipsoidal heights.

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

4.18.2.3 The order of chart resolution of elevation and geoid undulation shall be that specified for a particular chart series and in accordance with Appendix 6, Table 2.

4.18.3 Temporal reference system

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

4.18.3.2 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 5

AERODROME OBSTACLE CHART – ICAO TYPE (OPERATING LIMITATIONS)

5.1 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 operating limitations Part VI of CAR-84.

5.2 Availability:

5.2.1 Aerodrome Obstacle Charts — ICAO Type A (Operating Limitations) shall be made available in the manner as prescribed for all aerodromes regularly used by International Civil Aviation except for those aerodromes where there are no obstacles in the takeoff flight path areas or where the Aerodrome Terrain and Obstacle Chart — ICAO (Electronic) is provided in accordance with Chapter 7.

5.2.2 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 AIP.

5.3 Units of measurement:

5.3.1 Elevations shall be shown to the nearest half-meter or to the nearest foot.

5.3.2 Linear dimensions shall be shown to the nearest half-meter.

5.4 Coverage and scale:

5.4.1 The extent of each plan shall be sufficient to cover all significant obstacles.

Note.— Isolated distant obstacles that would unnecessarily increase the sheet size may be indicated by the appropriate symbol and an arrow, provided that the distance and bearing from the end of the runway farthest removed and the elevation are given.

5.4.2 The horizontal scale shall be within the range of 1:10 000 to 1:15 000.

5.4.3 A horizontal scale should be 1: 10 000.

5.4.4 The vertical scale shall be ten times the horizontal scale.

5.4.5 Linear scales. Horizontal and vertical linear scales showing both meters and feet shall be included in the charts.

5.5 Format :

5.5.1 The charts shall depict a plan and profile of each runway, any associated stopway or clearway, the take-off flight path area and obstacles.

5.5.2 The profile for each runway, stopway, clearway and the obstacles in the takeoff flight path area shall be shown above its corresponding plan. 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.

5.5.3 A profile grid shall be ruled over the entire profile area exclusive of the runway. The zero for vertical coordinates shall be mean sea level. The zero for horizontal coordinates shall be the end of the runway furthest from the take-off flight path area concerned. Graduation marks indicating the subdivisions of intervals shall be shown along the base of the grid and along the vertical margins.

5.5.3.1 The vertical grid shall have intervals of 30 m (100 ft) and the horizontal grid should have intervals of 300 m (1 000 ft).

5.5.4 The chart shall include:

- a) a box for recording the operational data specified in 5.8.3;
- b) a box for recording amendments and dates thereof.

5.6 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).

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

5.8 Aeronautical data

5.8.1 Obstacles

5.8.1.1 Objects in the take-off flight path area which project above a plane surface having a 1.2 per 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 5.8.1.2 need not be shown. Mobile objects such as boats, trains and trucks, which may project above the 1.2 per cent plane, shall be considered obstacles but shall not be considered as being capable of creating a shadow.

5.8.1.2 The shadow of an obstacle is considered to be a plane surface originating at a horizontal line passing through the top of the obstacle at right angles 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 or to the next higher obstacle if it occurs first. For the first 300 m (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.

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

5.8.2 Take-off flight path area

5.8.2.1 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 180 m (600 ft) and this width increases at the rate of 0.25D to a maximum of 1 800 m (6 000 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 (5.4 NM), whichever is the lesser.

5.8.2.2 For runways serving aircraft having operating limitations which do not preclude the use of a take-off flight path gradient of less than 1.2 per cent, the extent of the takeoff flight path area specified in 5.8.2.1 c) shall be increased to not less than 12.0 km (6.5 NM) and the slope of the plane surface specified in 5.8.1.1 and 5.8.1.2 shall be reduced to 1.0 per cent or less.

Note.— When a 1.0 per cent survey plane touches no obstacles, this plane may be lowered until it touches the first obstacle.

5.8.3 Declared distances

5.8.3.1 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.

5.8.3.2 Where a declared distance is not provided because a runway is usable in one direction only, that runway shall be identified as “not usable for takeoff, landing or both”.

5.8.4 Plan and profile views

5.8.4.1 The plan view shall show:

- a) the outline of the runways 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 clearways 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. When 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.

Note.— This does not exclude the necessity for indicating critical spot elevations within the take-off flight path area.

5.8.4.1.1 The nature of the runway and stopway surfaces shall be indicated.

5.8.4.1.2 Stopways shall be identified as such and shall be shown by a broken line.

5.8.4.1.3 When stopways are shown, the length of each stopway shall be indicated.

5.8.4.2 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 clearways 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 takeoff 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 a distinctive manner identified in the legend.

Note.— An obstacle profile consisting of a line joining the tops of each obstacle and representing the shadow created by successive obstacles may be shown.

5.9 Accuracy

5.9.1 The order of accuracy attained shall be shown on the chart.

5.9.2 The horizontal dimensions and the elevations of the runway, stopway and clearway to be printed on the chart shall be determined to the nearest 0.5 m (1 ft).

5.9.3 The order of accuracy of the field work and the precision of chart production shall be such that measurements in the take-off flight path areas can be taken from the chart within the following maximum deviations:

- 1) horizontal distances: 5 m (15 ft) at a point of origin increasing at a rate of 1 per 500;
- 2) vertical distances: 0.5 m (1.5 ft) in the first 300 m (1 000 ft) and increasing at a rate of 1 per 1 000.

5.9.4 Datum. Where no accurate datum for vertical reference is available, the elevation of the datum used shall be stated and shall be identified as assumed.

CHAPTER 6

AERODROME OBSTACLE CHART — ICAO TYPE B

6.1 Function

This chart shall provide information to satisfy the following functions:

- a) the determination of minimum safe altitudes/heights including those for circling procedures;
- b) the determination of procedures for use in the event of an emergency during take-off or landing;
- c) the application of obstacle clearing and marking criteria; and d) the provision of source material for aeronautical charts.

6.2 Availability

6.2.1 Aerodrome Obstacle Charts — ICAO Type B shall be made available, in the manner prescribed in 4.3.2, for all aerodromes.

6.2.2 When a chart combining the specifications of para 3 and 4 is made available, it shall be called the Aerodrome Obstacle Chart — ICAO (Comprehensive).

6.3 Units of measurement

6.3.1 Elevations shall be shown to the nearest half-metre or to the nearest foot.

6.3.2 Linear dimensions shall be shown to the nearest half-metre.

6.4 Coverage and scale

6.4.1 The extent of each plan shall be sufficient to cover all obstacles.

Note.— Isolated distant obstacles that would unnecessarily increase the sheet size may be indicated by the appropriate symbol and an arrow, provided that the distance and bearing from the aerodrome reference point and elevation are given.

6.4.2 The horizontal scale shall be within the range of 1:10 000 to 1:20 000.

6.4.3 A horizontal linear scale showing both meters and feet shall be included in the chart. When necessary, a linear scale for kilometers and a linear scale for nautical miles shall also be shown.

6.5 Format:

The charts shall include:

- a) any necessary explanation of the projection used;
- b) any necessary identification of the grid used;
- c) a notation indicating that obstacles are those which penetrate the surfaces specified in CAR84, Section 4, Series 'B' Part I (Aerodrome Design and Operations);
- d) a box for recording amendments and dates thereof;
- e) outside the neat line, every minute of latitude and longitude marked in degrees and minutes.

Note. — Lines of latitude and longitude may be shown across the face of the chart.

6.6 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 and the name of the aerodrome.

6.7 Culture and topography:

6.7.1 Drainage and hydrographic details shall be kept to a minimum.

6.7.2 Buildings and other salient features associated with the aerodrome shall be shown. Wherever possible, they shall be shown to scale.

6.7.3 All objects, either cultural or natural, that project above the take-off and approach surfaces specified in 8.9 or the clearing and marking surfaces specified in Annex 14, Volume I, Chapter 4, shall be shown;

6.7.4 Roads and railroads within the take-off and approach area, and less than 600m (2 000 ft) from the end of the runway or runway extensions, shall be shown.

Note. — Geographical names of features may be shown if of significance.

6.8 Magnetic variation:

The chart shall show a compass rose orientated to the True North, or a North point, showing the magnetic variation to the nearest degree with the date of magnetic information and annual change.

6.9 Aeronautical data

6.9.1 The charts shall show:

- a) the aerodrome reference point and its geographical coordinates in degrees, minutes and seconds;
- b) the outline of the runways by a solid line;
- c) the length and width of the runway;
- d) the magnetic bearing to the nearest degree of the runway and the runway number;
- e) the elevation of the runway centre line at each end of the runway, at the stopway, at the origin of each takeoff and approach area, and at each significant change of slope of runway and stopway;
- f) taxiways, aprons and parking areas identified as such, and the outlines by a solid line;
- g) stopways identified as such and depicted by a broken line;
- h) the length of each stopway;
- i) clearways identified as such and depicted by a broken line;
- j) the length of each clearway;
- k) take-off and approach surfaces identified as such and depicted by a broken line;
- l) take-off and approach areas;
- m) obstacles at their exact location, including:
 - 1) a symbol indicative of their type;
 - 2) elevation;
 - 3) identification;
 - 4) limits of penetration of large extent in a distinctive manner identified in the legend;

Note.— This does not exclude the necessity for indicating critical spot elevations within the take-off and approach areas.

- n) any additional obstacles, as determined by 5.8.1.1 including the obstacles in the shadow of an obstacle, which would otherwise be exempted.

6.9.1.1 The nature of the runway and stopway surfaces shall be given.

6.9.1.2 Wherever practicable, the highest object or obstacle between adjacent approach areas within a radius of 5 000 m (15 000 ft) from the aerodrome reference point shall be indicated in a prominent manner.

6.9.1.3 The extent of tree areas and relief features, part of which constitute obstacles, shall be shown.

6.10 Accuracy

6.10.1 The order of accuracy attained shall be shown on the chart.

6.10.2 The horizontal dimensions and the elevations of the movement area, stopways and clearways to be printed on the chart shall be determined to the nearest 0.5 m (1 ft).

6.10.3 The order or accuracy of the field work and the precision of chart production shall be such that the resulting data will be within the maximum deviations indicated herein:

- a) Take-off and approach areas:
 - 1) horizontal distances: 5 m (15 ft) at point of origin increasing at a rate of 1 per 500;
 - 2) vertical distances: 0.5 m (1.5 ft) in the first 300 m (1 000 ft) and increasing at a rate of 1 per 1 000.
- b) Other areas:
 - 1) horizontal distances: 5 m (15 ft) within 5 000 m (15 000 ft) of the aerodrome reference point and 12 m (40 ft) beyond that area;
 - 2) vertical distances: 1 m (3 ft) within 1 500 m (5 000 ft) of the aerodrome reference point increasing at a rate of 1 per 1 000.

6.10.4 Datum. Where no accurate datum for vertical reference is available, the elevation of the datum used shall be stated and identified as assumed.

CHAPTER - 7

AERODROME OBSTACLE CHART - ICAO TYPE C

7.1 Function

This electronic chart shall portray the terrain and obstacle data in combination with aeronautical data, as appropriate, necessary to:

- a) enable an operator to comply with the operating limitations of Annex 6, Part I, Chapter 5, and Part III, Section II, Chapter 3 by developing contingency procedures for use in the event of an emergency during a missed approach or take-off, and by performing aircraft operating limitations analysis; and
- b) support the following air navigation applications:
 - 1) instrument procedure design (including circling procedure);
 - 2) aerodrome obstacle restriction and removal; and
 - 3) provision of source data for the production of other aeronautical charts.

7.2 Availability

7.2.1 From 18 November 2010, Aerodrome Terrain and Obstacle Charts — ICAO (Electronic) shall be made available in the manner as prescribed for all aerodromes regularly used by international civil aviation.

Note 1. — Where the Aerodrome Terrain and Obstacle Chart — ICAO (Electronic) is made available, the Aerodrome Obstacle Chart — ICAO Type A (Operating Limitations) and the Aerodrome Obstacle Chart — ICAO Type B are not required (see 7.2.1 and 8.2.1).

Note 2. — The information required by the Precision Approach Terrain Chart — ICAO may be provided in the Aerodrome Terrain and Obstacle Chart — ICAO (Electronic). Where this occurs the Precision Approach Terrain Chart — ICAO is not required (see 8.2.1).

7.2.2 Aerodrome Terrain and Obstacle Charts — ICAO (Electronic) should be made available in the manner as prescribed for all aerodromes regularly used by international civil aviation.

7.2.3 The Aerodrome Terrain and Obstacle Chart — ICAO (Electronic) shall also be made available in hard copy format upon request.

Note. — For specifications regarding hard copy printed output see 7.7.7.

7.2.4 The ISO 19100 series of standards for geographic information shall be used as a general data modelling framework.

Note. — The use of the ISO 19100 series of standards for geographic information supports the interchange and use of the Aerodrome Terrain and Obstacle Chart — ICAO (Electronic) among different users.

7.3 Identification:

Electronic charts shall be identified by the name of the country in which the aerodrome is located, the name of the city or town which the aerodrome serves, and the name of the aerodrome.

7.4 Chart coverage:

The extent of each chart shall be sufficient to cover Area 2 as specified in Annex 15, 10.2.

7.5 Chart content:

7.5.1 General

7.5.1.1 When developing computer graphic applications that are used to portray features on the chart, the relationships between features, feature attributes, and the underlying spatial geometry and associated topological

relationships shall be specified by an application schema. Portrayed information shall be provided on the basis of portrayal specifications applied according to defined portrayal rules. Portrayal specifications and portrayal rules shall not be part of the data set. Portrayal rules shall be stored in a portrayal catalogue which shall make reference to separately-stored portrayal specifications.

Note.— ISO Standard 19117 contains a definition of the schema describing the portrayal mechanism of feature-based geographic information, while ISO Standard 19109 contains rules for application schema. Spatial geometry and associated topological relationships are defined in ISO Standard 19107.

7.5.1.2 Symbols used to portray features shall be in accordance with 4.4 and Appendix 2 — ICAO Chart Symbols.

7.5.2 Terrain feature

7.5.2.1 The terrain feature, and associated attributes, to be portrayed and database linked to the chart shall be based on the electronic terrain data sets which satisfy the requirements of Annex 15, Chapter 10 and Appendix 8.

7.5.2.2 The terrain feature shall be portrayed in a manner that provides an effective general impression of a terrain. This shall be a representation of terrain surface by continuous elevation values at all intersections of the defined grid, also known as the Digital Elevation Model (DEM).

7.5.2.3 Representation of terrain surface should be provided as a selectable layer of contour lines in addition to the DEM.

7.5.2.4 An ortho-rectified image which matches the features on the DEM with features on the overlying image should be used to enhance the DEM. The image should be provided as a separate selectable layer.

7.5.2.5 The portrayed terrain feature shall be linked to the following associated attributes in the database(s):

- a) horizontal positions of grid points in geographic coordinates and elevations of the points;
- b) surface type;
- c) contour line values, if provided; and
- d) names of cities, towns and other prominent topographic features.

7.5.2.6 Other terrain attributes specified in ANO(AIS) A.1, Appendix 8, Table A8-3 and provided in the database(s) should be linked to the portrayed terrain feature.

7.5.3 Obstacle features

7.5.3.1 Obstacle features, and associated attributes, portrayed or database-linked to the chart shall be based on electronic obstacle data sets which satisfy the requirements of ANO(AIS) A.1, Chapter 10 and Appendix 8.

7.5.3.2 Each obstacle shall be portrayed by an appropriate symbol and obstacle identifier.

7.5.3.3 The portrayed obstacle feature shall be linked to the following associated attributes in the database(s):

- a) horizontal position in geographic coordinates and associated elevation;
- b) obstacle type; and
- c) obstacle extent, if appropriate.

7.5.3.4 Other obstacle attributes specified in ANO(AIS) A.1, Appendix 8, Table A8-4 and provided in the database(s) should be linked to the portrayed obstacle feature.

7.5.4 Aerodrome features

7.5.4.1 Aerodrome features, and associated attributes, portrayed and database-linked to the chart shall be based on aerodrome data which satisfy the requirements of ANO(AD) A.1, Appendix 5 and ANO(AIS) A.1, Appendix 7.

7.5.4.2 The following aerodrome features shall be portrayed by an appropriate symbol:

- a) aerodrome reference point;
- b) runway(s), with designation numbers, and if available, stopway(s) and clearway(s);
and
- c) taxiways, aprons, large buildings and other prominent aerodrome features.

- 7.5.4.3 The portrayed aerodrome feature shall be linked to the following associated attributes in the database(s):
- a) geographical coordinates of the aerodrome reference point;
 - b) aerodrome magnetic variation, year of information and annual change;
 - c) length and width of runway(s), stopway(s) and clearway(s);
 - d) type of surface of runway(s) and stopway(s);
 - e) magnetic bearings of the runway(s) to the nearest degree;
 - f) elevations at each end of runway(s), stopway(s) and clearway(s), and at each significant change in slope of runway(s) and stopway(s);
 - g) declared distances for each runway direction, or the abbreviation “NU” where a runway direction cannot be used for take-off or landing or both.

7.5.5 Radio navigation aid features.

Each radio navigation aid feature located within the chart coverage shall be portrayed by an appropriate symbol.

Note.— Navigation aid feature attributes may be linked to the portrayed navigation aid features in the database(s).

7.6 Accuracy and resolution

7.6.1 The order of accuracy of aeronautical data shall be as specified in ANO(ATS) A.1, Appendix 5 and ANO(AD) A.1, Appendix 5. The order of accuracy of terrain and obstacle data shall be as specified in ANO(AIS) A.1, Appendix 8.

7.6.2 The aeronautical data resolution shall be as specified in ANO(AIS) A.1, Appendix 7 while the resolution for terrain and obstacle data shall be as specified in ANO(AIS) A.1, Appendix 8.

7.7 Electronic functionality

7.7.1 It shall be possible to vary the scale at which the chart is viewed. Symbols and text size shall vary with chart scale to enhance readability.

7.7.2 Information on the chart shall be geo-referenced, and it shall be possible to determine cursor position to at least the nearest second.

7.7.3 The chart shall be compatible with widely available desktop computer hardware, software and media.

7.7.4 The chart should include its own “reader” software.

7.7.5 It shall not be possible to remove information from the chart without an authorized update.

7.7.6 When, due to congestion of information, the details necessary to support the function of the chart cannot be shown with sufficient clarity on a single comprehensive chart view, selectable information layers shall be provided to allow for the customized combination of information.

7.7.7 It shall be possible to print the chart in hard copy format according to the content specifications and scale determined by the user.

7.8 Chart data product specifications

7.8.1 A comprehensive statement of the data sets comprising the chart shall be provided in the form of data product specifications on which basis air navigation users will be able to evaluate the chart data product and determine whether it fulfills the requirements for its intended use (application).

7.8.2 The chart data product specifications shall include an overview, a specification scope, a data product identification, data content information, the reference systems used, the data quality requirements, and information on data capture, data maintenance, data portrayal, data product delivery, as well as any additional information available, and metadata.

Note.— ISO Standard 19131 specifies the requirements and outline of data product specifications for geographic information.

7.8.3 The overview of the chart data product specifications shall provide an informal description of the product and shall contain general information about the data product. The specification scope of the chart data product specifications shall contain the spatial (horizontal) extent of the chart coverage. The chart data product identification shall include the title of the product, a brief narrative summary of the content and purpose, and a description of the geographic area covered by the chart.

7.8.4 The data content of the chart data product specifications shall clearly identify the type of coverage and/or imagery and shall provide a narrative description of each.

Note.— ISO Standard 19123 contains schema for coverage geometry and functions.

7.8.5 The chart data product specifications shall include information that defines the reference systems used. This shall include the spatial reference system (horizontal and vertical) and, if appropriate, temporal reference system. The chart data product specifications shall identify the data quality requirements. This shall include a statement on acceptable conformance quality levels and corresponding data quality measures. This statement shall cover all the data quality elements and data quality sub-elements, even if only to state that a specific data quality element or sub-element is not applicable.

Note.— ISO Standard 19113 contains quality principles for geographic information while ISO Standard 19114 covers quality evaluation procedures.

7.8.6 The chart data product specifications shall include a data capture statement which shall be a general description of the sources and of processes applied for the capture of chart data. The principles and criteria applied in the maintenance of the chart shall also be provided in the chart data product specifications, including the frequency with which the chart product is updated. Of particular importance shall be the maintenance information of obstacle data sets included on the chart and an indication of the principles, methods and criteria applied for obstacle data maintenance.

7.8.7 The chart data product specifications shall contain information on how data are portrayed on the chart, as detailed in 7.5.1.1. The chart data product specifications shall also contain dataproduct delivery information which shall include delivery formats and delivery medium information.

7.8.8 The core chart metadata elements shall be included in the chart data product specifications. Any additional metadata items required to be supplied shall be stated in the product specifications together with the format and encoding of the metadata.

Note 1.— ISO Standard 19115 specifies requirements for geographic information metadata.

Note 2.— The chart data product specifications document the chart data product which is implemented as data set

Those data sets are described by Metadata.

CHAPTER 8.

PRECISION APPROACH TERRAIN CHART — ICAO

8.1 Function

The chart shall provide detailed terrain profile information within a defined portion of the final decision height determination by the use of radio altimeters.

8.2 Availability

8.2.1 The Precision Approach Terrain Chart — ICAO shall be made available for all precision approach runways Categories II and III.

8.2.2 The Precision Approach Terrain Chart — ICAO shall be revised whenever any significant change occurs.

8.3 Scale

8.3.1 The horizontal scale shall be 1:2 500, and the vertical scale 1:500.

8.3.2 When the chart includes a profile of the terrain to a distance greater than 900m (3 000 ft) from the runway threshold, the horizontal scale shall be 1:5 000.

8.4 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 of the runway.

8.5 Plan and profile information

8.5.1 The chart shall include:

- 1) a plan showing contours at 1 m (3 ft) intervals in the area 60 m (200 ft) on either side of the extended centre line of the runway, to the same distance as the profile, the contours to be related to the runway threshold;
- 2) an indication where the terrain or any object thereon, within the plan defined in 1) above, differs by ± 3 m (10 ft) in height from the centre line profile and is likely to affect a radio altimeter;
- 3) a profile of the terrain to a distance of 900 m (3 000 ft) from the threshold along the extended centre line of the runway.

8.5.2 Where the terrain at a distance greater than 900 m (3000 ft) from the runway threshold is mountainous or otherwise significant to users of the chart, the profile of the terrain shall be shown to a distance not exceeding 2 000 m (6500 ft) from the runway threshold.

8.5.3 The ILS reference datum height shall be shown to the nearest half meter or foot.

CHAPTER- 9

ENROUTE CHART – ICAO

9.1 Function

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

Note.— Simplified versions of these charts are appropriate for inclusion in Aeronautical Information Publications to complement the tabulation of radio communication and navigation facilities.

9.2 Availability

9.2.1 The Enroute Chart — ICAO shall be made available in the manner as prescribed for all areas where flight information regions have been established.

9.2.2 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.

9.3 Coverage and scale

Note 1.— A uniform scale for charts of this type cannot be specified due to the varying degree of congestion of information in certain areas.

Note 2.— A linear scale based on the mean scale of the chart may be shown.

9.3.1 Layout of sheet lines shall be determined by the density and pattern of the ATS route structure.

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

9.3.3 An adequate overlap of charts shall be provided to ensure continuity of navigation.

9.4 Projection

9.4.1 A conformal projection on which a straight line approximates a great circle shall be used.

Note: Existing charts where Mercator projection is used will continue to be in use till they are modified/ amended. New chart shall conform to the above provision.

9.4.2 Parallels and meridians shall be shown at suitable intervals.

9.4.3 Graduation marks shall be placed at consistent intervals along selected parallels and meridians.

9.5 Identification

Each sheet shall be identified by chart series and number.

9.6 Culture and topography

9.6.1 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.

9.6.2 Within each quadrilateral formed by the parallels and meridians the area minimum altitude shall be shown, except as provided for in 9.6.3.

9.6.3 In areas of high latitude where it is determined that True North orientation of the chart is impractical, the area minimum altitude shall be shown within each quadrilateral formed by reference lines of the graticule (grid) used.

9.6.4 Where charts are not True North orientated, this fact and the selected orientation used shall be clearly indicated.

9.7 Magnetic variation

Isogonals shall be indicated and the date of the isogonic information given.

9.8 Bearings, tracks and radials

9.8.1 Bearings, tracks and radials shall be magnetic.

9.8.2 Intentionally kept blank.

9.8.3 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.

9.9 Aeronautical data

9.9.1 Aerodromes

All aerodromes to which an instrument approach can be made shall be shown.

Note.— Other aerodromes may be shown.

9.9.2 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.

9.9.3 Air traffic services system

9.9.3.1 Where appropriate, the components of the established air traffic services system shall be shown.

9.9.3.1.1 The components shall include the following:

- 1) 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;
- 2) in respect of DME, additionally the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft);
- 3) an indication of all designated airspace, including lateral and vertical limits and the appropriate class of airspace;
- 4) all ATS routes for en-route flight including route designators, required navigation performance (RNP) types, the track to the nearest degree in both directions along each segment of the routes and, where applicable, the direction of traffic flow;
- 5) 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;
- 6) in respect of waypoints defining VOR/DME area navigation routes, additionally,
 - a) the station identification and radio frequency of the reference VOR/DME;
 - b) the bearing to the nearest tenth of a degree and the distance to the nearest two-tenths of a kilometer (tenth of a nautical mile) from the reference VOR/DME, if the waypoint is not collocated with it;
- 7) an indication of all compulsory and “on-request” reporting points and ATS/MET reporting points;
- 8) the distances to the nearest kilometer or nautical mile between significant points constituting turning points or reporting points;

Note. — Overall distances between radio navigation aids may also be shown.

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

Note.— Change-over points established at the midpoint between two aids, or at the intersection of two radials in the case of a route which changes direction between the aids, need not be shown for each route segment if a general statement regarding their existence is made.

- 10) minimum flight altitudes on ATS routes to the nearest higher 50 meters or 100 feet;
- 11) radio communication facilities listed with their frequencies;
- 12) air defence identification zone (ADIZ) properly identified.

Note.— ADIZ procedures may be described in the chart legend.

9.9.4 Supplementary information

9.9.4.1 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) — ICAO or a Standard Arrival Chart — Instrument (STAR) — ICAO.

Note 1. — For specifications of these charts see Chapter 10,11,12.

Note 2. — Departure routes normally originate at the end of a runway; arrival routes normally terminate at the point where an instrument approach is initiated.

9.9.4.2 Where established, altimeter setting regions shall be shown and identified.

CHAPTER 10

AREA CHART – ICAO

10.1 Function

This chart shall provide the flight crew with information to facilitate the following phases of instrument flight:

- a) the transition between the en-route phase and approach to an aerodrome;
- b) the transition between take-off/missed approach and enroute phase of flight; and
- c) flights through areas of complex ATS routes or airspace structure.

Note.— The function described in 8.1 c) may be satisfied by a separate chart or an inset on an Enroute Chart — ICAO.

10.2 Availability:

10.2.1 The Area Chart — ICAO shall be made available in the manner prescribed in 1.3.2 where the air traffic services routes or position reporting requirements are complex and cannot be adequately shown on an Enroute Chart — ICAO.

10.2.2 Where air traffic services routes or position reporting requirements are different for arrivals and for departures, and these cannot be shown with sufficient clarity on one chart, separate charts shall be provided.

10.3 Coverage and scale

10.3.1 The coverage of each chart shall extend to points that effectively show departure and arrival routes.

10.3.2 The chart shall be drawn to scale and a scale-bar shown.

10.4 Projection

10.4.1 A conformal projection on which a straight line approximates a great circle shall be used.

Note: Existing charts where Mercator projection is used will continue to be in use till they are modified/ amended. New chart shall conform to the above provision.

10.4.2 Parallels and meridians shall be shown at suitable intervals.

10.4.3 Graduation marks shall be placed at consistent intervals along the neat lines, as appropriate.

10.5 Identification

The chart shall be identified by a name associated with the airspace portrayed.

Note.— The name may be that of the air traffic services centre, the name of the largest city or town situated in the area covered by the chart or the name of the city that the aerodrome serves. Where more than one aerodrome serves the city or town, the name of the aerodrome on which the procedures are based should be added.

10.6 Culture and topography

10.6.1 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.

10.6.2 To improve situational awareness in areas where significant relief exists, all relief exceeding 300 m (1 000 ft) above the elevation of the primary aerodrome 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 be shown printed in black. Obstacles shall also be shown.

Note 1.— The next higher suitable contour line appearing on base topographic maps exceeding 300 m (1 000 ft) above the elevation of the primary aerodrome may be selected to start layer tinting.

Note 2.— An appropriate brown colour, on which half-tone layer tinting is to be based, is specified in Appendix 3 — Colour Guide for contours and topographic features.

Note 3.— Appropriate spot elevations and obstacles are those provided by the procedures specialist.

10.7 Magnetic variation

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

10.8 Bearings, tracks and radials

10.8.1 Bearings, tracks and radials shall be magnetic.

10.8.2 Intentionally kept blank.

10.8.3 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.

10.9 Aeronautical data

10.9.1 Aerodromes

All aerodromes which affect the terminal routings shall be shown. Where appropriate a runway pattern symbol shall be used.

10.9.2 Prohibited, restricted and danger areas

Prohibited, restricted and danger areas shall be depicted with their identification and vertical limits.

10.9.3 Area minimum altitudes Area minimum altitudes shall be shown within quadrilaterals formed by the parallels and meridians.

Note.— Depending on the selected chart scale, quadrilaterals formed by the parallels and meridians normally correspond to the whole degree of latitude and longitude.

10.9.4 Air traffic services system

10.9.4.1 The components of the established relevant air traffic services system shall be shown.

10.9.4.1.1 The components shall include the following:

- 1) 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;
- 2) in respect of DME, additionally the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft);
- 3) terminal radio aids which are required for outbound and inbound traffic and for holding patterns;
- 4) the lateral and vertical limits of all designated airspace and the appropriate class of airspace;
- 5) holding patterns and terminal routings, together with the route designators, and the track to the nearest degree along each segment of the prescribed airways and terminal routings;
- 6) all significant points which define the terminal routings 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;
- 7) in respect of waypoints defining VOR/DME area navigation routes, additionally,
 - a) the station identification and radio frequency of the reference VOR/DME;
 - b) the bearing to the nearest tenth of a degree and the distance to the nearest two-tenths of a kilometer (tenth of a nautical mile) from the reference VOR/DME, if the waypoint is not collocated with it;
- 8) an indication of all compulsory and “on-request” reporting points;
- 9) the distances to the nearest kilometer or nautical mile between significant points constituting turning points or reporting points;

Note.— Overall distances between radio navigation aids may also be shown.

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

Note.— Change-over points established at midpoint between two aids, or at the intersection of two radials in the case of a route which changes direction between the aids, need not be shown for each route segment if a general statement regarding their existence is made.

11) minimum flight altitudes on ATS routes to the nearest higher 50 m or 100 ft;

12) established radar minimum altitudes to the nearest higher 50 m or 100 ft, clearly identified;

Note 1.— Where radar procedures are used to vector aircraft to or from significant points on a published standard departure or arrival route or to issue clearance for descent below the minimum sector altitude during arrival, the radar procedures may be shown on the Area Chart — ICAO unless excessive chart clutter will result.

Note 2.— Where excessive chart clutter will result, a Radar Minimum Altitude Chart — ICAO may be provided (see Para 21), in which case the elements indicated by 8.9.4.1.1, 12), need not be duplicated on the Area Chart — ICAO.

13) area speed and level/altitude restrictions where established;

14) radio communication facilities listed with their frequencies.

CHAPTER 11

STANDARD DEPARTURE CHART – INSTRUMENT (SID) – ICAO.

11.1 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.

Note 1.— Provisions governing the identification of standard departure routes are in ANO(ATS) A.1 guidance material relating to the establishment of such routes is contained in the Air Traffic Services Planning Manual (Doc 9426).

Note 2.— Provisions governing obstacle clearance criteria and details of the minimum information to be published are contained in the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume II, Part II.

11.2 Availability

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

11.3 Coverage and scale

11.3.1 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.

Note.— The departure route normally originates at the end of a runway.

11.3.2 The chart should be drawn to scale.

11.3.3 If the chart is drawn to scale, a scale-bar shall be shown.

11.3.4 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.

11.4 Projection

11.4.1 A conformal projection on which a straight line approximates a great circle should be used.

11.4.2 When the chart is drawn to scale, parallels and meridians should be shown at suitable intervals.

11.4.3 Graduation marks shall be placed at consistent intervals along the neat lines.

11.5 Identification

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 (PANSOPS, Doc 8168), Volume II, Part I, Section 3, Chapter 5.

Note.— The identification of the standard departure route(s)— instrument is provided by the procedures specialist.

11.6 Culture and topography

11.6.1 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.

11.6.2 To improve situational awareness in areas where significant relief exists, the chart should be drawn to scale and all relief exceeding 300 m (1 000 ft) above the aerodrome elevation should 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, should be shown printed in black. Obstacles should also be shown.

Note 1.— The next higher suitable contour line appearing on base topographic maps exceeding 300 m (1 000 ft) above the aerodrome elevation may be selected to start layer tinting.

Note 2.— An appropriate brown colour, on which half-tone layer tinting is to be based, is specified in Appendix 3 —Colour Guide for contours and topographic features.

Note 3.— Appropriate spot elevations and obstacles are those provided by the procedures specialist.

11.7 Magnetic variation

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

11.8 Bearings, tracks and radials

11.8.1 Bearings, tracks and radials shall be magnetic, except as provided for in 11.8.2.

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

11.8.2 In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, should be used.

11.8.3 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.

11.9 Aeronautical data

11.9.1 Aerodromes

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

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

11.9.2 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.

11.9.3 Minimum sector altitude

11.9.3.1 The established minimum sector altitude, based on a navigation aid associated with the procedure, shall be shown with a clear indication of the sector to which it applies.

11.9.3.2 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.

Note.— Depending on the selected chart scale, quadrilaterals formed by the parallels and meridians normally correspond to the half-degree of latitude and longitude.

11.9.4 Air traffic services system

11.9.4.1 The components of the established relevant air traffic services system shall be shown.

11.9.4.1.1 The components shall comprise the following:

- 1) a graphic portrayal of each standard departure 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 kilometer 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 50m or 100ft and flight level restrictions where established ;
 - f) 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;

Note 1.— Where ATS surveillance systems are used to vector aircraft to or from significant points on a published standard departure route, the relevant procedures may be shown on the Standard Departure Chart — Instrument (SID) — ICAO unless excessive chart clutter will result.

Note 2.— Where excessive chart clutter will result, an ATC Surveillance Minimum Altitude Chart — ICAO may be provided (see Chapter 21), in which case the elements indicated by 11.9.4.1.1,

1) f), need not be duplicated on the Standard Departure Chart — Instrument (SID) — ICAO.

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 30m/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 kilometer (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) 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;

Note.— In accordance with PANS-OPS, Volume II, information on close-in obstacles is provided by the procedures specialist.

7) area speed restrictions, where established;

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

9) radio communication procedures, including:

- a) call sign(s) of ATS unit(s);
- b) frequency;
- c) transponder setting, where appropriate.

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

11.9.4.3 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), Volume II, Part III, Section 5, Chapter 2, 2.1, on the verso of the chart or as a separate, properly referenced sheet.

Note.— Appropriate data are those provided by the procedures specialist.

CHAPTER 12

STANDARD ARRIVAL CHART – INSTRUMENT (STAR) – ICAO

12.1 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.

12.2 Availability

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

12.3 Coverage and scale

12.3.1 The coverage of the chart shall be sufficient to indicate the points where the en-route phase ends and the approach phase begins.

12.3.2 The chart should be drawn to scale.

12.3.3 If the chart is drawn to scale, a scale-bar shall be shown.

12.3.4 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.

12.4 Projection

12.4.1 A conformal projection on which a straight line approximates a great circle shall be used.

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

12.4.3 Graduation marks shall be placed at consistent intervals along the neat lines.

12.5 Identification

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) C instrument as established in accordance with the Procedures for Air Navigation Services — Aircraft Operations (PANSOPS, Doc 8168), Volume II, Part I, Section 4, Chapter 2.

Note.— The identification of the standard arrival route(s) — instrument is provided by the procedures specialist.

12.6 Culture and topography

12.6.1 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.

12.6.2 To improve situational awareness in areas where significant relief exists, the chart should be drawn to scale and all relief exceeding 300 m (1 000 ft) above the aerodrome elevation should 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, should be shown printed in black. Obstacles should also be shown.

Note 1.— The next higher suitable contour line appearing on base topographic maps exceeding 300 m (1 000 ft) above the aerodrome elevation may be selected to start layer tinting.

Note 2.— An appropriate brown colour, on which half-tone layer tinting is to be based, is specified in Appendix 3 —Colour Guide for contours and topographic features.

Note 3.— Appropriate spot elevations and obstacles are those provided by the procedures specialist.

12.7 Magnetic variation

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

12.8 Bearings, tracks and radials

12.8.1 Bearings, tracks and radials shall be magnetic, except as provided for in 10.8.2.

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

12.8.2 In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, should be used.

12.8.3 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.

12.9 Aeronautical data

12.9.1 Aerodromes

12.9.1.1 The aerodrome of landing shall be shown by the runway pattern.

12.9.1.2 All aerodromes which affect the designated standard arrival route —instrument shall be shown and identified. Where appropriate the aerodrome runway patterns shall be shown.

12.9.2 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.

12.9.3 Minimum sector altitude

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

12.9.3.2 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.

Note.— Depending on the selected chart scale, quadrilaterals formed by the parallels and meridians normally correspond to the half-degree of latitude and longitude.

12.9.4 Air traffic services system

12.9.4.1 The components of the established relevant air traffic services system shall be shown.

12.9.4.1.1 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 kilometer or nautical mile between significant points;
 - e) minimum flight 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 radar vectoring on arrival is provided, established radar minimum altitudes to the nearest higher 50 m or 100 ft, clearly identified;

Note 1.— Where radar procedures 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 radar procedures may be shown on the Standard Arrival Chart — Instrument (STAR) — ICAO unless excessive chart clutter will result.

Note 2.— Where excessive chart clutter will result, a Radar Minimum Altitude Chart — ICAO may be provided (see Para 21), in which case the elements indicated by 12.9.4.1.1, 1) f), need not be duplicated on the Standard Arrival Chart — Instrument (STAR) — ICAO.

- 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 kilometer (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) all compulsory and "on-request" reporting points;
- 8) radio communication procedures, including:
 - a) call sign(s) of ATS unit(s);
 - b) frequency;
 - c) transponder setting, where appropriate.

12.9.4.2 A textual description of standard arrival route(s) — instrument (STAR) and communication failure procedures in relation to radar control shall be provided and shall, whenever feasible, be shown on the chart or on the same page which contains the chart.

12.9.4.3 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), Volume II, Part III, Section 5, Chapter 2, 2.2, on the verso of the chart or as a separate, properly referenced sheet.

Note.— Appropriate data are those provided by the procedures specialist.

CHAPTER- 13

INSTRUMENT APPROACH CHART – ICAO.

13.1 Function

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.

13.2 Availability

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

13.2.2 A separate Instrument Approach Chart — ICAO shall normally be provided for each precision approach procedure established by the State.

13.2.3 A separate Instrument Approach Chart — ICAO shall normally be provided for each non- precision approach procedure established by the State.

13.2.4 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.

Note.— For categories of aircraft, see Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume II, Part I, Section 4, Chapter 9.

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

13.3 Coverage and scale

13.3.1 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.

13.3.2 The scale selected shall ensure optimum legibility consistent with:

- 1) the procedure shown on the chart;
- 2) sheet size.

13.3.3 A scale indication shall be given.

13.3.3.1 Except where this is not practicable, a distance circle with a radius of 20 km (10 NM) centered 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.

13.3.3.2 A distance scale should be shown directly below the profile.

13.4 Format

The sheet size should be 210 x 148mm (8.27 x 5.82 inch)

13.5 Projection

13.5.1 A conformal projection on which a straight line approximates a great circle shall be used.

13.5.2 Graduation marks shall be placed at consistent intervals along the neat lines.

13.6 Identification

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.

13.7 Culture and topography

13.7.1 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.

13.7.2 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.

Note 1. — The next higher suitable contour line appearing on base topographic maps exceeding 150 m (500 ft) above the aerodrome elevation may be selected to start layer tinting.

Note 2.— An appropriate brown colour, on which half-tone layer tinting is to be based, is specified in Appendix 3 — Colour Guide for contours and topographic features.

13.7.3 In areas where relief is lower than specified in 13.7.2, 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.

Note 1.— The next higher suitable contour line appearing on base topographic maps exceeding 150 m (500 ft) above the aerodrome elevation may be selected to start layer tinting.

Note 2.— An appropriate brown colour, on which half-tone layer tinting is to be based, is specified in Appendix 3 — Colour Guide for contours and topographic features.

13.8 Magnetic variation

13.8.1 The magnetic variation shall be shown.

13.8.2 The value of the variation, indicated to the nearest degree, shall agree with that used in determining magnetic bearings, tracks and radials.

13.9 Bearings, tracks and radials

13.9.1 Bearings, tracks and radials shall normally be magnetic except as provided 13.9.2.

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

13.9.2 In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, should be used.

13.9.3 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.

13.10 Aeronautical data

13.10.1 Aerodromes

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

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

- 1) the aerodrome on which the procedure is based;
- 2) 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.

13.10.1.3 The aerodrome elevation shall be shown to the nearest meter or foot in a prominent position on the chart.

13.10.1.4 The threshold elevation or, where applicable, the highest elevation of the touchdown zone shall be shown to the nearest meter or foot.

13.10.2 Obstacles

13.10.2.1 Obstacles shall be shown on the plan view of the chart.

Note- Appropriate obstacles are those provided by the procedure specialist.

13.10.2.2 If one or more obstacles are the determining factor of an obstacle clearance altitude/height, those obstacles shall be identified.

13.10.2.3 The elevation of the top of obstacles shall be shown to the nearest (next higher) meter or foot.

13.10.2.4 The heights of obstacles above a datum other than mean sea level (see 13.10.2.3) should be shown. When shown, they shall be given in parentheses on the chart.

13.10.2.5 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.

13.10.2.6 Where a datum other than mean sea level is used, it shall be stated in a prominent position on the chart.

13.10.2.7 Where an obstacle free zone has not been established for a precision approach runway Category I, this shall be indicated.

13.10.3 Prohibited, restricted and danger areas:

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

13.10.4 Radio communication facilities and navigation aids

13.10.4.1 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.

13.10.4.2 The final approach fix (or final approach point for an ILS approach procedure) and other essential fixes or points comprising the procedure shall be shown and identified.

13.10.4.3 The final approach fix (or final approach point for an ILS approach procedure) should be identified with its geographical coordinates in degrees, minutes and seconds.

13.10.4.4 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.

13.10.4.5 Radio communication frequencies, including call signs that are required for the execution of the procedures shall be shown.

13.10.4.6 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 kilometer or nautical mile. When no track-defining aid indicates the bearing of the aerodrome, the bearing shall also be shown to the nearest degree.

13.10.5 Minimum sector altitude or terminal arrival altitude: 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.

13.10.6 Portrayal of procedure tracks

13.10.6.1 The plan view shall show the following information in the manner indicated:

- a) the approach procedure track by an arrowed continuous line indicating the direction of flight;

- b) the missed approach procedure track by an arrowed broken line;
- c) any additional procedure track, other than those specified in a) and b), by an arrowed dotted line;
- d) bearings, tracks, radials to the nearest degree and distances to the nearest two-tenths of a kilometer or tenth of a nautical mile or times required for the procedure;
- e) 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;
- f) the boundaries of any sector in which visual manoeuvring (circling) is prohibited;
- g) where specified the holding pattern and minimum holding altitude/height associated with the approach and missed approach;
- h) caution notes where required, prominently displayed on the face of the chart.

13.10.6.2 The plan view shall show the distance to the aerodrome from each radio navigation aid concerned with the final approach.

13.10.6.3 A profile shall be provided normally below the plan view showing the following data:

- a) the aerodrome by a solid block at aerodrome elevation;
- b) the profile of the approach procedure segments by an arrowed continuous line indicating the direction of flight;
- c) the profile of the missed approach procedure segment by an arrowed broken line and a description of the procedure;
- d) the profile of any additional procedure segment, other than those specified in b) and c), by an arrowed dotted line;
- e) 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;
- f) altitudes/heights required by the procedures, including transition altitude and procedure altitudes/heights, where established;
- g) limiting distance to the nearest kilometre or nautical mile on procedure turn, when specified;
- h) the intermediate approach fix or point, on procedures where no course reversal is authorized;
- i) 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.

13.10.6.4 Heights required by procedures shall be shown in parentheses, using the height datum selected in accordance with 13.10.2.5.

13.10.6.5 The profile view shall include a ground profile or a minimum altitude/height portrayal as follows:

- a) a ground profile shown by a solid line depicting the highest elevations of the relief occurring within the primary area of the final approach segment. The highest elevations of the relief occurring in the secondary areas of the final approach segment shown by a dashed line; or
- b) minimum altitudes/heights in the intermediate and final approach segments indicated within bounded shaded blocks.

Note 1.— For the ground profile portrayal, actual templates of the primary and secondary areas of the final approach segment are provided to the cartographer by the procedures specialist.

Note 2.— The minimum altitude/height portrayal is intended for use on charts depicting non-precision approaches with a final approach fix.

13.10.7 Aerodrome operating minima

13.10.7.1 Aerodrome operating minima when established by the State shall be shown.

13.10.7.2 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.

13.10.8 Supplementary information

13.10.8.1 When the missed approach point is defined by:

— a distance from the final approach fix, or

— a facility or a fix and the corresponding distance from the final approach fix, the distance to the nearest two-tenths of a kilometer 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.

13.10.8.2 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.

13.10.8.3 For procedures in which DME is not required for use in the final approach segment but where a suitably located DME is available to provide advisory descent profile information, a table showing the altitudes/ heights shall be included.

13.10.8.4 A rate of descent table shall be shown.

13.10.8.5 Final approach descent gradient and, in parenthesis, descent angle to the nearest one tenth of a degree shall be shown for non-precision procedures with a final approach fix.

13.10.8.6 On charts depicting ILS/MLS and LNAV/ VNAV approach procedures, the height of the ILS/MLS and LNAV/VNAV reference datum to the nearest half meter or foot and the glide path/elevation/vertical path angle shall be shown. If the ILS/MLS glide path/elevation angle exceeds 3.5 degrees, a note shall be included referring to appropriate aircraft and flight crew qualification requirements for such a procedure. 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.

Note.— See Procedures for Air Navigation Services — ICAO Aircraft Operations (PANS-OPS, Doc 8168), Volume II, about additional requirements when glide path angles/elevations exceed 3.5 degrees.

13.10.8.7 Final approach descent angle shall be shown to the nearest one tenth of a degree for instrument procedures with vertical guidance.

13.10.8.8 If the final approach descent gradient/angle for any type of instrument approach procedure exceeds the maximum value specified in the procedure for air navigation services aircraft operations (PANS-OPS, Doc 8168) Volume II, Part I, Section 4, Chapter 5, a cautionary note shall be included.

13.10.9 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), Volume II, Part III, Section 5, Chapter 2, 2.3 for RNAV procedures and Volume II, Part I, Section 4, Chapter 9, 9.4.1.4 for non-RNAV procedures, on the verso of the chart or as a separate, properly referenced sheet.

Note.— Appropriate data are those provided by the procedures specialist.

CHAPTER – 14

VISUAL APPROACH CHART – ICAO

14.1 Function

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.

14.2 Availability

The Visual Approach Chart — ICAO shall be made available in the manner as prescribed for all aerodromes used by international civil aviation where:

- 1) only limited navigation facilities are available; or
- 2) radio communication facilities are not available; or
- 3) no adequate aeronautical charts of the aerodrome and its surroundings at 1:500 000 or greater scale are available; or
- 4) visual approach procedures have been established.

14.3 Scale

14.3.1 The scale shall be sufficiently large to permit depiction of significant features and indication of the aerodrome layout.

14.3.2 The scale should not be smaller than 1:500 000.

Note.— A scale of 1:250 000 or 1:200 000 is preferred.

14.3.3 When an Instrument Approach Chart is available for a given aerodrome, the Visual Approach Chart shall be drawn to the same scale.

14.4 Format

The sheet size should be 210 × 148 mm (8.27 × 5.82 in).

Note. — It would be advantageous to print the charts in several colours, selected to provide maximum legibility in varying degrees and kinds of light.

14.5 Projection

14.5.1 A conformal projection on which a straight line approximates a great circle shall be used.

14.5.2 Graduation marks shall be placed at consistent intervals along the neat lines.

14.6 Identification

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

14.7 Culture and topography

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

14.7.1.1 Geographical place names should be included only when they are required to avoid confusion or ambiguity.

14.7.2 Shore lines, lakes, rivers and streams shall be shown.

14.7.3 Relief shall be shown in a manner best suited to the particular elevation and obstacle characteristics of the area covered by the chart.

14.7.4 When shown, spot elevations should be carefully selected.

Note. — The value of certain spot elevations/heights in relation to both mean sea level and aerodrome elevation may be given.

14.7.5 The figures relating to different reference levels shall be clearly differentiated in their presentation.

14.8 Magnetic variation

The magnetic variation shall be shown.

14.9 Bearings, tracks and radials

14.9.1 Bearings, tracks and radials shall normally be magnetic.

14.9.2 Intentionally left blank.

14.9.3 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.

14.10 Aeronautical data

14.10.1 Aerodromes

14.10.1.1 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 neighboring aerodromes this shall be indicated. Abandoned aerodromes shall be identified as abandoned.

14.10.1.2 The aerodrome elevation shall be shown in a prominent position on the chart.

14.10.2 Obstacles

14.10.2.1 Obstacles shall be shown and identified.

14.10.2.2 The elevation of the top of obstacles shall be shown to the nearest (next higher) meter or foot.

14.10.2.3 The heights of obstacles above the aerodrome elevation shall be shown.

14.10.2.3.1 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.

14.10.3 Prohibited, restricted and danger areas.

Prohibited areas, restricted areas, and danger areas shall be depicted with their identification and vertical limits.

14.10.4 Designated airspace

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

14.10.5 Visual approach information

14.10.5.1 Visual approach procedures shall be shown where applicable.

14.10.5.2 Visual aids for navigation shall be shown as appropriate.

14.10.5.3 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.

14.10.6 Supplementary information

14.10.6.1 Radio navigation aids together with their frequencies and identifications shall be shown as appropriate.

14.10.6.2 Radio communication facilities with their frequencies shall be shown as appropriate.

CHAPTER – 15

AERODROME/HELIPORT CHART – ICAO.

15.1 Function:

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

- a) from the aircraft stand to the runway; and
- b) from the runway to the aircraft stand; and helicopter movement:
 - a) from the helicopter stand to the touchdown and lift-off area and to the final approach and take-off area;
 - b) from the final approach and take-off area to the touchdown and lift-off area and to the helicopter stand;
- c) along helicopter ground and air taxiways; and
- d) along air transit routes; it shall also provide essential operational information at the aerodrome/heliport.

15.2 Availability

15.2.1 The Aerodrome/Heliport Chart — ICAO shall be made available in the manner as prescribed for all aerodromes/heliports used for schedule operation.

15.2.2 Intentionally left blank.

15.3 Coverage and scale

15.3.1 The coverage and scale shall be sufficiently large to show clearly all the elements listed in 15.6.1.

15.3.2 A linear scale shall be shown.

15.4 Identification

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.

15.5 Magnetic variation

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

15.6 Aerodrome/heliport data

15.6.1 This chart shall show:

- a) geographical coordinates in degrees, minutes and seconds for the aerodrome/heliport reference point;
- b) elevations, to the nearest meter 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;
- c) elevations and geoid undulations, to the nearest half meter 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;
- d) all runways including those under construction with designation number, length and width to the nearest meter, bearing strength, displaced thresholds, stopways, clearways, runway directions to the nearest degree magnetic, type of surface and runway markings;
Note.— Bearing strengths may be shown in tabular form on the face or verso of the chart.
- e) 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;
Note.— Bearing strengths or aircraft type restrictions may be shown in tabular form on the face or verso of the chart.
- f) 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);

g) 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.

h) 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.

i) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for appropriate taxiway centre line points and aircraft stands;

j) where established, standard routes for taxiing aircraft with their designators;

k) the boundaries of the air traffic control service;

l) position of runway visual range (RVR) observation sites;

m) approach and runway lighting;

n) 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;

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

p) obstacles to taxiing;

q) aircraft servicing areas and buildings of operational significance;

r) VOR checkpoint and radio frequency of the aid concerned;

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

15.6.2 In addition to the items in 15.6.1 relating to heliports, the chart shall show:

a) heliport type;

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

b) touchdown and lift-off area including dimensions to the nearest meter, slope, type of surface and bearing strength in tones;

c) final approach and take-off area including type, true bearing to the nearest degree, designation number (where appropriate), length and width to the nearest meter, slope and type of surface;

d) safety area including length, width and type of surface;

e) helicopter clearway including length and ground profile;

f) obstacles including type and elevation of the top of the obstacles to the nearest (next higher) meter or foot;

g) visual aids for approach procedures, marking and lighting of final approach and take-off area, and of touchdown and lift-off area;

h) declared distances to the nearest meter for heliports, where relevant, including:

1) take-off distance available;

2) rejected take-off distance available;

3) landing distance available.

CHAPTER – 16

AERODROME GROUND MOVEMENT CHART – ICAO

16.1 Function

This supplementary chart shall provide flight crews with detailed information to facilitate the ground movement of aircraft to and from the aircraft stands and the parking/docking of aircraft.

16.2 Availability

The Aerodrome Ground Movement Chart — ICAO should be made available in the manner as prescribed where, due to congestion of information, details necessary for the ground movement of aircraft along the taxiways to and from the aircraft stands cannot be shown with sufficient clarity on the Aerodrome/Heliport Chart — ICAO.

16.3 Coverage and scale

16.3.1 The coverage and scale shall be sufficiently large to show clearly all the elements listed in 16.6.

16.3.2 A linear scale should be shown.

16.4 Identification

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.

16.5 Magnetic variation

16.5.1 A True North arrow shall be shown.

16.5.2 Magnetic variation to the nearest degree and its annual change shall be shown.

Note.— This chart need not be True North orientated.

16.6 Aerodrome data

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

- a) apron elevation to the nearest meter or foot;
- b) 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;
- c) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for aircraft stands;
- d) taxiways with designations, width to the nearest meter, bearing strength or aircraft type restrictions where applicable, lighting, markings, including runway holding positions and stop bars and other visual guidance and control aids;
- e) where established, standard routes for taxiing aircraft, with their designators;
- f) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for appropriate taxiway centre line points;
- g) the boundaries of the air traffic control service;
- h) relevant radio communication facilities listed with their frequencies;
- i) obstacles to taxiing;
- j) aircraft servicing areas and buildings of operational significance;
- k) VOR checkpoint and radio frequency of the aid concerned;
- l) any part of the depicted movement area permanently unsuitable for aircraft, clearly identified as such.

CHAPTER – 17

AIRCRAFT PARKING/DOCKING CHART – ICAO.

17.1 Function

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.

17.2 Availability

The Aircraft Parking/ Docking Chart — ICAO shall be made available in the manner as prescribed where, due to the complexity of the terminal facilities, the information cannot be shown with sufficient clarity on the Aerodrome/Heliport Chart — ICAO or on the Aerodrome Ground Movement Chart — ICAO.

17.3 Coverage and scale

17.3.1 The coverage and scale shall be sufficiently large to show clearly all the elements listed in 17.6.

17.3.2 A linear scale should be shown.

17.4 Identification

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.

17.5 Magnetic variation

17.5.1 A True North arrow shall be shown.

17.5.2 Magnetic variation to the nearest degree and its annual change shall be shown.

Note. — This chart need not be True North orientated.

17.6 Aerodrome data

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:

- a) apron elevation to the nearest meter or foot;
- b) 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;
- c) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for aircraft stands;
- d) taxiway entries with designations, including runway holding positions and, where established, intermediate holding positions, and stop bars;
- e) 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 version of the chart.
- f) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for appropriate taxiway centre line points;
- g) the boundaries of the air traffic control service;
- h) relevant communication facilities listed with their channels and, if applicable, logon address;
- i) obstacles to taxiing;
- j) aircraft servicing areas and buildings of operational significance;
- k) VOR checkpoint and radio frequency of the aid concerned;
- l) any part of the depicted movement area permanently unsuitable for aircraft, clearly identified such apron elevation to the nearest meter or foot.

CHAPTER- 18

WORLD AERONAUTICAL CHART – ICAO 1:1 000 000.

18.1 Function

This chart shall provide information to satisfy the requirements of visual air navigation.

Note.— This chart may also serve:

- 1) as a basic aeronautical chart:
 - a) when highly specialized charts lacking visual information do not provide essential data;
 - b) to provide complete world coverage at a constant scale with a uniform presentation of planimetric data;
 - c) in the production of other charts required by international civil aviation;
- 2) as a pre-flight planning chart.

18.2 Availability

18.2.1 The World Aeronautical Chart — ICAO 1:1 000 000 shall be made available in the manner as prescribed for all areas delineated in Appendix 5.

Note.— When operational or chart production considerations indicate that operational requirements can be effectively satisfied by Aeronautical Charts— ICAO 1:500 000 or Aeronautical Navigation Charts — ICAO Small Scale, either of these charts may be made available instead of the basic 1:1 000 000 chart.

18.2.2 To ensure complete coverage of all land areas and adequate continuity in any one coordinated series, the selection of a scale of other than 1:1 000 000 should be determined by regional agreement.

18.3 Scales

18.3.1 Linear scales for kilometers and nautical miles arranged in the following order:

— kilometers,

— nautical miles,

with their zero points in the same vertical line shall be shown in the margin.

18.3.1.1 The length of the linear scales shall represent at least 200 km (110 NM).

18.3.2 A conversion scale (meters/feet) shall be shown in the margin.

18.4 Format

18.4.1 The title and marginal notes shall be in English.

18.4.2 The information regarding the number of the adjoining sheets and the unit of measurement to express elevations shall be so located as to be clearly visible when the sheet is folded.

18.4.3 The method of folding shall be as follows: Fold the chart on the long axis, near the mid-parallel of latitude, face out; with the bottom half of the chart face upward, fold inwards near the meridian, and fold both halves backward in accordion folds.

18.4.4 Whenever practicable, the sheet lines shall conform with those shown in the index in Appendix 5.

Note 1.— The area covered by a sheet may vary from the lines shown to satisfy particular requirements.

Note 2.— The value of adopting identical sheet lines for ICAO 1:1 000 000 Charts and the corresponding sheet of the International Map of the World (IMW), provided aeronautical requirements are not compromised, is recognized.

18.4.5 The sheet lines used shall be notified to ICAO for publication in the ICAO Aeronautical Chart Catalogue (Doc 7101).

18.4.6 Overlaps shall be provided by extending the chart area on the top and right side beyond the area given on the index. This overlap area shall contain all aeronautical, topographical, hydrographical and cultural information. The overlap shall extend up to 28 km (15 NM) if possible but in any case from the limiting parallels and meridians of each chart to the neat line.

18.5 Projection

18.5.1 The projections shall be as follows:

- 1) between the Equator and 80° latitude: the Lambert conformal conic projection, in separate bands for each tier of charts. The standard parallels for each 4° band shall be 40' south of the northern parallel and 40' north of the southern parallel;
- 2) between 80° and 90° latitude: the Polar stereographic projection with scale matching that of the Lambert conformal conic projection at latitude 80°, except that in the northern hemisphere the Lambert conformal conic projection may be used between 80° and 84° latitude and the Polar stereographic projection between 84° and 90° with the scales matching at 84° North.

18.5.2 Graticules and graduations shall be shown as follows:

1) Parallels:

Latitude	Distance between parallels	Graduations on parallels
0° to 72°	30'	1'
72° to 84°	30'	5'
84° to 89°	30'	1°
89° to 90°	30'	5°

Latitude	Interval between meridians	Graduations on meridians
0° to 52°	30'	1'
52° to 72°	30'	1'
		(Only on even numbered meridians)
72° to 84°	1°	1'
84° to 89°	5°	1'
89° to 90°	15°	1'
		(Only on every fourth meridian)

18.5.3 The graduation marks at 1' and 5' intervals shall extend away from the Greenwich Meridian and from the Equator. Each 10' interval shall be shown by a mark on both sides of the graticule line.

18.5.3.1 The length of the graduation marks shall be approximately 1.3 mm (0.05 in) for the 1' intervals, and 2 mm (0.08 in) for the 5' intervals and 2 mm (0.08 in) extending on both sides of the graticule line for the 10' intervals.

18.5.4 All meridians and parallels shall be numbered in the borders of the charts. In addition, each parallel shall be numbered within the body of the chart in such a manner that the parallel can be readily identified when the chart is folded.

Note.— Meridians may be numbered within the body of the chart.

18.5.5 The name and basic parameters of the projection shall be indicated in the margin.

18.6 Identification

Sheet numbering shall be in conformity with the index in Appendix 5.

Note.— The corresponding International Map of the World (IMW) sheet number may also be shown.

18.7 Culture and topography

18.7.1 Built-up areas

18.7.1.1 Cities, towns and villages shall be selected and shown according to their relative importance to visual air navigation.

18.7.1.2 Cities and towns of sufficient size shall be indicated by the outline of their built up areas and not of their established city limits.

18.7.2 Railroads

18.7.2.1 All railroads having landmark value shall be shown.

Note 1.— In congested areas, some railroads may be omitted in the interest of legibility.

Note 2.— Railroads may be named where space permits.

18.7.2.2 Important tunnels shall be shown.

Note.— A descriptive note may be added.

18.7.3 Highways and roads

18.7.3.1 Road systems shall be shown in sufficient detail to indicate significant patterns from the air.

18.7.3.2 Roads shall not be shown in built-up areas unless they can be distinguished from the air as definite landmarks.

Note.— The numbers or names of important highways may be shown.

18.7.4 Landmarks Natural and cultural landmarks, such as bridges, prominent transmission lines, permanent cable car installations, mine structures, forts, ruins, levees, pipelines, and rocks, bluffs, cliffs, sand dunes, isolated lighthouses, lightships, etc., when considered to be of importance for visual air navigation, shall be shown.

Note.— Descriptive notes may be added.

18.7.5 Political boundaries

International boundaries shall be shown. Un-demarcated and un-defined boundaries shall be distinguished by descriptive notes.

18.7.6 Hydrography

18.7.6.1 All water features compatible with the scale of the chart comprising shore lines, lakes, rivers and streams (including those non-perennial in nature), salt lakes, glaciers and ice caps shall be shown.

18.7.6.2 The tint covering large open water areas shall be kept very light.

Note.— A narrow band of darker tone may be used along the shore line to emphasize this feature.

18.7.6.3 Reefs and shoals including rocky ledges, tidal flats, isolated rocks, sand, gravel, stone and all similar areas shall be shown by symbols when of significant landmark value.

Note.— Groups of rocks may be shown by a few representative rock symbols within the area.

18.7.7 Contours

18.7.7.1 Contours shall be shown. The selection of intervals shall be governed by the requirement to depict clearly the relief features required in air navigation.

18.7.7.2 The values of the contours used shall be shown.

18.7.8 Hypsometric tints

18.7.8.1 When hypsometric tints are used the range of elevations for the tints shall be shown.

18.7.8.2 The scale of the hypsometric tints used on the chart shall be shown in the margin.

18.7.9 Spot elevations

18.7.9.1 Spot elevations shall be shown at selected critical points. The elevations selected shall always be the highest in the immediate vicinity and shall generally indicate the top of a peak, ridge, etc. Elevations in valleys and at lake surface levels which are of special value to the aviator shall be shown. The position of each selected elevation shall be indicated by a dot.

18.7.9.2 The elevation (in meters or feet) of the highest point on the chart and its geographical position to the nearest five minutes shall be indicated in the margin.

18.7.9.3 The spot elevation of the highest point in any sheet shall be cleared of hypsometric tinting.

18.7.10 Incomplete or unreliable relief

18.7.10.1 Areas that have not been surveyed for contour information shall be 18.7.10.2 Charts on which spot elevations are generally unreliable shall bear a warning note prominently displayed on the face of the chart in the colour used for aeronautical information, as follows: "Warning — The reliability of relief information on this chart is doubtful and elevations should be used with caution."

18.7.11 Escarpments

Escarpments shall be shown when they are prominent landmarks or when cultural detail is very sparse.

18.7.12 Wooded areas

18.7.12.1 Wooded areas shall be shown.

Note.— On high latitude charts, the approximate extreme northern or southern limits of tree growth may be shown.

18.7.12.2 Where shown, the approximate extreme northern or southern limits of tree growth shall be indicated by a dashed black line and shall be appropriately labeled.

18.7.13 Date of topographic information The date of latest information shown on the topographic base shall be indicated in the margin.

18.8 Magnetic variation

18.8.1 Isogonic lines shall be shown.

18.8.2 The date of the isogonic information shall be indicated in the margin.

18.9 Aeronautical data

18.9.1 Aeronautical data shown shall be kept to a minimum consistent with the use of the chart for visual navigation and the revision cycle.

18.9.2 Aerodromes

18.9.2.1 Land and water aerodromes and heliports shall be shown with their names, to the extent that they do not produce undesirable congestion on the chart, priority being given to those of greatest aeronautical significance.

18.9.2.2 The aerodrome elevation, the lighting available, the type of runway surface and the length of the longest runway or channel, shown in abbreviated form for each aerodrome in conformity with the example given in Appendix 2, provided they do not cause undesirable clutter on the chart, shall be indicated.

18.9.2.3 Abandoned aerodromes which are still recognizable as aerodromes from the air shall be shown and identified as abandoned.

18.9.3 Obstacles

18.9.3.1 Obstacles shall be shown.

Note.— Objects of a height of 100 m (300 ft) or more above ground are normally regarded as obstacles.

18.9.3.2 When considered of importance to visual flight, prominent transmission lines and permanent cable car installations, which are obstacles, shall be shown.

18.9.4 Prohibited, restricted and danger areas Prohibited, restricted and danger areas shall be shown.

18.9.5 Air traffic services system

18.9.5.1 Significant elements of the air traffic services system including, where practicable, control zones, aerodrome traffic zones, control areas, flight information regions and other airspaces in which VFR flights operate shall be shown together with the appropriate class of airspace.

18.9.5.2 Where appropriate, the air defence identification zone (ADIZ) shall be shown and properly identified.

Note.— ADIZ procedures may be described in the chart legend.

18.9.6 Radio navigation aids Radio navigation aids shall be shown by the appropriate symbol and named, but excluding their frequencies, coded designators, times of operation and other characteristics unless any or all of this information which is shown is kept up to date by means of new editions of the chart.

18.9.7 Supplementary information

18.9.7.1 Aeronautical ground lights together with their characteristics or their identifications or both shall be shown.

18.9.7.2 Marine lights on outer prominent coastal or isolated features of not less than 28 km (15NM) visibility range shall be shown:

- 1) where they are not less distinguishable than more powerful marine lights in the vicinity;
- 2) where they are readily distinguishable from other marine or other types of lights in the vicinity of built-up coastal areas;
- 3) where they are the only lights of significance available.

CHAPTER 19

AERONAUTICAL CHART – ICAO 1:500 000

19.1 Function

This chart shall provide information to satisfy the requirements of visual air navigation for low speed, short- or medium-range operations at low and intermediate altitudes.

Note 1.— This chart may be used:

- a) to serve as a basic aeronautical chart;
- b) to provide a suitable medium for basic pilot and navigation training;
- c) to supplement highly specialized charts which do not provide essential visual information;
- d) in pre-flight planning.

Note 2.— It is intended that these charts be provided for land areas where charts of this scale are required for civil air operations employing visual air navigation independently or in support of other forms of air navigation.

19.2 Availability

The Aeronautical Chart — ICAO 1:500 000 shall be made available in the manner as prescribed for all areas delineated in Appendix 5.

19.3 Scales

19.3.1 Linear scales for kilometers and nautical miles arranged in the following order:

- kilometers,
- nautical miles,

with their zero points in the same vertical line shall be shown in the margin.

19.3.1.1 The length of the linear scale shall be not less than 200 mm (8 in).

19.3.2 A conversion scale (meters/feet) shall be shown in the margin.

19.4 Format

19.4.1 The title and marginal notes shall be in English.

19.4.2 The information regarding the number of the adjoining sheets and the unit of measurement used to express elevation shall be so located as to be clearly visible when the sheet is folded.

19.4.3 The method of folding shall be as follows:

Fold the chart on the long axis near the mid-parallel of latitude, face out, with the bottom part of the chart face upward. Fold inwards near the meridian and fold both halves backward in accordion folds.

19.4.4 Whenever practicable, sheets shall be quarter sheets of the World Aeronautical Chart — ICAO 1:1 000 000. An appropriate index to adjacent sheets, showing the relationship between the two chart series should be included on the face of the chart or on the reverse side.

Note.— Sheet lines may be varied to satisfy particular requirements.

19.4.5 Overlaps shall be provided by extending the chart area on the top and right side beyond the area given on the index. This overlap area shall contain all aeronautical, topographical, hydrographical and cultural information. The overlap shall extend up to 15 km (8 NM), if possible, but in any case from the limiting parallels and meridians of each chart to the neat line.

19.5 Projection

19.5.1 A conformal (orthomorphic) projection shall be used.

19.5.2 The projection of the World Aeronautical Chart — ICAO 1:1 000 000 shall be used.

19.5.3 Parallels shall be shown at intervals of 30'.

19.5.3.1 Meridians shall normally be shown at intervals of 30'.

Note.— At high latitudes this interval may be increased.

19.5.4 Graduation marks shall be shown at 1' intervals along each whole degree meridian and parallel, extending away from the Greenwich Meridian and from the Equator. Each 10' interval shall be shown by a mark on both sides of the graticule line.

19.5.4.1 The length of the graduation marks shall be approximately 1.3 mm (0.05 in) for the 1' intervals, and 2 mm (0.08 in) for the 5' intervals and 2 mm (0.08 in) extending on both sides of the graticule line for the 10' intervals.

19.5.5 All meridians and parallels shown shall be numbered in the borders of the chart.

19.5.5.1 Each meridian and parallel shall be numbered within the body of the chart whenever this data is required operationally.

19.5.6 The name and basic parameters of the projection shall be indicated in the margin.

19.6 Identification

19.6.1 Each sheet shall be identified by a name which should be that of the principal town or of a main geographical feature appearing on the sheet.

19.6.1.1 Where applicable, sheets shall also be identified by the reference number of the corresponding World Aeronautical Chart — ICAO 1:1 000 000, with the addition of one or more of the following letter suffixes indicating the quadrant or quadrants:

Letter	Chart quadrant
A	North-West
B	North-East
C	South-East
D	South-West

19.7 Culture and topography

19.7.1 Built-up areas

19.7.1.1 Cities, towns and villages shall be selected and shown according to their relative importance to visual air navigation.

19.7.1.2 Cities and towns of sufficient size shall be shown by the outline of their built-up areas and not of their established city limits.

19.7.2 Railroads

19.7.2.1 All railroads having landmark value shall be shown.

Note 1.— In congested areas, some railroads may be omitted in the interest of legibility.

Note 2.— Railroads may be named.

Note 3.— Rail stations may be shown.

19.7.2.2 Tunnels shall be shown when they serve as prominent landmarks.

Note.— A descriptive note may be added, if necessary, to accentuate this feature.

19.7.3 Highways and roads

19.7.3.1 Road systems shall be shown in sufficient detail to indicate significant patterns from the air.

19.7.3.2 Roads shall not be shown in built-up areas unless they can be distinguished from the air as definite landmarks.

Note.— The numbers or names of important highways may be shown.

19.7.4 Landmarks: Natural and cultural landmarks, such as bridges, mine structures, lookout towers, forts, ruins, levees, pipelines, prominent transmission lines, permanent cable car installations, and rocks, bluffs, cliffs, sand dunes, isolated lighthouses, lightships, etc., when considered to be of importance for visual air navigation, shall be shown.

Note.— Descriptive notes may be added.

19.7.5 Political boundaries

International boundaries shall be shown. Undemarcated or undefined boundaries shall be distinguished by descriptive notes.

19.7.6 Hydrography

19.7.6.1 All water features compatible with the scale of the chart comprising shore lines, lakes, rivers and streams (including those non-perennial in nature), salt lakes, glaciers and ice caps shall be shown.

19.7.6.2 The tint covering large open water areas shall be kept very light.

Note.— A narrow band of darker tone may be used along the shore line to emphasize this feature.

19.7.6.3 Reefs and shoals, including rocky ledges, tidal flats, isolated rocks, sand, gravel, stone and all similar areas shall be shown by symbols when of significant landmark value.

Note. — Groups of rocks may be shown by a few representative rock symbols within the area.

19.7.7 Contours

19.7.7.1 Contours shall be shown. The selection of intervals shall be governed by the requirement to depict clearly the relief features required in air navigation.

19.7.7.2 The values of the contours used shall be shown.

19.7.8 Hypsometric tints

19.7.8.1 When hypsometric tints are used, the range of elevations for the tints shall be shown.

19.7.8.2 The scale of the hypsometric tints used on the chart shall be shown in the margin.

19.7.9 Spot elevations

19.7.9.1 Spot elevations shall be shown at selected critical points. The elevation selected shall always be the highest in the immediate vicinity and shall generally indicate the top of a peak, ridge, etc. Elevations in valleys and at lake surface levels which are of navigational value shall be shown. The position of each selected elevation shall be indicated by a dot.

19.7.9.2 The elevation (in meters or feet) of the highest point on the chart and its geographical position to the nearest five minutes shall be indicated in the margin.

19.7.9.3 The spot elevation of the highest point on any sheet shall be cleared of hypsometric tinting.

19.7.10 Incomplete or unreliable relief

19.7.10.1 Areas that have not been surveyed for contour information shall be 19.7.10.2 Charts on which spot elevations are generally unreliable shall bear a warning note prominently displayed on the face of the chart in the colour used for aeronautical information, as follows: "Warning — The reliability of relief information on this chart is doubtful and elevations should be used with caution."

19.7.11 Escarpments

Escarpments shall be shown when they are prominent landmarks or when cultural detail is very sparse.

19.7.12 Wooded areas

19.7.12.1 Wooded areas shall be shown.

Note.— On high latitude charts the approximate extreme northern or southern limits of tree growth may be shown.

19.7.12.2 Where shown, the approximate northern or southern limits of tree growth shall be indicated by a dashed black line and shall be appropriately labelled.

19.7.13 Date of topographic information

The date of latest information shown on the topographic base shall be indicated in the margin.

19.8 Magnetic variation

19.8.1 Isogonic lines shall be shown.

19.8.2 The date of the isogonic information shall be indicated in the margin.

19.9 Aeronautical data

19.9.1 Aeronautical information shall be shown consistent with the use of the chart and the revision cycle.

19.9.2 Aerodromes

19.9.2.1 Land and water aerodromes and heliports shall be shown with their names, to the extent that they do not produce undesirable congestion on the chart, priority being given to those of greatest aeronautical significance.

19.9.2.2 The aerodrome elevation, the lighting available, the type of runway surface and the length of the longest runway or channel, shown in abbreviated form for each aerodrome in conformity with the example given in Appendix 2, provided they do not cause undesirable clutter on the chart, shall be indicated.

19.9.2.3 Abandoned aerodromes which are still recognizable as aerodromes from the air shall be shown and identified as abandoned.

19.9.3 Obstacles

19.9.3.1 Obstacles shall be shown.

Note.— Objects of a height of 100 m (300 ft) or more above ground are normally regarded as obstacles.

19.9.3.2 When considered of importance to visual flight, prominent transmission lines and permanent cable car installations, which are obstacles, shall be shown.

19.9.4 Prohibited, restricted and danger areas

Prohibited, restricted and danger areas shall be shown.

19.9.5 Air traffic services system

19.9.5.1 Significant elements of the air traffic services system including, where practicable, control zones, aerodrome traffic zones, control areas, flight information regions and other airspaces in which VFR flights operate shall be shown together with the appropriate class of airspace.

19.9.5.2 Where appropriate, the air defence identification zone (ADIZ) shall be shown and properly identified.

Note.— ADIZ procedures may be described in the chart legend.

19.9.6 Radio navigation aids: Radio navigation aids shall be shown by the appropriate symbol and named, but excluding their frequencies, coded designators, times of operation and other characteristics unless any or all of this information which is shown is kept up to date by means of new editions of the chart.

19.9.7 Supplementary Information

19.9.7.1 Aeronautical ground lights together with their characteristics or their identifications or both shall be shown.

19.9.7.2 Marine lights on outer prominent coastal or isolated features of not less than 28 km (15NM) visibility range shall be shown:

- 1) where they are not less distinguishable than more powerful marine lights in the vicinity;
- 2) where they are readily distinguishable from other marine or other types of lights in the vicinity of built-up coastal areas;
- 3) where they are the only lights of significance available.

CHAPTER – 20

AERONAUTICAL NAVIGATION CHART – ICAO SMALL SCALE.

20.1 Function

This chart shall:

- 1) serve as an air navigation aid for flight crews of long range aircraft at high altitudes;
- 2) provide selective checkpoints over extensive ranges for identification at high altitudes and speeds, which are required for visual confirmation of position;
- 3) provide for continuous visual reference to the ground during long range flights over areas lacking radio or other electronic navigation aids, or over areas where visual navigation is preferred or becomes necessary;
- 4) provide a general purpose chart series for long range flight planning and plotting.

20.2 Availability

The Aeronautical Navigation Chart — ICAO Small Scale shall be made available in the manner as prescribed for all areas delineated in Appendix 5.

Note.— The selection of this scale as an alternative to the World Aeronautical Chart — ICAO 1:1 000 000 is covered by 18.2.1 and 18.2.2.

20.3 Coverage and scale

20.3.1 The Aeronautical Navigation Chart — ICAO Small Scale shall provide, as a minimum, complete coverage of the major land masses of the world.

Note 1. — A sheet layout for this series is contained in the Aeronautical Chart Manual (Doc 8697).

20.3.2 The scale shall be in the range of 1:2 000 000 to 1:5 000 000.

20.3.3 The scale of the chart shall be substituted in the title for the words “Small Scale”.

20.3.4 Linear scales for kilometers and nautical miles arranged in the following order:

— kilometers,

— nautical miles,

with their zero points in the same vertical line shall be shown in the margin.

20.3.5 The length of the linear scale shall be not less than 200 mm (8 in).

20.3.6 A conversion scale (meters/feet) shall be shown in the margin.

20.4 Format

20.4.1 The title and marginal notes shall be in English.

20.4.2 The information regarding the number of the adjoining sheets and the unit of measurement to express elevations shall be so located as to be clearly visible when the sheet is folded.

20.5 Projection

20.5.1 A conformal (orthomorphic) projection shall be used.

20.5.1.1 The name and basic parameters of the projection shall be shown in the margin.

20.5.2 Parallels shall be shown at intervals of 1°.

20.5.2.1 Graduations on the parallels shall be shown at sufficiently close intervals compatible with the latitude and the scale of the chart.

20.5.3 Meridians shall be shown at intervals compatible with the latitude and the scale of the chart.

20.5.3.1 Graduations on the meridians shall be shown at intervals not exceeding 5'.

20.5.4 The graduation marks shall extend away from the Greenwich Meridian and from the Equator.
20.5.5 All meridians and parallels shown shall be numbered in the borders of the chart. In addition, when required, meridians and parallels shall be numbered within the body of the chart in such a manner that they can be readily identified when the chart is folded.

20.6 Culture and topography

20.6.1 Built-up areas

20.6.1.1 Cities, towns and villages shall be selected and shown according to their relative importance to visual air navigation.

20.6.1.2 Cities and towns of sufficient size shall be indicated by the outline of their built-up areas and not of their established city limits.

20.6.2 Railroads

20.6.2.1 All railroads having landmark value shall be shown.

Note.— In congested areas, some railroads may be omitted in the interest of legibility.

20.6.2.2 Important tunnels shall be shown.

Note.— A descriptive note may be added.

20.6.3 Highways and roads

20.6.3.1 Road systems shall be shown in sufficient detail to indicate significant patterns from the air.

20.6.3.2 Roads shall not be shown in built-up areas unless they can be distinguished from the air as definite landmarks.

20.6.4 Landmarks: Natural and cultural landmarks, such as bridges, prominent transmission lines, permanent cable car installations, mine structures, forts, ruins, levees, pipelines and rocks, bluffs, cliffs, sand dunes, isolated lighthouses, lightships, etc., when considered to be of importance for visual air navigation, shall be shown.

Note.— Descriptive notes may be added.

20.6.5 Political boundaries:

International boundaries shall be shown. Un-demarcated and un-defined boundaries shall be distinguished by descriptive notes.

20.6.6 Hydrography

20.6.6.1 All water features compatible with the scale of the chart comprising shore lines, lakes, rivers and streams (including those non-perennial in nature), salt lakes, glaciers and ice caps shall be shown.

20.6.6.2 The tint covering large open water areas shall be kept very light.

Note.— A narrow band of darker tone may be used along the shore line to emphasize this feature.

20.6.6.3 Reefs and shoals including rocky ledges, tidal flats, isolated rocks, sand, gravel, stone and all similar areas shall be shown by a symbol when of significant landmark value.

20.6.7 Contours

20.6.7.1 Contours shall be shown. The selection of intervals shall be governed by the requirement to depict clearly the relief features required in air navigation.

20.6.7.2 The values of the contours used shall be shown.

20.6.8 Hypsometric tints

20.6.8.1 When hypsometric tints are used the range of elevations for the tints shall be shown.

20.6.8.2 The scale of the hypsometric tints used on the chart shall be shown in the margin.

20.6.9 Spot elevations

20.6.9.1 Spot elevations shall be shown at selected critical points. The elevations selected shall always be the highest in the immediate vicinity, and shall generally indicate the top of a peak, ridge, etc. Elevations in valleys and at lake surface levels which are of value to visual air navigation shall be shown. The position of each selected elevation shall be indicated by a dot.

20.6.9.2 The elevation (in meters or feet) of the highest point on the chart and its geographical position to the nearest five minutes shall be indicated in the margin.

20.6.9.3 The spot elevation of the highest point in any sheet shall be cleared of hypsometric tinting.

20.6.10 Incomplete or unreliable relief

20.6.10.1 Areas that have not been surveyed for contour information shall be labeled "Relief data incomplete".

20.6.10.2 Charts on which spot elevations are generally unreliable shall bear a warning note prominently displayed on the face of the chart in the colour used for aeronautical information, as follows:

"Warning — The reliability of relief information on this chart is doubtful and elevations should be used with caution."

20.6.11 Escarpments: Escarpments shall be shown when they are prominent landmarks or when cultural detail is very sparse.

20.6.12 Wooded areas: Wooded areas of large extent shall be shown.

20.6.13 Date of topographic information: The date of latest information shown on the topographic base shall be indicated in the margin.

20.6.14 Colours

20.6.14.1 Subdued colours shall be used for the chart background to facilitate plotting.

20.6.14.2 Good colour contrast shall be ensured to emphasize features important to visual air navigation.

20.7 Magnetic variation

20.7.1 Isogonic lines shall be shown.

20.7.2 The date of isogonic information shall be indicated in the margin.

20.8 Aeronautical data

20.8.1 Aerodromes: Land and water aerodromes and heliports shall be shown with their names, to the extent that they do not produce undesirable congestion on the chart, priority being given to those of greatest aeronautical significance.

20.8.2 Obstacles : Obstacles shall be shown.

20.8.3 Prohibited, restricted and danger areas

Prohibited, restricted and danger areas shall be shown when considered to be of importance to air navigation.

20.8.4 Air traffic services system

20.8.4.1 Significant elements of the air traffic services system shall be shown when considered to be of importance to air navigation.

20.8.4.2 Where appropriate, the air defence identification zone (ADIZ) shall be shown and properly identified.

Note. — ADIZ procedures may be described in the chart legend.

20.8.5 Radio navigation aids: Radio aids to navigation may be shown by the appropriate symbol and named.

CHAPTER 21

PLOTING CHART – ICAO.

21.1 Function

This chart shall provide a means of maintaining a continuous flight record of the aircraft position by various fixing methods and dead reckoning in order to maintain an intended flight path.

21.2 Availability

This chart should be made available, in the manner as prescribed to cover major air routes over oceanic areas and sparsely settled areas.

Note. — In areas where the Enroute Chart — ICAO is provided there may be no requirement for a plotting chart.

21.3 Coverage and scale

21.3.1 Where practicable, the chart for a particular region shall cover major air routes and their terminals on a single sheet.

21.3.2 The scale shall be governed by the area to be covered.

Note. — Normally the scale will range from 1:3 000 000 to 1:7 500 000.

21.4 Format

The sheet shall be of a size that can be adapted for use on a navigator's plotting table.

21.5 Projection

21.5.1 A conformal projection on which a straight line approximates a great circle should be used.

21.5.2 Parallels and meridians shall be shown.

21.5.2.1 The intervals shall be arranged to permit accurate plotting to be carried out with a minimum of time and effort.

21.5.2.2 Graduation marks shall be shown at consistent intervals along an appropriate number of parallels and meridians. The interval selected shall, regardless of scale, minimize the amount of interpolation required for accurate plotting.

21.5.2.3 Parallels and meridians shall be numbered so that a number appears at least once every 15 cm (6 in) on the face of the chart.

21.5.2.4 If a navigational grid is shown on charts covering the higher latitudes, it shall comprise lines parallel to the Meridian or anti-Meridian of Greenwich.

21.6 Identification

Each sheet shall be identified by chart series and number.

21.7 Culture and topography

21.7.1 Generalized shore lines of all open water areas, large lakes and rivers shall be shown.

21.7.2 Spot elevations for selected features constituting a hazard to air navigation shall be shown.

21.7.3 Particularly hazardous or prominent relief features shall be emphasized.

Note. — Large cities and towns may be shown.

21.8 Magnetic variation

21.8.1 Isogonals or, in higher latitudes, isogrivs, or both, shall be shown at consistent intervals throughout the chart. The interval selected shall, regardless of scale, minimize the amount of interpolation required.

21.8.2 The date of the isogonic information shall be shown.

21.9 Aeronautical data

21.9.1 The following aeronautical data shall be shown:

- 1) aerodromes regularly used by international commercial air transport together with their names;
- 2) selected radio aids to navigation that will contribute to position-finding together with their names and identifications;
- 3) lattices of long-range electronic aids to navigation, as required;
- 4) boundaries of flight information regions, control areas and control zones necessary to the function of the chart;
- 5) designated reporting points necessary to the function of the chart;
- 6) ocean station vessels.

Note. — Other aeronautical data may be shown provided that they do not detract from the legibility of essential information.

21.9.2 Aeronautical ground lights and marine lights useful for air navigation shall be shown where other means of navigation are non-existent.

CHAPTER - 22

ELECTRONIC AERONAUTICAL CHART DISPLAY – ICAO.

22.1 Function

The Electronic Aeronautical Chart Display — ICAO, with adequate back-up arrangements and in compliance with the requirements of Rule Part VI CAR 84 for charts, shall enable flight crews to execute, in a convenient and timely manner, route planning, route monitoring and navigation by displaying required information.

22.2 Information available for display

22.2.1 The Electronic Aeronautical Chart Display — ICAO shall be capable of displaying all aeronautical, cultural and topographic information required by ANO (Aeronautical Charts) A.1

22.2.2 The Electronic Aeronautical Chart Display — ICAO should be capable of displaying all aeronautical, culture and topographic information recommended by ANO (Aeronautical Charts) A.1 Chapter 5 and Chapter 7 through 19.

Note.— The Electronic Aeronautical Chart Display — ICAO may display supplementary information, in addition to that required for the equivalent paper chart, which may be considered useful for safe navigation.

22.3 Display requirements

22.3.1 Display categories

22.3.1.1 Information available for display shall be subdivided into the following categories:

- a) basic display information, permanently retained on the display and consisting of the minimum information essential for the safe conduct of flight; and
- b) other display information, which may be removed from the display or displayed essential for the safe conduct of flight.

22.3.1.2 It shall be a simple function to add or remove other display information but shall not be possible to remove information contained in the basic display.

22.3.2 Display mode and generation of neighboring area

22.3.2.1 The Electronic Aeronautical Chart Display — ICAO shall be capable of continuously plotting the aircraft's position in a true motion mode where reset and generation of the surrounding area shall take place automatically.

22.3.2.2 It shall be possible manually to change the chart area and the position of the aircraft relative to the edge of the display.

22.3.3 Scale

It shall be possible to vary the scale at which a chart is displayed.

22.3.4 Symbols used shall conform to those specified for electronic charts in Appendix 2 — ICAO Chart Symbols except where it is desired to show items for which no ICAO chart symbol is provided. In these cases electronic chart symbols shall be chosen which:

- a) employ a minimum use of lines, arcs and area fills;
- b) do not cause confusion with any existing aeronautical chart symbol;
- c) do not impair the legibility of the display.

Note. — Additional details for each symbol may be added according to the resolution of the output media, but any enhancements may not change the basic recognizability of the symbol.

22.3.5 Display hardware

22.3.5.1 The effective size of the chart presentation shall be sufficient to display the information required by 22.2 without excessive scrolling.

22.3.5.2 The display shall have the capabilities required to accurately portray required elements of Appendix 2 — ICAO Chart Symbols.

22.3.5.3 The method of presentation shall ensure that the displayed information is clearly visible to the observer in the conditions of natural and artificial light experienced in the cockpit.

22.3.5.4 The display luminance shall be adjustable by the flight crew.

22.4 Provision and updating of data

22.4.1 The provision and updating of data for use by the display shall be in conformance with the aeronautical data quality system requirements.

22.4.2 The display shall be capable of automatically accepting authorized updates to existing data. A means of ensuring that authorized data and all relevant updates to that data have been correctly loaded into the display shall be provided.

22.4.3 The display shall be capable of accepting updates to authorized data entered manually with simple means for verification prior to final acceptance of the data. Updates entered manually shall be distinguishable on the display from authorized data and its authorized updates and shall not affect display legibility.

22.4.4 A record shall be kept of all updates, including date and time of application.

22.4.5 The display shall allow the flight crew to display updates so that the flight crew may review the contents of the updates and determine that they have been included in the system.

22.5 Performance tests, malfunction alarms and indications

22.5.1 A means shall be provided for carrying out onboard tests of major functions. In case of a failure, the test shall display information to indicate which part of the system is at fault.

22.5.2 A suitable alarm or indication of system malfunction shall be provided.

22.6 Back-up arrangements

To ensure safe navigation in case of a failure of the Electronic Aeronautical Chart Display — ICAO, the provision of adequate back-up arrangements shall include:

a) facilities enabling a safe takeover of display functions in order to ensure that a failure does not result in a critical situation; and

b) a back-up arrangement facilitating the means for safe navigation of the remaining part of the flight.

Note. — A suitable back-up system may include the carriage of paper charts.

CHAPTER – 23.

ATC SURVEILLANCE MINIMUM ALTITUDE CHART – ICAO.

23.1 Function

23.1.1 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.

23.1.2 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.

23.2 Availability

The ATC Surveillance Minimum Altitude Chart — ICAO should be made available, in the manner as prescribed where vectoring procedures are established and minimum vectoring altitudes cannot be shown adequately on the Area Chart — ICAO, Standard Departure Chart — Instrument (SID) — ICAO or Standard Arrival Chart — Instrument (STAR) — ICAO.

23.3 Coverage and scale

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

23.3.2 The chart shall be drawn to scale.

23.3.3 The chart should be drawn to the same scale as the associated Area Chart — ICAO.

23.4 Projection

23.4.1 A conformal projection on which a straight line approximates a geodesic line should be used.

23.4.2 Graduation marks should be placed at consistent intervals along the neat lines, as appropriate.

23.5 Identification

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.

Note. — The name may be that of the city which the aerodrome serves or, when the procedures apply to more than one aerodrome, that of the air traffic services centre or the largest city or town situated in the area covered by the chart.

23.6 Culture and topography

23.6.1 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.

23.6.2 Appropriate spot elevations and obstacles shall be shown.

Note.— Appropriate spot elevations and obstacles are those provided by the procedures specialist.

23.7 Magnetic variation

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

23.8 Bearings, tracks and radials

23.8.1 Bearings, tracks and radials shall be magnetic, except as provided for in 23.8.2.

23.8.2 In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, should be used.

23.8.3 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.

23.9 Aeronautical data

23.9.1 Aerodromes

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

23.9.1.2 The elevation of the primary aerodrome to the nearest meter or foot shall be shown.

23.9.2 Prohibited, restricted and danger areas

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

23.9.3 Air traffic services system

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

- 1) relevant radio navigation aids together with their identifications;
- 2) lateral limits of relevant designated airspace;
- 3) 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.

- 4) transition altitude, where established;
 - 5) information associated with vectoring including:
 - a) minimum vectoring altitudes to the nearest higher 50 m or 100 ft, clearly identified;
 - b) 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.
- c) 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 centered on the identified aerodrome main VOR radio navigation aid or, if not available, on the aerodrome/heliport reference point;
 - d) notes concerning correction for low temperature effect, as applicable;

- 6) communications procedures including call sign(s) and channel(s) of the ATC unit(s) concerned

.23.9.3.2 A textual description of relevant communication failure procedures should be provided and should, whenever feasible, be shown on the chart or on the same page that contains the chart.

APPENDIX 1. MARGINAL NOTE LAYOUT

The unit of measurement used to express elevation	Designation or title of the chart series	
Date of aeronautical information	Name and location of producing organization	Number and name of the chart

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Overhead cable (on Aerodrome Obstacle Charts)	82	TACAN (UHF tactical air navigation aid)	106,110
Pagoda	17	Tank farms	71
Palms	147	Taxiways (on Aerodrome/Heliport Charts)	147
Parking areas (on Aerodrome/Heliport Charts)	152	Telegraph or telephone line (when a landmark)	66
Pierced steel plank or steel mesh runway (on Aerodrome/Heliport Charts)	69	Temple	83
Pipeline	153	Terminal arrival altitude —TAA	169
Point light (on Aerodrome/Heliport Charts)	160	Terrain penetrating obstacle plane (on Aerodrome Obstacle Charts)	164
Pole (on Aerodrome Obstacle Charts)	58	Tidal flnts	21
Primary road	129	Topography	1-18
Prohibited area	138	Tower (on Aerodrome Obstacle Charts)	160
Prominent transmission line	77	Town	48
Race track	109,174,175,177	Trail	60
Radio marker beacon	99,173	Transmission line (on Aerodrome Obstacle Charts)	163
Radio navigation aid —basic	99-110,173-176	Tree (on Aerodrome Obstacle Charts)	159
Radio navigation aids	51-56	Tree, coniferous	15
Railroads	54	Tree, other	16
Bridge	162	UHF tactical air navigation aid —TACAN	106,110
Railroad (on Aerodrome Obstacle Charts)	51	Uncontrolled route	114
Single track	56	Unpaved runway (on Aerodrome/Heliport Charts)	145
Station	55	Unusual land features, appropriately labelled	10
Tunnel	52	Unusual water features, appropriately labelled	46
Two or more tracks	53	VHF omnidirectional radio range —VOR	101,110
Under construction	27	Village	49
Rapids	18	Visual aids	141-143
Relief data incomplete	3	Visual flight path	119
Relief shown by hachures	121	VOR (VHF omnidirectional radio range)	101,110
Reporting point —REP (compulsory, on request)	38		
Reservoir			

Appendix 2

<i>Index</i>	<i>No.</i>	<i>Index</i>
VOR check-point (on Aerodrome/Heliport Charts)	\50	
VORIDME (collocated VOR and DME radio navigation aids)	103,110	
VOR radial	105	
VORTAC (collocated VOR and TACAN radio navigation aids)	107,110	
Wash	40	
Water hole (perennial or intennittent)	37	
Waypoint — WPT	124	
Well (perennial or intermittent)	37	

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TOPOGRAPHY

Contours		8 G-avel		12 Highest elevation on chart	17456
Approximate contours		9 levee or esker			.17456
Relief shown by hachures				13 Spot elevation	,6397 .8 ,6370
Bluff, cliff or escarpment		Unusual and features		14 Spot elevation (of doubtful accuracy)	
Lava flow		10 appropriately labeled			
Sand dunes		Active volcano		15 Coniferous trees	Q.tt_t Q.
Sand area		11 Mountain pass		16 Other trees	11: T 1: f r
				17 Palms	
		18 Areas not surveyed for contour information or relief data incomplete			

HYDROGRAPHY

19 Shallow (relief)		30 Abandoned canal Note. — Dry canal having landmark value.		38 Reservoir	
21 Tidal flats		31 Lakes (perennial)		39 Dry lake bed	
22 Coral reefs and ledges		32 lakes (non-perennial)		40 Wash	
23 large river (perennial)		33 Salt lake		41 Shoals	
24 Small river (perennial)		34 Salt pans (evaporator)		42 Glaciers and ice caps	
25 Rivers and streams (non-perennial)		Swamp		43 Danger line (2 or one fathom line)	
26 Rivers and streams (unsurveyed)		36 Rea field		44 Charted isolated rock	
21 Rapids				28 Falls	

37 Spring, well or
water hole

perennial

Intermittent

●

○

■ ■ ■ ■

46 Unusual water features
appropriately labelled



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CULTURE

AERODROMES

84	Civil	Land		66	Joint civil and military	Land		92	Sheltered anchorage	
85	Civil	Water		69	Joint civil and military	Water		93	Aerodrome for use on charts on which aerodrome classification is not required e.g. Enroute Charts	
86	Military	Land		90	Emergency aerodrome or aerodrome with no facilities					
87	Military	Water		91	Abandoned or closed aerodrome				Heliport	
								94	Note. — Aerodrome for the exclusive use of helicopters	

95 *Note. — Where required by the function of the chart, the runway pattern of the aerodrome may be shown in lieu of the aerodrome symbol, for example:*



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Appendix 2

AERODROMES (Cont.) AERODROME DATA IN ABBREVIATED FORM WHICH MAY BE IN ASSOCIATION WITH AERODROME SYMBOLS (Reference: 16.9.2.2 and 17.9.2.2)

96	Elevation of aerodrome (metres or feet) selected for use on the chart Minimum lighting: obstacles, boundary or runway lights and lighted wind indicator or landing direction on local or	Name of aerodrome LIVSGSTONE 357 L H 95	Length of longest runway in hundreds of metres or feet (whichever is selected for use on the chart) Runway hard surfaced, normally all weather
----	--	---	--

AERODROME SYMBOLS FOR APPROACH CHARTS

97	Aerodrome affecting the traffic pattern on the aerodrome on which the procedure is based	X	The aerodrome on which the procedure is based	
99	Basic radio navigation aid symbol. Not to be used with or without the data	o	Collocated VOR and TACAN radio navigation aids	3? o
100	Non-directional radio beacon	NOB o	Electronoc	PLAN VIEW
101	Distance measuring equipment	DME D	Instrument landing system	Elev. in ft FRONT COURSE BACK COURSE
102	Collocated VOR and DME radio navigation aids	VOR/DME @	Radio marker beacon	PROFILE Elect. in ft GLIDE PATH
103	Distance in kilometres (nautical miles) to DME identification or radio navigation aid	• 15 km - 'KAV'	Radio marker beacon	Elliptical Borne Shape
104	VOR radial	R00- A V	Radio marker beacon	<=> C.....)
105	UHF tactical radio navigation aid	TACAN	Radio marker beacon	
106	Compass rose			
107	To be orientated on the chart in accordance with the alignment of the station (normally Magnetic North)			
108				
109				
110				

Note.- Marked as shown by the following symbols

With the following symbols

TACAN

VO
R

O

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a
p
p
r
o
p
n
a
t
e

o
n

c
o
m
b
n
a

o
n

VOR/DME

VORTAC

Note.- All distances shown on the chart are in miles unless otherwise stated.

Note.- Guidance for the pilot on the use of the chart is given in the Aeronautical Chart Manual (Doc 8697)

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AIR TRAFFIC SERVICES

111	Flight information region	FIR		119	Visual flight path	compulsory with radio communication requirement	
112	Aerodrome traffic zone	ATZ				compulsory, without radio communication requirement	
113	Control area Airway Controlled route	CTA AWY				recommended	
114	Uncontrolled route			120	Scale-break (on ATS route)		
115	Advisory airspace	ADA		121	Reporting point	REP	
		CTR		122	Change-over point	COP	
117	Air defence identification zone	AOIZ				To be superimposed on the appropriate route symbol at right angles to the route	
118	Advisory route	ADR		123	ATSIMET reporting point	MRP	
				124	Waypoint WPT		
						Flyover WPT (also used for start point and end point or a controlled turn)	
						Fly-by WPT	
				125	Final approach fix	FAF	

Altitude flight level "window"	17 000	FL 220
"Above" altitude/flight level	10 000	10 000
"At or below" altitude/flight level	7 000	FL 70
"Mandatory" altitude/flight level	5 000	FL 50
"Recommended" procedure altitude/flight level	3 000	FL 30
"Expected" altitude	5 000	FL 50

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Appendix 2

AIRSPACE CLASSIFICATIONS

127	Airspace classifications		1	Aeronautical data in abbreviated form to be used in association with the airspace classification symbols:
				Type of airspace or Radio --- Airspace --- Vertical limits TMA DONLON 119.1 call sign frequency (MHz) classification limits C FL 245 200m AGL 119.1

AIRSPACE RESTRICTIONS

129	Restricted airspace (prohibited, restricted or danger area)		Common boundary of IWO areas	
Note.—The angle and density of hatching may be varied according to the size, shape and orientation of the area				
130	International boundary closed to passage of aircraft except through air corridor			

OBSTACLES

131	Obstacle	A	135	Exceptionally high obstacle (optional symbol)	
132	Lighted obstacle	A	136	Exceptionally high obstacle • lighted (optional symbol)	
133	Group obstacles	M	Note.—For obstacles having a height of the order of 300 m (1,000 ft) above terrain.		
134	Lighted group obstacles	M	137	Elevation of top (Italics)	
				Height above specified datum (upright type in parentheses)	

MISCELLANEOUS

138	Prominent transmission line		139	Isogonic line or isogonic		140	Ocean station vessel (normal position)	
-----	-----------------------------	--	-----	---------------------------	--	-----	--	--

VISUAL AIDS

141		Mars light	Note 1.—Mars alternating lights are red and white unless otherwise indicated. Mars lights are white unless colours are stated.					
		Note 2.—Characteristics are to be indicated as follows			Flashing Green Group Alternating Blue Fixed Electronic	Flashing Green Group Cleared Red Sector Second Unwatched White		
142	Aeronautical ground light							
143	Light ship							

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SYMBOLS FOR AERODROME/HELIPORT CHARTS

144	Hard surface runway		153	Point height	
145	Unpaved runway		154	Obstacle light	
146	Stopway		155	Landing direction indicator (lighted)	
147	Taxiways and parking areas		156	Landing direction indicator (unlighted)	
148	Helicopter alighting area on an aerodrome		157	Stop bar	
149	Aerodrome reference point		158	Runway-holding position	
150	VOR check-point				
151	Runway visual range (RVR) observation site				

SWY
 ARP
 M.O.V.
 Pattern A
 Pattern B

Note: For aerodrome charts, see Annex 14, Volume I, paragraph 5.2.10.

SYMBOLS FOR AERODROME OBSTACLE CHARTS - TYPE A, BAND C

	Plan	Profile		Plan	Profile
159	Tree or shrub		164	Terrain penetrating obstacle plane	
160	Pole, tower, spire, antenna, etc.		165	Escarpment	
161	Building or large structure		166	Stopway	
			167	Clearway	
	Transmission line or overhead cable				



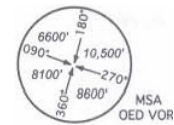
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ADDITIONAL SYMBOLS FOR USE ON PAPER AND ELECTRONIC CHARTS

PLAN VIEW

168 Minimum sector altitude
Note – This symbol may be modified to reflect particular sector shapes.

MSA



169 Terminal arrival altitude
Note – This symbol may be modified to reflect particular TAA shape

TAA



170 Holding pattern



171 Missed approach track



PROFILE

172 Runway



173 Radio navigation aid
(type of aid and its use in the procedure to be annotated on top of the symbol)



174 Radio marker beacon
(type of beacon to be annotated on top of the symbol)



175 Collocated radio navigation aid and marker beacon
(type of aid to be annotated on top of the symbol)



176 DME fix
(distance from DME and the fix use in the procedure to be annotated on top of the symbol)



177 Collocated DME fix and marker beacon
(distance from DME and the type of beacon to be annotated on top of the symbol)





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APPENDIX 3. COLOUR GUIDE

CHART SYMBOLS

Culture, except highways and roads, outlines of large cities, grids and grati- cules.
spot elevations: danger lines and off-shore rocks. names and lettering except
for aeronautical and hydrographic features

BLACK



Built-up areas of cities

BLACK
Stipple



BLACK
Half-tone



Highways and roads

Optional
colours

RED



Built-up areas for cities (alternative to black stipple)

YELLOW



Contours and topographic features: Items 1 through 10 or Appendix 2
Hydrographic features: Items 39 through 41 of Appendix 2

BROWN



Shore lines, drainage, rivers, lakes, bathymetric contours and other hydrographic features
including their names or description

BLUE



Open water areas

BLUE
Half-tone



Salt lakes and salt pans

BLUE
Stipple



Large non-perennial rivers and non-perennial lakes

BLUE
Stipple

Aeronautical data, except for Enroute and Area Charts - ICAO where different
colours may be required. Both colours may be used on the same sheet
but, where only one colour is used, dark blue is preferred

Optional
colours

MAGENTA



DARK
BLUE



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CHART SYMBOLS (Cont.)

Woods	GREEN	
	GOLDEN BUFF	
Areas which have not been surveyed for contour information or relief data are incomplete	Optional colours	

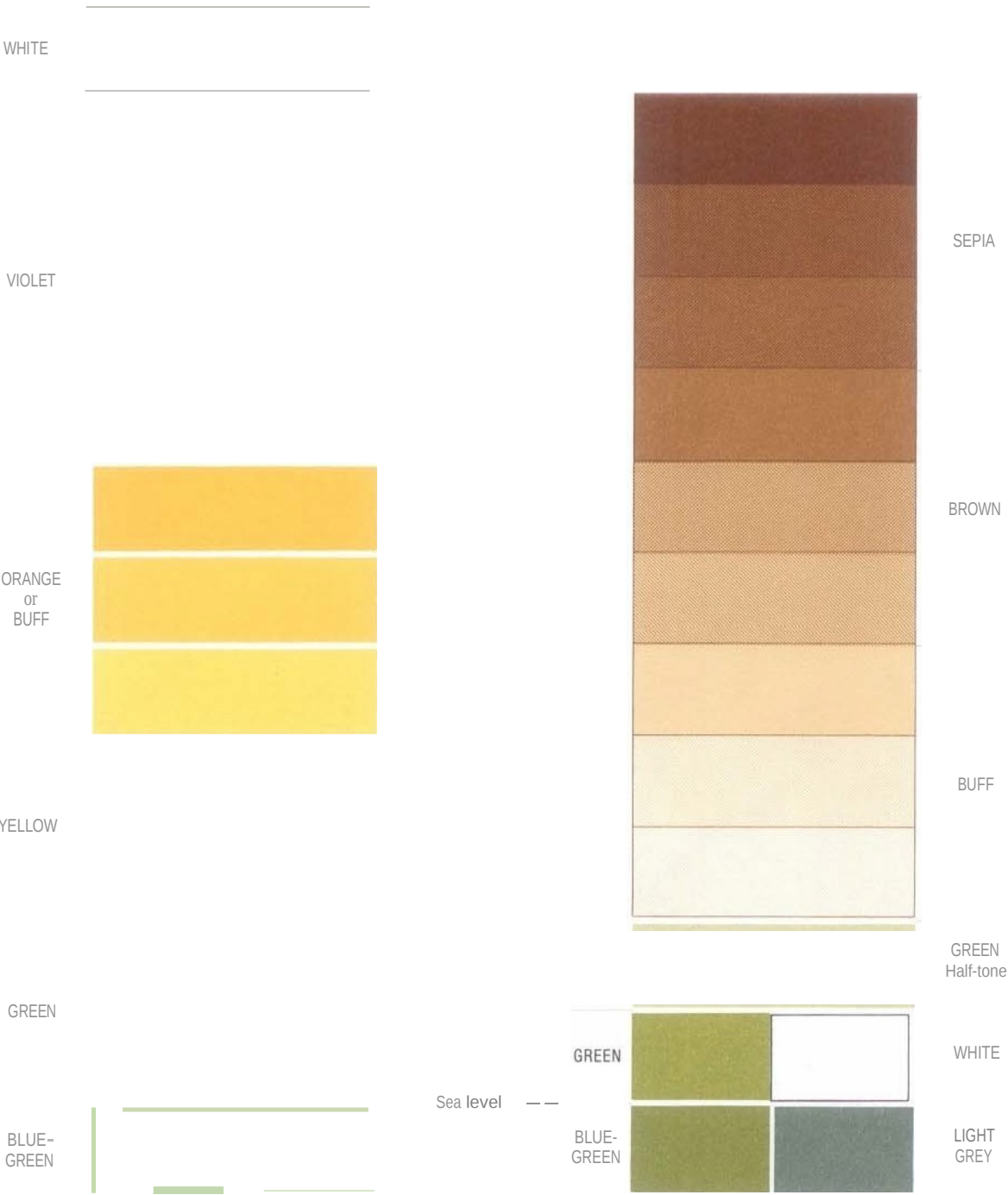
HYPSONETRIC TINTS

	WHITE				
		Tint for extreme elevations	SEPIA		
	VIOLET				
	ORANGE or BUFF	Tint for higher range elevations	BROWN		
	YELLOW	Tint for middle range elevations	BUFF		
	GREEN	Tint for lower range elevations	Optional colours	GREEN	
			WHITE		
	BLUE GREEN	Tint for areas below sea level	Optional colours	BLU GREEN	
				LIGHT GREY	

Note. — Basic tints are identical to those specified for the International Map of the World

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APPENDIX 4. HYPSONOMETRIC TINT GUIDE



Note 1.- These tints are identical to those specified for the International Map of the World

Note 2.- Elevations have not been associated with tints of either system in order to allow for flexibility in their selection.

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APPENDIX 6. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table 1. Latitude and longitude

Latitude and longitude	Chan resolution	Integrity Classification
Flight information region boundary points.....	as plotted	1×10^8 routine
P, R, D area boundary points (outside CTA/CTZ boundaries)	as plotted	1×10^3 routine
P, R, D area boundary points (inside CTA/CTZ boundaries)	as plotted	1×10^6 essential
CTA/CTZ boundary points	as plotted	1×10^5 essential
En-route navaids and fixes, holding, STAR/SID points	1 sec	1×10^5 essential
Obstacles in Area 1 (the entire State territory)	as plotted	1×10^3 routine
Aerodrome/heliport reference point	1 sec	1×10^8 routine
Navaids located at the aerodrome/heliport	as plotted	1×10^5 essential
Obstacles in Area 3.....	1/10 sec	1×10^5 essential
Obstacles in Area 2.....	1/10 sec	1×10^6 essential
Final approach fixes/points and other essential fixes/points comprising the instrument approach procedure	1 sec	1×10^5 essential
Runway thresholds	1 sec	1×10^8 critical
Taxiway centre line/parking guidance line points	1/100 sec	1×10^5 essential
Runway end (flight path alignment point)	1 sec	1×10^8 critical
Runway holding position	1 sec	1×10^8 critical
Taxiway intersection marking line	1 sec	1×10^6 essential
Exit guidance line	1 sec	1×10^6 essential
Apron boundaries (polygon).....	1 sec	1×10^8 routine
De-/anti-icing facility (polygon)	1 sec	1×10^8 routine
Aircraft standpoints/INS checkpoints	1/100 sec	1×10^3 routine
Geometric centre of TLOF or FATO thresholds, heliports	1 sec	1×10^8 critical

Note.-See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Table 2. Elevation/altitude/height

Elevation/altitude/height	Chart resolution	Integrity Classification
Aerodrome/heliport elevation	1 m or 1 ft	1×10^{-5} essential
WGS-84 geoid undulation at aerodrome/heliport elevation position	1 m or 1 ft	1×10^{-5} essential
Runway or FATO threshold, non-precision approaches.....	1 m or 1 ft	1×10^{-5} essential
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, non-precision approaches	1 m or 1 ft	1×10^{-5} essential
Runway or FATO threshold, precision approaches	0.5 m or 1 ft	1×10^{-8} critical
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, precision approaches	0.5 m or 1 ft	1×10^{-8} critical
Threshold crossing height, precision approaches.....	0.5 m or 1 ft	1×10^{-8} critical
Obstacle clearance altitude/height (OCNH)	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Obstacles in Area I (the entire State territory)	3m (10ft)	1×10^{-3} routine
Obstacles in Area 2.....	1 m or 1 ft	1×10^{-5} essential
Obstacles in Area 3.....	1 m or 1 ft	1×10^{-5} essential
Distance measuring equipment (DME)	30m (100ft)	1×10^{-5} essential
Instrument approach procedures altitude	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Minimum altitudes.....	50 m or 100ft	1×10^{-3} routine

Note.-See Annex I5, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Appendix 6

Table 3. Magnetic variation

Magnetic variation	Chart resolution	Integrity Classification
Aerodrome/heliport magnetic variation	1 degree	1×10^5 essential

Table 4. Bearing

Bearing	Chart resolution	Integrity Classification
Airway segments	1 degree	1×10^{-3} routine
En-route and terminal fix formations,	1110 degree	1×10^8 routine
Terminal arrival/departure route segments	1 degree	1×10^{-3} routine
Instrument approach procedure fix formations	1110 degree	1×10^5 essential
ILS localizer alignment	1 degree	1×10^5 essential
MLS zero azimuth alignment	1 degree	1×10^5 essential
Runway and FATO bearing	1 degree	1×10^{-3} routine

Table 5. Length/distance/dimension

Length/distance/dimension

Airway segment length En-route fix formation distance
..... Terminal arrival/departure route segment length
Terminal and instrument approach procedure fix formation distance Runway and FATO length, TLOF dimensions
..... Runway width Stopway length
and width Landing distance available
..... Take-off run available Take-off distance available
..... Accelerate-stop distance available
. ILS localizer antenna-runway end, distance ILS glide slope antenna-threshold, distance along
centre line ILS marker-threshold distance ILS DME antenna -
threshold, distance along centre line MLS azimuth antenna-runway end, distance
..... MLS elevation antenna-threshold, distance along centre line MLS DMEIP
antenna-threshold, distance along centre line

-END-

Chart	Integrity resolution	Classification
1 km or 1 NM routine	3×10^3	
2110 km (1/10 NM)	1×10^3 routine	
1 km or 1 NM essential	1×10^5	
2110 km (1/10 NM)	1×10^5 essential	
1m critical	1×10^8	
1m essential	1×10^5	
1m critical	1×10^8	
1m critical	1×10^8	
1m critical	1×10^8	
1m critical	1×10^8	
1m critical	1×10^8	
as plotted routine	1×10^3	
as plotted routine	1×10^3	
2110 km (1/10 NM)	1×10^5 essential	
as plotted essential	1×10^5	
as plotted routine	1×10^3	
as plotted routine	1×10^3	
as plotted	1×10^5	