Republic of the Philippines
Department of Transportation and Communications
CIVIL AVIATION AUTHORITY OF THE PHILIPPINES
MIA Road, Pasay City, Philippines 1300

Manual of Standards

Aeronautical Charts

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FOREWORD

The Standards and Recommended Practices (SARPs) and explanatory notes contained in CAR-ANS Part 4 – ***Aeronautical Charts*** define the obligations of Civil Aviation Authority of the Philippines (CAAP) to make available certain ICAO aeronautical chart types, and specify chart coverage, format, identification and content including standardized symbology and colour use. The goal is to satisfy the need for uniformity and consistency in the provision of a broad range of aeronautical charts that contain appropriate information of a defined quality. The aeronautical charts required by all segments of the aviation community can thus be provided in the form, quality and variety in which they best serve their function.

The purpose of this manual is to explain the obligations of Aeronautical Charts provider for providing aeronautical charts and to describe methods for their production, distribution and maintenance. It is also intended of the manual to:

a) Assist both governmental and non-governmental charting agencies in the uniform application of the SARPs contained in Annex 4;
b) Promote maximum efficiency in the organization and operation of services providing aeronautical charts; and
c) Assist Aeronautical Charts provider in the training of personnel responsible for the production of aeronautical charts.

In the development of the manual some limitation of the contents was necessary. The manual does not generally cover how information data to be charted is derived before it reaches the cartographer. The manual does, however, often indicate who or which authority should be supplying the information and provides references to associated documents. It has been assumed that the aeronautical charts provider has cartographic capacity and that it would be unnecessary to give significant consideration to basic cartographic practices and techniques. Also, techniques specific to particular cartographic software and hardware are not covered as those elements would be included in the training and documentation provided by the producers and vendors of those products. The scope of the manual is therefore generally limited to those aspects which concern the application of CAR-ANS Part 4 SARPs to aeronautical chart production and chart distribution.

The manual is published for the Aeronautical Information Services and Aeronautical Charts and is published under the authority of the Director General of CAAP. It should be read in conjunction with the latest editions of the following related ICAO documents:

1. CAR-ANS Part 4 - ***Aeronautical Charts***
2. CAR-ANS Part 15 - ***Aeronautical Information Services***
3. ICAO DOC 8697 - ***Aeronautical Charts Manual***
4. ICAO DOC 8126 - ***Aeronautical Information Services Manual***
5. ICAO DOC 8400 - ***Procedures for Air Navigation Services*** – ***ICAO Abbreviations and Codes*** **(PANS-ABC)**
6. ICAO DOC 9674 - ***World Geodetic System - 1984 (WGS-84) Manual***

Users of this manual may also wish to consult the ICAO Document 8697 *Aeronautical Chart Manual.*

This Manual may be amended from time to time, and the Director General of Civil Aviation will provide such amendment service. Comments about the content are welcome from members of the aviation industry or the public. Any comments or request for clarification should be addressed to CAAP Director General (Attention: Chief, Aerodrome and Air Navigation Safety Oversight Office (AANSOO)), Civil Aviation Authority of the Philippines, Old MIA Road corner Ninoy Aquino Avenue, Pasay City, Metro Manila, Philippines 1300.

CAPT ANTONIO G BUENDIA, JR.
Director General
Civil Aviation Authority of the Philippines

Date: 21 JUL 2016

AMENDMENTS RECORD				
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DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for aeronautical charts, 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 reference point. The designated geographical location of an aerodrome.

Aeronautical chart. A representation of a portion of the Earth, its culture and relief, specifically designated to meet the requirements of air navigation.

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 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 route for the air transiting of helicopters.

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

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

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 conditions (IMC), that provides a minimum obstacle clearance within a specified area, normally formed by parallels and meridians.

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

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

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 channelling the flow of traffic as necessary for the provision of air traffic services.

Note 1.— The term ATS route is used to mean variously, airway, 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.

ATS surveillance system. A generic term meaning variously, ADS-B, PSR, SSR or any comparable ground-based system that enables the identification of aircraft.

Note.— A comparable ground-based system is one that has been demonstrated, by comparative assessment or other methodology, to have a level of safety and performance equal to or better than monopulse SSR.

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

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 omni-directional 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 a 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 check (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 dimensions within which activities dangerous to the flight of aircraft may exist at specified times.

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.

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

Note.— Digital Terrain Model (DTM) is sometimes referred to as DEM.

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.

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 maneuver to hover or landing is completed and from which the take-off maneuver 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 are accomplished.

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

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

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

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

Geodetic 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 coincides 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.

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 ground taxi operations are completed or where the helicopter touches down and lifts off for air taxi operations.

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 maneuver which keeps an aircraft within a specified airspace while awaiting further clearance.

Hot spot. A location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.

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 approach fixes or points.

Instrument approach procedure. A series of predetermined maneuvers 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.

Isogriv. 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.

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.

Maneuvering area. That part of an aerodrome to be used for the 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.

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 300 m (1 000 ft) above all objects located in an area contained within a sector of a circle of 46 km (25 NM) radius centered on a radio aid to navigation.

Missed 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 the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron(s).

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

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

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

Note 1.— The Performance-based Navigation (PBN) Manual *(Doc 9613), Volume II, contains detailed guidance on navigation specifications.*

Note 2.— The term RNP, previously defined as "a statement of the navigation performance necessary for operation within a defined airspace", has been removed from this Annex as the concept of RNP has been overtaken by the concept of PBN. The term RNP in this Annex is now solely used in the context of navigation specifications that require performance monitoring and alerting, e.g. RNP 4 refers to the

aircraft and operating requirements, including a 4 NM lateral performance with on-board performance monitoring and alerting that are detailed in Doc 9613.

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

a) are located on an area intended for the surface movement of aircraft; or

b) extend above a defined surface intended to protect aircraft in flight; or

c) stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.

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 2 m (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 Procedures for Air Navigation Services — Aircraft Operations *(Doc 8168), Volume I, Part I, Section 4,Chapter 1, 1.5, and Volume II, Part I, Section 4, Chapter 5, 5.4, for specific applications of this definition.*

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

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

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

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 maneuver 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 (named) geographical location in relation to which the position of an aircraft can be reported.

Note.— There are three categories of reporting points: ground-based navigation aid, intersection and waypoint. In the context of this definition, intersection is a significant point expressed as radials, bearings and/or distances from ground-based navigation aids. A reporting point can be indicated as "on request" or as "compulsory".

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 conditions.

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.

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.

Note.— In radiotelephony phraseologies, the expression "holding point" is used to designate the runway-holding position.

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 center line of a runway can see the runway surface markings or the lights delineating the runway or identifying its center 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.

Note.— There are three categories of significant points: ground-based navigation aid, intersection and waypoint. In the context of this definition, intersection is a significant point expressed as radials, bearings and/or distances from ground-based navigation aids.

Stopway. A defined rectangular area on the ground at 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.

Taxi-route. A defined path established for the movement of helicopters from one part of a heliport to another. A taxi-route includes a helicopter air or ground taxiway which is centered on the taxi-route.

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 taxilane.* 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 300 m (1 000 ft) above all objects located in an arc of a circle defined by a 46 km (25 NM) radius centered 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 arc to 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 maneuvers 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 1
GENERAL

1.1 Evolution of Annex 4

1.1.1 The International Standards and Recommended Practices (SARPS) of Annex ***4*** had their inception in "Annex J - Aeronautical Maps and Charts" of the Draft Technical Annexes adopted by the International Civil Aviation Conference in Chicago in 1944. This draft material formed the basis for the work of the first Meeting of the MAP Sub-Committee of the PICA0 Air Navigation Committee in 1945.
Further development and refinement was continued by four meetings of the Aeronautical Charts Division (1945, 1947, 1948 and 19511, by combined meetings of the Aeronautical Information Services and Aeronautical Charts Division held in 1959 and 1966 and, in a limited way, by other divisional components of the Organization. A *MAP* Panel was organized in 1958 to do preparatory work for the first of these two combined meetings.

1.1.2 Standards and Recommended Practices for aeronautical charts were first adopted by the Council in 1948 and were designated as Annex *4* to the Convention on International Civil Aviation at that time. The original *SARPS* were written so as to be generally applicable to all types of charts but with the emphasis on the World Aeronautical Chart 1:l 000 000. As successive meetings were held, Standards and Recommended Practices for the specific types were prepared so that by the time the first combined divisional meeting was held, some eleven types had been designated. However, there was still no obligation to produce any of these charts.

1.1.3 On the establishment of the MAP Panel the entire situation was reviewed on the basis of developing in turn the operational requirements for charts, the functions to be satisfied, the specifications of general application, the specifications for individual types of charts with due regard to their functional inter-relationship and the obligations of States to produce charts. The Division accepted these concepts and they are reflected in the present SARPS. A more detailed account of the historical background of Annex 4, including the major elements of the various amendments to the Annex, is contained in the Foreword to the Annex.

1.1.4 On 27 February 1984 and 18 March 1985, the Council of ICAO adopted amendments (Nos. 46 and 47) t o Annex 4 which constituted major changes to the specifications of that Annex. These amendments, developed with the assistance of a Study Group, affected largely the specifications for charts to be used in the cockpit. They also introduced specifications for five new charts, i.e. Aerodrome Ground Movement Chart - ICAO; Aircraft Parking/Docking Chart - ICAO; Standard Departure Chart Instrument (SID) - ICAO; Standard Arrival Chart - Instrument (STAR) - ICAO; and Aerodrome Obstacle Chart - ICAO Type C, and deleted the specifications for the Landing Chart - ICAO.

1.2 Functional relationship of aeronautical charts

1.2.1 As indicated in 1.1.3 in the later stages of development of Annex *4*, care was taken to ensure that the specifications for each type of chart took account of the inter-relationship of charts and the need for easy transition from one chart to another in the various phases of flight operations. For example, the Enroute Chart and the Area

Chart are complementary and cover similar requirements for navigation in the en-route and terminal area phases respectively, and in the compilation of any such pair of charts, the functional inter-relationship embodied in the specifications should be fully exploited. Similarly, there is an inter-relationship between the Area Chart and the Instrument Approach Chart, the Approach Chart and the Aerodrome Chart, etc.

1.2.2 The main functions to be taken into account giving due cognizance's to this aspect of aeronautical chart design are:
1) use of a common projection;
2) selection of scales, the relative values of which should be easily comprehensible, e.g. 10 t o 1;
3) rational coverage where one chart is a larger scale portion of another;
4) selection of spot elevations/heights and other terrain information, culture and aeronautical data which will facilitate transition from one chart to another; and
5) simultaneous issue of related charts, both new charts and revisions.
These various factors have been treated in more detail in Chapter 6 – Preparation of Specific Charts.

1.3 Obligation of State to provide charts

1.3.1 Under the terms of Article 28 of the Convention on International Civil Aviation, each Contracting State has undertaken, so far as practicable, to adopt and put into operation the Standards and other operational practices and rules which might be recommended or established from time to time pursuant to the Convention. One such set of Standards and Recommended Practices is contained in Annex 4 to the Convention, which lays down specifications for the production and dissemination (including their availability) of certain types of aeronautical charts. Their purpose is to contribute to the safety, regularity and efficiency of international air navigation by specifying the types of charts to be made available, and by ensuring adequate uniformity for all charts within its scope.
Another set of Standards and Recommended Practices is contained in Annex 15 to the Convention, which deals with the collection and dissemination (including its availability) of aeronautical information for use by all types of international aircraft operations, and which is the responsibility of the aeronautical information service (AIS) established by each State (cf. 3.1 of Annex 15). The inter-relationship between these two Annexes is treated in some detail in subsequent paragraphs.

1.3.2 Annex 4 requires each Contracting State to ensure the availability of the required charts either by producing the charts itself, or by arranging for production by another Contracting State or by an agency, which should be provided with the necessary data. For any chart or single sheet of a chart series which includes the territory of two or more Contracting States, the States with jurisdiction over the territory so included are required to determine the manner in which the chart or sheet will be made available. In reaching a decision, due regard should be given to regional air navigation agreements approved by the Council of ICAO, normally on the advice of Regional Air Navigation Meetings and to any programme of allocation established by the Council of ICAO. Such agreements and allocations are normally reflected in the Air Navigation Plan publication for each ICAO Region. Annex 4 also requires each Contracting State to provide all information relating to its territory that is necessary to enable any other Contracting State to implement its chart programme.

1.3.3 The increased speed of aircraft, together with greater range in operating altitude and route stages, and the increasing congestion of air traffic impose requirements for rapid chart interpretation and some latitude for improvements in chart design to meet changing operational needs. There is a continuing need for experimentation in these directions but a balance has to be struck among uniformity in chart presentation, operational requirements, and the need to use the most efficient and economical techniques. To promote world-wide adoption of new techniques and production methods of proven value, Annex 4 recommends the exchange without charge between Contracting States of appropriate charts, since cartographic methods and techniques are major factors governing ability to meet aeronautical cartographic requirements. Also, information on new charting techniques and production methods as such should receive the widest possible dissemination.

1.3.4 The effective function of AIS pre-flight information units is partly dependent upon the availability of aeronautical charts for flight planning and plotting purposes, and these charts are in turn dependent upon the cooperative efforts of those responsible for compiling and draughting them as well as of those responsible for originating the raw information for the prescribed aeronautical overlays. All branches of endeavour involved in the production of a State's Aeronautical charts need to be aware of the functional inter-relationships involved, as well as off specifications and related requirements. Safe air navigation requires timely, up-to-date and accurate aeronautical charts that meet current aviation needs; but the availability of such charts must pre-suppose an adequate cartographic establishment, experience in aeronautical cartography, adequate basic surveys, the availability of the data required for the topographic base and aeronautical overlays, awareness of the circumstances under which the charts require to be revised and the related amendment cycles, appreciation of the nature of the demand, and familiarity with the division of responsibility with the division of responsibility for compilation and production of the charts and the machinery established for coordination of this activity. It is incumbent on each Contracting State therefore to ensure the liaison and arrangements necessary for the efficient discharge of the cooperative effort involved in the production and dissemination of aeronautical charts. This is particularly significant where the aeronautical chart programme is administered by an agency outside of the aviation administration.

1.4 National cartographic services

1.4.1 Local circumstances generally determine the administrative arrangements of States with regard to their national cartographic services. While these arrangements vary as between States depending on the existing infrastructure and the availability of suitable staff, accommodation and facilities, they commonly take, with minor variations, one of the following forms:

1) a department of surveys or national equivalent responsible for the entire governmental charting programme including aeronautical charts, in some cases with assistance from military cartographic units;

2) a department of surveys or equivalent body responsible for ministering to governmental needs for topographic maps and charts as well as small scale aeronautical charts, other aeronautical charts being the responsibility of a unit in the national civil aviation administration responsible for the aeronautical information services; or

3) a department of surveys or national equivalent responsible for the governmental charting programme with the exception of aeronautical charts, which are the responsibility of the unit within the national civil aviation administration in-charge of the aeronautical information service (AIS), the AIS in some cases having the assistance of the national cartographic service in the compilation and draughting of the topographic base for small scale visual air navigation charts, and perhaps drawing on the services of military cartographic units, or on a commercial chart-producing agency for similar charts.

1.4.2 While it is not the purpose of this manual to concern itself with charts other than aeronautical charts, it will be evident from the foregoing analysis of the general pattern of cartographic responsibility that the production of aeronautical charts is controlled in all cases where this is not the responsibility of a government Department distinct from the national civil aviation authority, by the unit responsible for administering the aeronautical information service which 3.1 of Annex 15 requires each Contracting State to provide. It is important that there should be a proper appreciation of this, so that the necessary machinery could be set in motion for organizing and co-ordinating the production of aeronautical charts in such a manner as to ensure their availability as required, their conformity with the stipulated specifications and amendment cycles, and proper liaison between the civil aviation administration and the chart-producing agency in all cases where these are not identical.

1.4.3 While the chart-producing agency, governmental or commercial, is responsible for making available accurate charts and data on request and for timely implementation of specifications and revision cycles, the aeronautical information service of each State is responsible for ensuring their availability to flight operations personnel including air crews, particularly at the aerodrome AIS units established at aerodromes normally used for international air operations (c f .3.1.3, 3.1.4, 7.1.1, 7.1.2, Annex 15). The aeronautical information services are also required to publish in their Aeronautical Information Publications a description and list of aeronautical chart series available and an indication of their intended use including details of how the charts may be obtained.

1.4.4 The Chief of the AIS/Charting Services division in the department responsible for civil aviation should be charged with the responsibility of maintaining day-to-day liaison, for solving purely local problems or developing local procedures, and for satisfying the requirements to the best possible extent with facilities and staff already available. Where the territory under control of a State for civil aviation purposes is administered through regional units it may be necessary to appoint appropriate officials in each regional unit who would operate under delegated authority of, and in accordance with instruction from, the Chief. These designated officials would also be responsible, within their department, for initiating action, through the machinery established by CAAP, on all matters affecting current policy, as well as recruitment and training already, provided for by the State. In some circumstances it may be found advantageous to form a "board" consisting of the more important providers of facilities, services and funds for the sole purposed of solving problems which require their intervention, or for identification and drafting of request affecting cartographic policy and recruitment.

1.4.5 Every possible attention should be given to the development of simplified chart distribution arrangements within CAAP:

1) by establishing a common center for the sale and distribution of all aeronautical charts and associated AIS publications;

2) by including as many charts as , practicable Aeronautical Information Publications;

3) by providing subscription service for any charts not associated with AIP; and

4) by placing the production of frequently amended charts (e.g. approach chart) on regular production schedule in keeping with the dates established by the Philippine AIS for advance distribution with a common effective date.

CHAPTER 2
REQUIREMENTS FOR AERONAUTICAL CHARTS

2.1 Establishing the need for aeronautical charts

For the safe performance of air operations, it is essential that a current, comprehensive and authoritative source of navigation data be made available at all times, and aeronautical charts provide a convenient medium for supplying this information in a manageable, condensed and coordinated manner. All segments of aviation make reference to them for air traffic control, planning and navigation purposes, and it is of prime importance to place current and accurate charts in the hands of these users quickly. The differing scales and functions of the charts in CAR-ANS Part 4 reflect this varied interest, as also do the chart design and the type of information shown on them. CAR-ANS Part 4 contains the specifications for seventeen types of aeronautical charts for which an international need for uniformity has been established. Of these charts the production/availability of six types of charts is mandatory and six non-mandatory's and of five types of charts the production is "conditional".

2.2 Six Mandatory Charts

2.2.1 The six mandatory charts are the *Aerodrome Obstacle Chart – ICAO Type A, Precision Approach Terrain Chart – ICAO, Enroute Chart – ICAO, Instrument Approach Chart – ICAO, Aerodrome/Heliport Chart – ICAO and the World Aeronautical Chart – ICAO*, 1:100 000.

2.2.2 For all aerodromes regularly used by international civil aviation, the Instrument Approach Chart where instrument approach procedure have been established by CAAP.

2.2.3 For all aerodromes regularly used by international civil aviation, the Aerodrome Chart is required, as well as the Aerodrome Obstacle Chart, Type A where significant obstacles exist in the take-off flight-path areas.

2.2.4 Further, the Enroute Chart must be made available for all areas where Flight Information Regions (FIR) have been established and the World Aeronautical Chart - ICAO 1: 1 000 000 must be produced for all areas delineated in Appendix 5 of CAR-ANS Part 4.

2.3 Non-mandatory charts

2.3.1 Six other charts, which are touched upon below, are considered "non-mandatory" charts, which mean that these should only be produced if, in the opinion of the State authority, the availability of these charts would contribute to the safety, regularity, safety and efficiency of aircraft operations.

2.3.2 The *Aerodrome Obstacle Chart - ICAO Type B* should only be produced where a need exists for a chart to assist in the determination of critical heights e.g. for circling procedures, or of procedures for use in the event of an emergency during take-off or landing, and an obstacle clearing and marking criteria. When it is necessary to produce a chart combining the specifications of the Aerodrome Obstacle Chart - ICAO Type A and Type B, the combined chart is to be called Aerodrome Obstacle Chart - ICAO (Comprehensive).

2.3.3 The *Aerodrome Ground Movement Chart - ICAO* is a supplementary chart which should be produced only where the detailed information needed for the ground movement of aircraft along taxiways to and from the aircraft stands and the parking and docking of aircraft cannot be shown with sufficient clarity on the Aerodrome

2.3.4 The *Aircraft Parking/Docking Chart - ICAO* is also a supplementary chart which should be made available only where, due to the complexity of terminal facilities, the information on the ground movement of aircraft between the taxiways and the aircraft stands and the parking/docking of aircraft cannot be shown with sufficient clarity on the *Aerodrome/Heliport Chart - ICAO* or on the Aerodrome Ground Movement Chart - ICAO.

2.3.5 The *Aeronautical Chart - ICAO* 1:500 000 and the Aeronautical Navigation Chart - Small Scale should be provided only when operational requirement for visual navigation or chart production considerations indicate a need for these charts either as a substitute for or to supplement the World Aeronautical Chart - ICAO 1:1 000 000.

2.3.6 *Plotting Chart – ICAO*. These charts are useful adjunct to where the need exists for a chart which will provide a means of maintaining a continuous flight record of the aircraft position by various fixing methods and dead-reckoning, and maintain an intended flight path. These charts would be appropriate to major air routes over oceanic areas and sparsely settled areas flown by international commercial air transport.

2.4 Conditionally required charts

2.4.1 The requirement for production of the five charts listed below is "conditional", which means that the availability of these charts is required only if certain conditions/ circumstances prevail.

2.4.2 The *Aerodrome Obstacle Chart - ICAO Type C* is not required where the obstacle data needed by the operator to develop procedures to comply with the operating limitations of Annex 6, Parts I and II, Chapter 5, are published in the AIP Philippines'.

2.4.3 The *Area Chart - ICAO* is to be made available only where the air traffic services routes or position reporting requirements are complex and cannot be adequately shown on the Enroute Chart - ICAO.

2.4.4 The *Standard Departure Chart - Instrument (SID) - ICAO* must be produced wherever a standard departure route - instrument has been established and cannot be shown with sufficient clarity on the Area Chart - ICAO.

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

2.4.6 The *Visual Approach Chart - ICAO* has to be made available for all aerodromes used by international civil aviation where only limited navigation facilities are available or radio communication facilities are not available or no adequate aeronautical charts of the aerodrome and its surroundings at 1:500 000 or greater scale are available, or where visual approach procedures have been established.

2.5 Relations with chart users

2.5.1 In the matter of aeronautical charts, design and development have their origin in the needs of the users, which also provide the impetus for the initiation of the charting programme. These users are primarily aircrew, and general aviation pilots, airline flight operations personnel, air traffic control personnel, and briefing officers in aerodrome AIS units, although other department and airline units directly involved in flight operations planning and chart production, as well as technical libraries, may have a secondary interest in the charts. Not only must the needs of these users be taken into consideration in determining priorities, design criteria and the cartographic requirement, arrangements must also be made to ensure distribution of the finished product to all those whose needs initially established the requirement for it. This cycle requires a total integration of the special operational skills and experience of those engaged in air navigation and flight planning, with the technological skills of cartographic or of AIS specialists responsible for publication of the charts. In as much as it is the operational data collected from users that, after internal analysis and co-ordination, and subject to technological limitations, ultimately makes up the finished product, the cycle is not complete until the product is in the hands of those who stimulated its creation.

2.5.2 The speed, volume and complexity of modern air navigation demand, for reasons of safety of human life and property, that accurate and up-to-date aeronautical charts be available promptly to all users. The most elaborate system of aids and procedures for air navigation would be of little value unless aircrew and those in the various aviation ground services who would assist them have the means to do so through the medium of the prescribed aeronautical charts, which are specialized tools expressly, designed to facilitate this purpose. Complete reliance on charts produced by non-State agencies is not in keeping with the obligation imposed on States by the Chicago Convention and Annex 4 thereto, which is t o assume responsibility for the production of the prescribed charts in the internationally agreed form.

CHAPTER 3
MAINTENANCE OF CHARTS

3.1 Nature of the problem

3.1.1 Consideration of the problem requires separate treatment of aeronautical information and topographical information, the former being more important because aeronautical information shown on a chart is highly susceptible to change. It is essential to safety that the information is kept up to date. The changes in some data on the chart will demand early revision, while changes in less important facilities and procedures can be held for a longer period.

The degree of urgency of chart revision varies according to:

1) The nature and function of the chart, this depending on the accuracy of the navigation required; and
2) The density of data on the chart which is subject to change and the rate of change.

For example, the Area Chart - ICAO is designed to provide data for navigation of high accuracy; it must therefore be kept up to date more strictly than a World Aeronautical Chart (WAC) - ICAO 1:1,000,000 which have much less aeronautical data and in general serves a less critical purpose. This true regardless of the particular type of chart, but there is a distinction to be made between a complex chart for an area where the degree of separation and navigation accuracy requirements are low as compared with a similar chart where they are high. In summary, there are three factors involved, i.e. the complexity of the chart, the chart accuracy of the navigation required, and the intensity of use.

3.1.2 Chart users are generally unwilling to accept hand amendments, which should be avoided as far as practicable or at least kept to a minimum as they are conducive to error. Pilots and briefing officers, particularly those handling large numbers of charts, have little time for manuscript corrections.

3.1.3 The best method of reducing the rate of obsolescence is to ensure that changes affecting the charts are kept to a minimum. Measures which may be taken to accomplish this are as follows, it being recognized that some of these matters are somewhat out of the hands of the AIS (chart producer):

1) Changeable data should be kept to the minimum required to fulfil the function of the chart. This requires, of course that the function of the chart is clearly defined. Since date on a chart starts to change from the moment of publication, if not before, every unnecessary item on the chart increases the chance of obsolescence;
2) A system of coordinating changes in facilities and procedures, and other matters over which one has control, with the schedule and new chart editions, should be established. This is particularly important around the period that the chart normally would be revised, to avoid delays and changes immediately following publication;
3) The effective date of changes in facilities, procedures, etc., should be given advance notice. The chart producer's job becomes impossible unless notice is received in time to permit appropriate action. It is also essential that such advance notification can be relied upon to take place at the specified time;
4) A facility should not be commissioned until it is reasonably certain that stability has been reached and that under normal conditions there would be no change in its status or characteristics;

5) The chart specifications should be kept simple and uncomplicated (not only those relating to aeronautical data) so that the production process can be kept to a minimum when a revision is necessary;
6) Simultaneous production of associated chart series should be arranged. When each of an associated group of charts carries a different aeronautical date the verification amendments (which may be found in NOTAM for example) becomes confusing;
7) Where practicable, bases for future aeronautical overprints should be printed in quantity to permit rapid and economical issue of new editions.

3.2 Methods.

3.2.1 There are three basic methods available to the chart producer for keeping charts up to date, namely hand amendments, overprints or new editions.

3.2.2 Hand amendments at first glance appear to offer the most effective solution, but are normally not acceptable to the user because:
1) the complexity of modern charts prevents insertion of legible amendments;
2) many corrections entail expert draughtsmanship and/or interpretation of the material;
3) there is uncertainty as to whether all relevant material has been received;
4) it places a burden on the user where as it is more economical collectively to act on the amendments at the source.

3.2.3 The issue of new editions of charts appears to offer the only effective solution, particularly in the case of the more complex charts (densely covered with aeronautical data) and this is the only method that seems to satisfy the user. Indeed, if any information as to the frequency, identifications, times of operation and other characteristics of radio aids to navigation are shown on World Aeronautical Charts - ICAO 1:l 000 000 or on Aeronautical Charts - ICAO 1:500 000, this information is required to be kept up to date by means of new editions of the chart. However, there are some disadvantages, namely:
1) greater production facilities are required;
2) there are economic drawbacks to both producer and distributing agencies;
3) it is difficult to gain co-operation of sales agencies when chart stocks are frequently rendered obsolete, unless the old stock are recalled at no loss to the agencies.

3.3 Frequency of revisions

3.3.1 A chart should be revised as frequently as is necessary to keep it up-to-date. It is difficult however, to assess the requirements for scheduling the issue of new editions of charts on an international basis because of the different conditions existing in each State. Also the criteria must rest on an analysis of the various charts or chart series available and their inter-relationship; for example, if a full complement of charts is available, the maintenance of one series such as the Enroute Chart in a completely up-to-date condition may lessen the necessity for adherence to a schedule for other less critical chart to the extent permissible under the specifications. With these reservations, the following table may be taken to indicate a close approximation of what is required:

3.4 Standard Annotations of change in aeronautical chart

The changes in the aeronautical chart are listed but not limited to the following:

Note: *In cases where there are more than one change is intended for the chart, the word CHANGE should become CHANGES and a period (.) symbol will serve as a separator for each changes. All Abbreviations and Codes should be capitalized.*

CHANGES	ENR	AD	ACFT PRKG & DCKG	AD GND MOV	OBS	AREA	SID	STAR	TRAC KING SYS	ATC MIN ALT	IAC	TFC CKT
Revision to FIR/TMA/CTR/PADIZ/ Sub ACC Boundary *(**CHANGE**: FIR BDRY COORD. TMA BDRY Re-established)*	Yes					Yes				Yes		
Revision to Adjacent FIR *(**CHANGE:** TAIPEI FIR ID)*	Yes											
Establishment/De-establishment of Radio NAVAID *(**CHANGE**: RS NDB Withdrawn.)*	Yes	Yes		Yes		Yes	Yes	Yes	Yes	Yes	Yes	
Revision to Name/ID/Coordinates/ Frequency/Channel/Elevation of Radio NAVAID *(**CHANGE**: MIA VOR FREQ.)*	Yes	Yes				Yes	Yes	Yes	Yes	Yes	Yes	
Revision to Route Designator/Distance/Direction of Flight/Altitude/Magnetic Track of ATS, RNAV and other Routes *(**CHANGE:** RTE Designators L625 and M501.)*	Yes					Yes	Yes	Yes	Yes	Yes	Yes	
Establishment/De-establishment of AWY/Track Routes *(**CHANGE:** A582 Established.)*	Yes					Yes	Yes	Yes	Yes			
Establishment/De-establishment of Prohibited/Restricted/Danger/Corridor/ Training Areas *(**CHANGE:** RP-P1 Established.)*	Yes					Yes	Yes	Yes	Yes	Yes	Yes	
Establishment/De-establishment of Designated Points *(**CHANGE:** REP PT MOROT Established.)*	Yes					Yes	Yes	Yes	Yes	Yes	Yes	
Revision to Name/Type/Coordinates of Designated Points *(**CHANGE:** FLYBY WPT ROSER.)*	Yes					Yes	Yes	Yes	Yes	Yes	Yes	
Revision to Prohibited/Restricted/Danger/Corridor/ Training Areas (**CHANGE:** *RP-P1 Vertical Limits.*)	Yes					Yes	Yes	Yes	Yes	Yes	Yes	
Revision to Radio NAVAID Label *(**CHANGE:** LIPA ID.)*	Yes	Yes				Yes	Yes	Yes	Yes	Yes	Yes	
Revision to AD Magnetic Variation *(**CHANGE:** MAG VAR.)*		Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Revision to ACC Freq *(**CHANGE:** ACC Manila East Sector FREQ.)*	Yes						Yes	Yes				
Revision to Approach Frequency *(**CHANGE:** MIA APP PRI FREQ.)*						Yes	Yes	Yes		Yes	Yes	Yes
Revision to Tower Frequency *(**CHANGE:** MIA TWR SRY FREQ .)*		Yes	Yes	Yes		Yes	Yes	Yes			Yes	Yes
Revision to SID/STAR Suffix *(**CHANGE:** SID SUFFIX.)*							Yes	Yes				
Revision to NOTE/COM FAILURE/LEGEND *(**CHANGE:** NOTE.COM.FAILURE.LEGEND)*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Revision to AD Elevation *(**CHANGE:** AD ELEV.)*		Yes								Yes	Yes	Yes
Revision to Apron Elevation *(**CHANGE:** APRON ELEV.)*			Yes	Yes								
Revision to MSA symbol. *(**CHANGE:** MSA.)*						Yes	Yes	Yes			Yes	Yes
Addition of Terrains *(**CHANGE:** Terrain Portrayal.)*	Note: Applicable to charts that will not compromise the integrity of aeronautical data or confused the data user											
Revision to Minima *(**CHANGE:** Circling Note at OCA/H Table.)*											Yes	
Revision to Profile View *(**CHANGE:** FAF.)*											Yes	
Revision to Plan View *(**CHANGE:** PROC Tracks.)*											Yes	

3.5 Issue of "advance" information (Following AIRAC Calendar)

3.5.1 There is no place on the airways for a pilot who is not up-to-date on his route information. The responsibility for the pilot-in-command of any international flight to-acquaint himself with all appropriate information is stated in Chapter 2 of CAR-ANS Part 2. The conventional practice of expecting him to absorb this information in a pre-flight information unit immediately prior to take-off is no longer adequate.

3.5.2 Changes to radio communication and navigation aids, services and procedures normally shown on aeronautical charts can be anticipated and made effective in accordance with a pre-determined schedule of "effective dates". Most of the above-mentioned changes are already subject to the "regulated system (AIRAC)" applied by Philippine AIS under the provisions of CAR-ANS Part 15, section 15.5.2. Under the AIRAC system, the changes, unless operational considerations make it impracticable,

a) must reach users at least 28 days in advance of an indicated effective date;

b) have effective dates in keeping with a pre-determined, internationally agreed schedule of effective dates on an interval of 28 days; and

c) must not be changed further for at least another 28 days after the indicated effective date, unless the circumstance notified is of a temporary nature and would not persist for the full period.

It is essential that coordination takes place between AIP and Charting Units to ensure that related aeronautical information is given advance distribution simultaneously on the documents issued by both activities, and timed to be available 28 days before the same effective date. It must be ensured that for four weeks after the effective date of such information, amendment will only be required in respect of urgent unexpected temporary changes.

3.5.2 The procedure described above should be brought to the attention of all parties responsible for originating information for aeronautical charts to ensure that the raw information will be protected while in transfer and received in time for publication on the scheduled date. These parties should be advised of the dates established, including not only the publication and effective dates, but also the number of days in advance of publication that all such information should be available to those processing the charts, Ideally, there should be an interval of 42 days between the publication date and the effective date. This allows for a period of up to 14 days' postage time in order for recipients to receive the information at least 28 days in advance of the effective date. In cases where additional notice is desirable and practicable, a publication date of 56 days (or even longer) in advance of the effective date is used. In order to ensure that charts published under AIRAC procedures include the correct effective date, it is essential that an effective date should not be notified until a high degree of certainty exists that it will be met.

CHAPTER 4
REPRODUCTION OF CHARTS

4.1 Estimating Demand

4.1.1 The interrelated factors which normally should be taken into account in estimating the potential demand for a new chart or chart series, as well as enabling the assessment of priorities and ensuring economies in production, are:

1) the past sales experience with other charts of a similar type;
2) if the chart is associated with a particular aerodrome, the relative traffic at that aerodrome;
3) the number of aircraft registered in the country;
4) the number of AIP subscribers in the country;
5) the chart procurement practices of airlines operating in the country (the operators may depend on the chart services of the country concerned, contract with a service agency or produce the charts themselves).

4.1.2 Obviously, the question of demand should be analyzed in the early planning stages to ensure that there is sufficient demand to warrant initiation of the project. This does not mean that the demand needs to be high since mandatory charts called for in CAR-ANS Part 4 will have to be produced in any event. For example, the requirement for Aerodrome Obstacle Charts - Type A may be limited to a few copies and the primary decision then becomes one method of reproduction".

4.1.3 In case of revisions, some of the factors above would not be applicable and past experience would be the major criterion.

4.1.4 In case of relatively expensive charts, such as multi-color visual navigation charts, it might be useful to estimate the demand based on the annual AIP subscribers.

4.2 Estimating production runs

4.2.1 Having estimated the demand, the actual production run will need to take into account:

1) the annual subscription system to cover all new and revised charts;
2) the probable period of validity of the chart;
3) the cost of producing various quantities beyond the minimum run necessary to serve initial requirements, considering the high cost of printing for multi-colored charts and the relative change in the aeronautical information and in the base information;
4) the extra cost involved in re-runs of a multi-color chart.

4.2.2 The Publication Section should be capable of printing the estimated initial demand and any supplementary demand for the chart during its estimated period of validity.

4.3 Reproduction

4.3.1 When the preparation of a chart is completed, it is imperative that printing instructions be clearly presented to the Publication Section for reproduction. The various items provided should be clearly identified in a reasonably permanent manner and this is particularly essential where more than one plate is involved. The following instructions should be provided:

1) number of copies required;
2) method of reproduction to be employed;
3) material on which the finished product is to be provided together with weight, thickness, tear and fold strengths, brightness and opacity of paper where relevant;
4) special instructions for drilling holes (for pages to be contained in loose leaf binders), folding or binding;
5) the target date for the finished product is required;

4.3.2 If a job is not of a standard pattern, it is good practice to obtain samples before commencing the reproduction of charts.

4.3.3 The required production date should be discussed with the Publication Section to ensure satisfactory scheduling.

4.4 Single-colored printing

4.4.1 Colors specified for use on aeronautical charts are contained in the Color Guide of CAR-ANS Appendix 2 together with the elements associated with each color, this specification are used in electronic chart that are published in PAMS of the EAD System. Single color version of the charts shall be printed in white or off-white paper.

CHAPTER 5
CHARTS DISTRIBUTION

5.1 Chart distribution

Chart distribution requires a simple system which will ensure prompt availability of the charts to AIP Subscribers. Every possible attention should be given to:

1) Including as many charts as practicable in the AIP;
2) Placing the production of frequently amended charts (e.g. Enroute Charts) on a regular production schedule in keeping with the procedure established by the Philippine AIS for advance distribution in accordance to AIRAC cycle.

5.2 Distribution with AIP

5.2.1 The Chart part of an AIP is intended as a catalogue of information on the availability of aeronautical charts and is not to be a repository for the charts themselves. The Chart part of the specimen AIP in *APPENDIX G of the Aeronautical Information Services Manual – DOC 8126* indicates the range and type of the information required to be published.

5.2.2 The following charts, especially for aerodrome listed in the AGA part of the regional plan, should, when available, form part of the AIP unless distributed through a separate subscription service to recipients of the AIP;

1) Aerodrome Chart - ICAO
2) Aerodrome Ground Movement Chart - ICAO
3) Aircraft Parking/Docking - ICAO
4) Aerodrome Obstacle Chart - ICAO Type A (Obstacle Type Limitations)
5) Precision Approach Terrain Chart – ICAO
6) Enroute Chart - ICAO
7) Instrument Approach Chart - ICAO
8) Area Chart - ICAO
9) Standard Departure Chart - Instrument (SID) - ICAO
10) Standard Arrival Chart - Instrument (STAR) – ICAO
11) Visual Approach Chart

5.3 The location of these charts should be as follows:

Aerodrome Charts (and when required, the Aerodrome Ground Movement and the Aircraft Parking/Docking Charts): in the AGA part, each chart to immediately follow the detailed description of the aerodrome to which it is related;

Aerodrome Obstacle Chart - Type A and Precision Approach Terrain Chart: to follow the relevant Aerodrome Chart;

Area Charts (and when required, the Standard Departure Chart - Instrument (SID) and the Standard Arrival Chart – Instrument (STAR)): in the RAC 4 part of the AIP in association with the description of holding, arrival, approach and departure procedures;

Instrument Approach and Visual Approach Charts: in an Appendix following the Chart part of the AIP and in that order with the charts in each series in alphabetical order by name of the city and given an appropriate page number for check list purposes.
In addition to the above, other charts in so far as possible should be included in the AIP to become a part of the regular distribution system of AIP.

5.3.1 When the sheet size of a chart is larger than AIP sheet size and the sheets are folded to this size, the chart (e.g. Enroute Chart) may be placed in a pocket or open end plastic wallet. If this would create difficulties in use or amendment, a separate volume of the AIP may be a solution.

5.4 Distribution by subscription

5.4.1 When it is not feasible to distribute charts with an AIP, a separate subscription service should be established especially for those charts which are reissued frequently, e.g. Approach Chart. This will ensure that all users of the would, for the period of the subscription, receive without delay all the charts produced without having to make arrangements for purchase of the charts each time a new edition is issued.

5.5 Reciprocal exchange

5.5.1 Annex 4, 1.3.4 recommends that appropriate charts produced by Contracting States should be made available without charge to other Contracting States on request on a reciprocal basis. In addition to providing essential aeronautical information, such an exchange serves to improve world-wide dissemination of information on new charting techniques and production methods.

5.5.2 Arrangements should be made for at least one copy of each chart (if series, a copy of one sheet in the series) to be furnished free of charge to each State receiving AIS publications. To this list may be added any other interested chart – producing State or agency willing to furnish similar charts on a reciprocal basis. The charts should be addressed to the designated aeronautical authority of the State or State-authorized chart-producing agency, as appropriate.

5.6 Out-of-date charts

5.6.1 In 2.5.2, the importance of the availability of up-to-date aeronautical charts has been emphasized. While State-controlled distribution agencies are in a good position to withdraw from sale charts that are obsolete, a problem arises with chart distribution centers or agencies designated by the State and engaged in the sale of charts for profit. The problem is magnified when foreign commercial and private users of aeronautical charts seek to obtain their requirements from advertised distribution agencies outside the control of the State in which these agencies operate. The difficulty arises mainly from the reluctance of sales agents to have unsold obsolete charts on their hands when new editions are issued. Unawareness of the charts being out-of-date could also be a factor. It is important that a State should take every practicable measure to prevent the sale of out-of-date charts. These measures should include prompt restocking of up-to-date editions of the charts concerned and advice to sale agents of the obsolescence of charts for which the State has production responsibility and of the need to withdraw immediately the obsolete charts from sale.

CHAPTER 6
PREPARATION OF SPECIFIC CHARTS

6.1 General

The AIS Chart Provider should ensure that all aeronautical charts which are produced in Philippines are in conformity with CAR-ANS Part 4, Annex 4 and ICAO Document 8697.

6.2 Availability

6.2.1 *Information.* The CAAP shall, on request by another ICAO Contracting States provide all information relating to its own territory that is necessary to enable the standards of this Civil Aviation Regulation to be met.

6.2.2 *Charts.* The CAAP and or AIS Chart Provider shall, when so specified, ensure the availability of charts in whichever of the following ways is appropriate for a particular chart or single sheet of a chart series.

6.2.2.1 For any chart or single sheet of a chart series entirely contained within the Philippine FIR, the Civil Aviation Authority of the Philippines shall either:

a) produce the chart or sheet itself; or
b) arrange for its production by another ICAO Contracting State or by an agency; or
c) provide another ICAO Contracting State prepared to accept an obligation to produce the chart or sheet with the data necessary for its production.

6.2.2.2 For any chart or single sheet of a chart series which includes the territory of two or more Contracting States, the States having jurisdiction over the territory so included shall determine the manner in which the chart or sheet will be made available. This determination shall be made with due regard being given to regional air navigation agreements and to any programme of allocation established by the Council of ICAO.
Note.— The phrase "regional air navigation agreements" refers to the agreements approved by the Council of ICAO normally on the advice of regional air navigation meetings.

6.2.3 CAAP and or AIS Chart Provider shall take all reasonable measures to ensure that the information it provides and the aeronautical charts made available are adequate and accurate and that they are maintained up to date by an adequate revision service.

6.2.4 To improve worldwide dissemination of information on new charting techniques and production methods, appropriate charts produced by Contracting States should be made available without charge to other Contracting States on request on a reciprocal basis.
Note.— Guidance material on the preparation of aeronautical charts, including sample formats, is contained in the Aeronautical Chart Manual *(Doc 8697).*

6.3 Operational Requirements for Charts

Note—the total flight is divided into the following phases:
Phase 1—Taxi from aircraft stand to take-off point
Phase 2—Take-off and climb to en route ATS route structure
Phase 3—En- route ATS route structure
Phase 4—Descent to approach
Phase 5---Approach to the Land and Missed approach
Phase 6—Landing and Taxi to aircraft Stand

6.3.1 Each type of chart shall provide information relevant to the function of the chart and its design shall provide human factor principles which facilitate its optimum use.
Note— Human Factors Principles can be found in the Human Factors Training manual {Doc 9683}.

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

6.4 Titles

6.4.1 The title of a chart or chart series prepared in accordance with the specifications contained in this Manual and or CAR-ANS Part 4 are intended to satisfy the function of the chart must be that of relevant chapter heading as modified by application of any Standard contained therein, except that such title shall not include “ICAO” unless the chart conforms with all standard specified in ICAO Annex 4, Chapter 2 and any specified for the particular chart.

6.5 Miscellaneous Information

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

a) Designation of the chart or title of chart series;
b) name and reference of the sheet;
c) on each margin, an indication of the adjoining sheet; (when applicable)

6.5.2 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.

6.5.3 The name and adequate address of the chart provider shall be shown in the margin except that, where the chart is published as part of aeronautical documents, this information may be placed in the front of that document.

6.6 Symbols

6.6.1 Symbols used shall conform to those shown in Appendix 2 – Chart Symbols in CAR-ANS Part 4, except that where it was desired to show on an aeronautical chart special features or items of importance to civil aviation for which no ICAO symbol is at present provided, any appropriate symbol may be chosen for this purpose, provided that it does not cause confusion with any existing chart symbol or impair the legibility of the chart.
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.

6.7 Units of Measurement

6.7.1 Distance shall be derived as a geodesic distances.

6.7.2 Distances shall be expressed in either kilometer or nautical miles or both, provided the units are clearly differentiated.

6.7.3 Altitudes, elevation and heights shall be expressed in either meters or feet or both, provided the unit shall be differentiated.

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

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

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

6.7.7 Conversion Scales (Kilometers/Nautical miles, meters/ feet) shall be provided on each chart on which distances, elevation, altitudes and heights are shown. The conversion of each scale shall be placed on the face of the chart.

6.8 Scale and Projection

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

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

6.9 Date of aeronautical information

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

6.10 Spelling of geographical names

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

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

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

6.11 Abbreviations

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

*Note - Abbreviations should be selected from the **ICAO Doc 8400** Procedures for Air Navigation Services —ICAO Abbreviations and Codes*

6.12 Prohibited, restricted and danger areas

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

*Note—The nationality letters are those contained in **ICAO Doc 7910** — Location Indicators.*

6.13 Air traffic services airspaces

6.13.1 When ATS airspace is shown on a chart, the class of airspace, the type, the name or call sign, the vertical limits and the radio frequency(ies) is to be used shall be indicated and the horizontal limits depicted in accordance with Appendix 2- Chart Symbols in CAR-ANS Part 4.

6.13.2 On chart used for visual flight, those parts of the ATS Airspace Classification table published in the Philippine Aeronautical Information Publication applicable to the airspace depicted on the chart, should be in the face or reverse of each chart.

6.14 Magnetic variation

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

6.14.2 When magnetic variation is shown on a chart, the values shown should 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.

6.15 Aeronautical data

6.15.1 AIS Charting or aeronautical chart producing company shall take all necessary measures to introduce a properly organized quality system containing procedures, processes and resources necessary to implement quality management at each function stage as outlined in Annex 15, 3.1.7. The execution of such management shall be made demonstrable of each function stage when required, In addition, AIS Charting or aeronautical chart producing company shall ensure that established procedures exist in order that aeronautical data at any moment are traceable to its origin so to allow any data anomalies or error, detected during the production/maintenance phases or in the operational use, be corrected.

Note—Specification governing the quality system are given in Annex 15, Chapter 3.

6.15.2 AIS Charting shall ensure that the order of chart resolution of aeronautical data shall be that as specified for a particular chart and as presented in tabular form in Tables 6-1 to 6-5.

6.15.3 AIS Charting shall ensure that the 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 of which the data item is put. Consequently, the following classification and data integrity level shall apply:

a. ***critical data***, integrity level $1x10^{-8}$: 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 $1x10^{-5}$: there is a low probability when using corrupted data that the continued safe flight and landing of an aircraft would be severely at risk with potential for catastrophe; and
c. ***routine data***, integrity level $1x10^{-3}$: there is a low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with potential for catastrophe:

6.15.4 Aeronautical data quality requirements related to the integrity and data classification shall be provided in Tables 6-1 to 6-5.

6.15.5 Protection of electronic Aeronautical data while stored or in transit shall be totally monitored by the Cyclic Redundancy Check {CRC}. To achieve protection of integrity level of critical and essential aeronautical data as classified in 6.15.3, a 32- or 24- bit CRC algorithm shall apply respectively.

6.15.6 To achieve protection of the integrity level of routine aeronautical data as classified in 10.15.3, a 16-bit algorithm should apply.
Note--- Guidance material in aeronautical data quality requirements {accuracy, resolution, integrity, protection and traceability} is contained in the World Geodetic System ---1984 {WGS-84} Manual {Doc 9674}.Supporting material in respect to the provision of Annex 4 appendix 6 related to chart resolution and integrity of aeronautical data is contain in RTCA Document DO 201A and European organization for Civil Aviation Equipment {EUROCAE} Document ED-77---Industry Requirements for Aeronautical Information.

6.16 Common reference system

6.16.1 Horizontal reference system

6.16.1.1 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.
Note--- Comprehensive guidance material concerning WGS-84 is contained in the World Geodetic System—1984 {WGS-84} Manual {Doc 9674}.

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

6.16.1.3 The order of publication resolution of geographical coordinates must be that specified in Annex 15, Appendix 1 and Table A7-1 of Appendix 7 while the order of chart resolution of geographical coordinates must be that specified in Annex 4, Appendix 6, Table 1.
Note*---Specifications governing the determination and reporting {accuracy of field work and data integrity} of WGS-84 related aeronautical coordinates for geographical positions established by Air Traffic Service are given in Annex 11, Chapter 2, Appendix 5 and Table 1: and for aerodrome/ heliport-related positions, in Annex 14, Volume I and II, Chapter 2 and in Table 1 of Appendices 5 and 1 respectively.*

6.16.2 Vertical reference system

6.16.2.1 Mean sea level {MSL} datum, which give the relationship 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. I is defined as 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.

6.16.2.2 In addition to the elevation referenced to MSL, for the specific surveyed ground position, geoid undulation {Referenced to the WGS-84 ellipsoid} for those positions shall also be published as specified for a particular chart.
Note--- Specifications governing the determination and reporting {accuracy of field work and data integrity} of elevation and geoid undulation at the specific position at aerodromes/heliports are given in Annex 14, Volumes I and II, Chapter II, and Table 2 Appendices 5 and 1 respectively.

6.16.2.3 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 of Annex 4.

6.16.3 Temporal Reference system

6.16.3.1 The Gregorian calendar and Coordinated Universal Time {UTC} shall be used as the temporal reference system.

6.16.3.2 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}.

6.17 Aeronautical Charts which shall be publish by AIS

6.17.1The AIS shall publish the following aeronautical charts which are applicable in Philippines:

(a) Aerodrome Terrain and Obstacle Chart – ICAO (electronic)
(b) Aerodrome Chart – ICAO
(c) Aerodrome Obstacle Chart – ICAO Type A
(d) Aerodrome Obstacle Chart – ICAO Type B
(e) Precision Approach Terrain Chart – ICAO
(f) Enroute Chart – ICAO
(g) Area Chart – ICAO
(h) Standard Departure Chart – Instrument (SID) – ICAO
(i) Standard Arrival Chart – Instrument (STAR) – ICAO
(j) Instrument Approach Chart – ICAO
(k) Visual Approach Chart – ICAO
(l) Aerodrome Ground Movement Chart – ICAO
(m) Aircraft Parking/Docking Chart – ICAO
(n) World Aeronautical Chart – ICAO 1:1 000 000
(o) Aeronautical Chart – ICAO 1:500 000

(p) Aeronautical Navigation Chart – ICAO (small scale)
(q) Plotting Chart – ICAO
(r) Electronic Aeronautical Chart Display – ICAO
(s) ATC Surveillance Minimum Altitude Chart – ICAO

6.17.2 The AIS shall ensure that all aeronautical charts listed in 6.17 are readily available to users, including from other ICAO Contracting States. The AIS shall take all reasonable measures to ensure that the information it provides and the aeronautical charts made available are adequate and accurate and that they are maintained up-to-date by AIS cartographic technical staff.

6.17.3 The AIS shall ensure that each type of aeronautical chart provides information relevant to the function of the chart and its design shall observe human factors principles which facilitate its optimum use.

6.17.4 The AIS shall ensure that the presentation of information in the aeronautical charts is accurate, free from distortion and clutter, unambiguous, and readable under all normal operating conditions.

6.17.5 The AIS shall ensure that aeronautical data quality requirements related to the data integrity and charting resolution are in accordance with CAR-ANS Part 4.2.17 and Tables 6-1 to 6-5 in section 6.24 of this chapter. The integrity of the data shall be maintained throughout the data process from survey/origin to the next intended user. Aeronautical data integrity requirement shall be based upon the potential risk resulting from the corruption of data and the use to which the data item is put.

6.17.6 The AIS shall ensure that electronic aeronautical data shall be protected by the inclusion in the data sets of a 32-bit cyclic redundancy check (CRC) implemented by the application dealing with the data sets.

6.17.7 Aerodrome Terrain and Obstacle Charts – ICAO (Electronic) as defined in CAR-ANS Part 4.5.

6.18 Aeronautical Data Quality Requirements

(Reference: Appendix 7 of CAR-ANS Part 4)

Table 6-1. LATITUDE AND LONGITUDE

Latitude and Longitude	***Chart resolution***	***Integrity classification***
Flight information region boundary points	as plotted	routine
P, R, D area boundary points (outside CTA/CTZ boundaries)	as plotted	routine
P, R, D area boundary points (inside CTA/CTZ boundaries)	as plotted	essential
CTA/CTZ boundary points	as plotted	essential
En-route NAVAIDS and fixes, holding, STAR/SID points	1 sec	essential
Obstacles en-route	as plotted	routine
Obstacles in Area 1 (the entire State territory)	----	
Aerodrome/heliport reference point	1 sec	routine
NAVAIDS located at the aerodrome/heliport	as plotted	essential
Obstacles in Area 3	----	essential
Obstacles in Area 2 (the part within the aerodrome boundary)	----	essential
Obstacles in the circling area and at the aerodrome	1/10 sec (AOC Type C)	essential
Significant obstacles in the approach and take-off area	1/10 sec (AOC Type C)	essential
Final approach fixes/points and other essential fixes/points comprising the instrument approach procedures	1 sec	essential
Runway threshold	1 sec	critical
Runway end (flight path alignment point)	----	critical
Runway center line points	1/100 sec	critical
Runway holding position	----	critical
Taxiway center line points/parking guidance line points	----	essential
Taxiway intersection marking line	----	essential
Exit guidance line	----	essential
Apron boundaries	----	routine
Ground taxiway center line points, air taxiways and transit routes points	1/100 sec	essential
Aircraft/helicopter standpoints /INS checkpoints	1/100 sec	routine
Geometric center of TLOF or FATO thresholds, heliports	1 sec	critical

Table 6-2. ELEVATION / ALTITUDE / HEIGHT

Elevation / Altitude / Height	***Chart resolution***	***Integrity classification***
Aerodrome/heliport elevation	1 m or 1 ft	essential
WGS-84 geoid undulation at aerodrome/heliport elevation position	1 m or 1 ft	essential
Runway or FATO threshold, non-precision approaches	1 m or 1 ft	essential
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric center, non-precision approaches	1 m or 1 ft	essential
Runway or FATO threshold, precision approaches	0.5 m or 1 ft	critical
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric center, precision approaches	0.5 m or 1 ft	critical
Obstacle Clearance Altitude/Height (OCA/H)	as specified in PANS-OPS (Doc 8168)	essential
Obstacles in Area 1 (the entire State territory)	3 m (10 ft)	routine
Obstacles in Area 2	1 m or 1 ft	essential
Obstacles in Area 3	1 m or 1 ft	essential
Distance Measuring Equipment (DME)	30 m or 100 ft	essential
Instrument approach procedures altitude	as specified in PANS-OPS (Doc 8168)	essential
Minimum altitudes	50 m or 100 ft	routine
Heliport crossing height, PinS approaches	1 m or 1 ft	essential

Table 6-3. GRADIENTS AND ANGLES

Declination and Magnetic Variation	***Chart resolution***	***Integrity classification***
Non-precision final approach descent gradient….	0.1 percent	critical
Final approach descent angle (non-precision approach or approach with vertical guidance……	0.1 degree	critical
Precision approach glide path/elevation angle….	0.1 degree	critical

Table 6-4. MAGNETIC VARIATION

Bearing	***Chart resolution***	***Integrity classification***
Aerodrome/heliport magnetic variation	1 degree	essential

Table 6-5. LENGTH/DISTANCE/DIMENSION

Length / Distance / Dimension	***Chart resolution***	***Integrity classification***
Airway segment length	1 km or 1 NM	routine
En-route fix formation distance	2/10 km (1/10 NM)	routine
Terminal arrival/departure route segments length	1 km or 1 NM	essential
Terminal and instrument approach procedure fix formation distance	2/10 km (1/10 NM)	essential
Runway and FATO length, TLOF dimensions	1 m (AD chart) 0.5 m (AOC chart)	critical
Runway width	----	essential
Displaced threshold distance	----	routine
Stopway length and width	0.5 m (AOC chart)	critical
Clearway length and width	0.5 m (AOC chart)	essential
Landing distance available	1 m (AD chart) 0.5 m (AOC chart)	critical
Take-off run available	----	critical
Take-off distance available	----	critical
Accelerate-stop distance available	----	critical
Runway shoulder width	----	essential
Taxiway width	----	essential
Taxiway shoulder width	----	essential
ILS localizer antenna – runway end and FATO end, distance	As plotted	routine
ILS glide slope antenna – threshold, distance along center line	As plotted	routine
ILS markers – threshold distance	2/10 km (1/10 NM)	essential
ILS DME antenna – threshold, distance along center line	As plotted	essential
MLS azimuth antenna – runway end and FATO end, distance	As plotted	routine
MLS elevation antenna – threshold, distance along center line	As plotted	routine
MLS DME/P antenna – threshold, distance along center line	As plotted	essential

APPENDIX 1. ICAO CHART SYMBOLS

TOPOGRAPHY

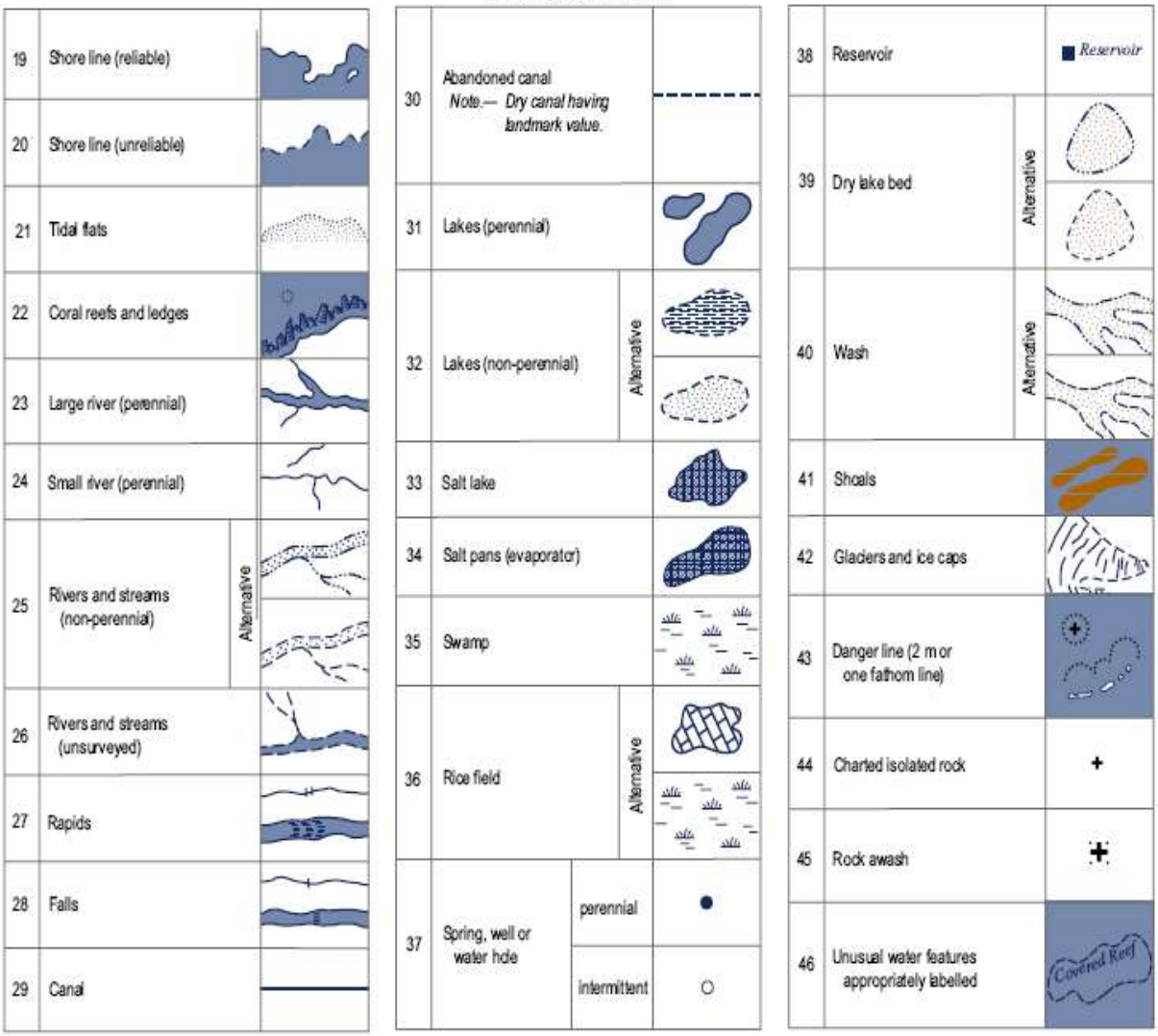
1	Contours	5000
2	Approximate contours	6500
3	Relief shown by hachures	
4	Bluff, cliff or escarpment	
5	Lava flow	
6	Sand dunes	
7	Sand area	

8	Gravel		
9	Levee or esker	Alternative	
10	Unusual land features appropriately labelled		Many Small Volcanoes / Rock Outcrop
	Active volcano		
11	Mountain pass		5395

12	Highest elevation on chart	Alternative	17456 / .17456
13	Spot elevation		.6397 .8975
14	Spot elevation (of doubtful accuracy)		.6370±
15	Coniferous trees		
16	Other trees		
17	Palms		

18	Areas not surveyed for contour information or relief data incomplete	Caution

HYDROGRAPHY



BUILT-UP AREAS

47	City or large town	
48	Town	
49	Village	
50	Buildings	

HIGHWAYS AND ROADS

57	Dual highway	
58	Primary road	
59	Secondary road	
60	Trail	
61	Road bridge	
62	Road tunnel	

MISCELLANEOUS (Cont.)

69	Pipeline	Pipeline
70	Oil or gas field	
71	Tank farms	
72	Nuclear power station	
73	Coast guard station	
74	Lookout tower	
75	Mine	
76	Forest ranger station	
77	Race track or stadium	
78	Ruins	
79	Fort	
80	Church	
81	Mosque	
82	Pagoda	
83	Temple	

RAILROADS

51	Railroad (single track)	
52	Railroad (two or more tracks)	
53	Railroad (under construction)	
54	Railroad bridge	
55	Railroad tunnel	
56	Railroad station	

MISCELLANEOUS

63	Boundaries (international)	
64	Outer boundaries	
65	Fence	X—X—X
66	Telegraph or telephone line (when a landmark)	—T—T—
67	Dam	
68	Ferry	

AERODROMES

84	Civil	Land	
85	Civil	Water	
86	Military	Land	
87	Military	Water	

88	Joint civil and military	Land	
89	Joint civil and military	Water	
90	Emergency aerodrome or aerodrome with no facilities		
91	Abandoned or closed aerodrome		

92	Sheltered anchorage	
93	Aerodrome for use on charts on which aerodrome classification is not required e.g. Enroute Charts	
94	Heliport *Note.— Aerodrome for the exclusive use of helicopters*	H

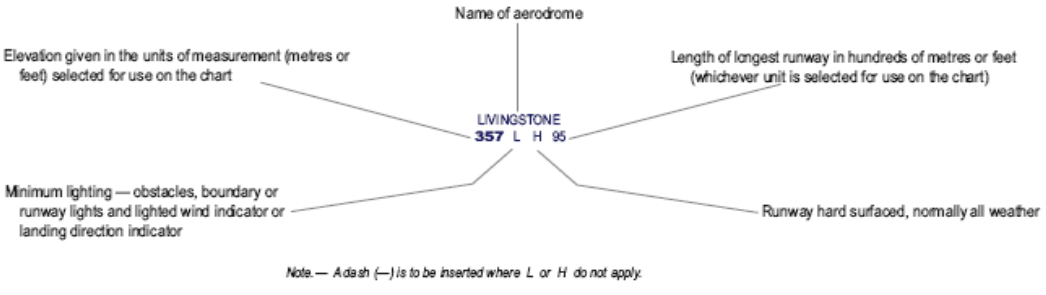
95	*Note.— Where required by the function of the chart, the runway pattern of the aerodrome may be shown in lieu of the aerodrome symbol, for example:*	

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



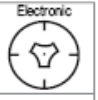
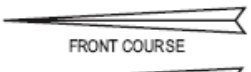
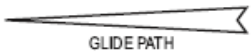
Note.— A dash (—) is to be inserted where L or H do not apply.

AERODROME SYMBOLS FOR APPROACH CHARTS

97	Aerodromes affecting the traffic pattern on the aerodrome on which the procedure is based	
98	The aerodrome on which the procedure is based	

RADIO NAVIGATION AIDS*

99	Basic radio navigation aid symbol *Note.— This symbol may be used with or without a box to enclose the data.*			
100	Non-directional radio beacon	NDB		Electronic 
101	VHF omnidirectional radio range	VOR		
102	Distance measuring equipment	DME		
103	Collocated VOR and DME radio navigation aids	VOR/DME		
104	DME distance	Distance in kilometres (nautical miles) to DME Identification of radio navigation aid	15 km KAV	
105	VOR radial	Radial bearing from, and identification of, VOR	R 090 KAV	
106	UHF tactical air navigation aid	TACAN		

107	Collocated VOR and TACAN radio navigation aids	VORTAC		Electronic 
108	Instrument landing system	ILS	PLAN VIEW 	
			Electronic 	FRONT COURSE BACK COURSE
			PROFILE 	
			Electronic 	GLIDE PATH
109	Radio marker beacon	Elliptical		
		Bone Shape		

Note.— Marker beacon may be shown by outline, or stipple, or both.

110	Compass rose To be orientated on the chart in accordance with the alignment of the station (normally Magnetic North)		Compass rose to be used as appropriate in combination with the following symbols:

VOR	
VOR/DME	
TACAN	
VORTAC	

Note.— Additional points of compass may be added as required.

* *Note.— Guidance material on the presentation of radio navigation aid data is given in the* Aeronautical Chart Manual *(Doc 8697).*

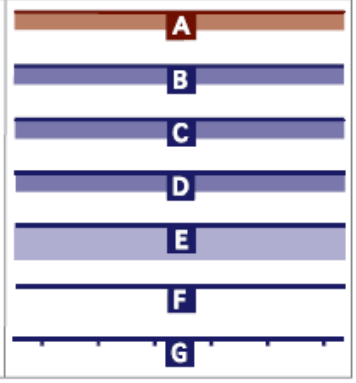
AIR TRAFFIC SERVICES

111	Flight information region	FIR		
112	Aerodrome traffic zone	ATZ		
113	Control area Airway Controlled route	CTA AWY	Alternative	
114	Uncontrolled route			
115	Advisory airspace	ADA		
116	Control zone	CTR		
117	Air defence identification zone	ADIZ		ADIZ
118	Advisory route	ADR	Alternative	

119	Visual flight path	compulsory with radio communication requirement		Ⓡ
		compulsory, without radio communication requirement		Ⓡ
		recommended		
120	Scale-break (on ATS route)		Alternative	
121	Reporting point	REP	Compulsory	▲
			On request	△
122	Change-over point To be superimposed on the appropriate route symbol at right angles to the route	COP		26 / 36
123	ATS/MET reporting point	MRP	Compulsory	
			On request	
124	Waypoint WPT	Flyover WPT (also used for start point and end point of a controlled turn)		
		Fly-by WPT		
125	Final approach fix	FAF		

126	Altitudes/flight levels	Altitude/flight level "window"	17 000 10 000	FL 220 10 000
		"At or above" altitude/flight level	7 000	FL 70
		"At or below" altitude/flight level	5 000	FL 50
		"Mandatory" altitude/flight level	3 000	FL 30
		"Recommended" procedure altitude/flight level	5 000	FL 50
		"Expected" altitude	Expect 5 000	Expect FL 50
	Note.– For use only on SID and STAR charts. Not intended for depiction of minimum obstacle clearance altitude.			

AIRSPACE CLASSIFICATIONS

127	Airspace classifications	

Aeronautical data in abbreviated form to be used in association with airspace classification symbols:

128	Alternative	TMA DONLON 119.1 C 200m AGL - FL 245 Type · Name or call sign · Radio frequency(ies) · Airspace classification · Vertical limits TMA DONLON / C / FL 245 / 200m AGL / 119.1

AIRSPACE RESTRICTIONS

129	Restricted airspace (prohibited, restricted or danger area)	Common boundary of two areas
	Note.– The angle and density of rulings may be varied according to scale and the size, shape and orientation of the area.	
130	International boundary closed to passage of aircraft except through air corridor	

OBSTACLES

131	Obstacle	
132	Lighted obstacle	
133	Group obstacles	
134	Lighted group obstacles	

135	Exceptionally high obstacle (optional symbol)	
136	Exceptionally high obstacle - lighted (optional symbol)	
	Note.– For obstacles having a height of the order of 300 m (1 000 ft) above terrain.	
137	Elevation of top (italics) 52 / (15) Height above specified datum (upright type in parentheses)	

MISCELLANEOUS

138	Prominent transmission line		139	Isogonic line or isogonal	3° E	140	Ocean station vessel (normal position)

VISUAL AIDS

141	Marine light *Note 2.– Characteristics are to be indicated as follows:*	F	Alt Alternating B Blue F Fixed	Fl Flashing G Green Gp Group	Occ Occulting R Red SEC Sector	sec Second (U) Unwatched W White	*Note 1.– Marine alternating lights are red and white unless otherwise indicated. Marine lights are white unless colours are stated.*
142	Aeronautical ground light	☆	Electronic ★			143	Lightship

APPENDIX 2.

SYMBOLS FOR AERODROME/HELIPORT CHARTS

144	Hard surface runway		
145	Unpaved runway		
146	Stopway	SWY	
147	Taxiways and parking areas		
148	Helicopter alighting area on an aerodrome		
149	Aerodrome reference point	ARP	
150	VOR check-point		
151	Runway visual range (RVR) observation site		

152	Pierced steel plank or steel mesh runway		
153	Point light		
154	Obstacle light		
155	Landing direction indicator (lighted)		
156	Landing direction indicator (unlighted)		
157	Stop bar		
158	Runway-holding position	Pattern A	
		Pattern B	
	Note.– For application, see Annex 14, Volume I, paragraph 5.2.10.		

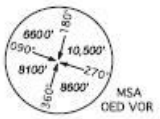
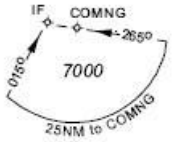
SYMBOLS FOR AERODROME OBSTACLE CHARTS - TYPE A, B AND C

		Plan	Profile
159	Tree or shrub		Identification number
160	Pole, tower, spire, antenna, etc.		
161	Building or large structure		
162	Railroad		
163	Transmission line or overhead cable		

			Plan	Profile
164	Terrain penetrating obstacle plane			
165	Escarpment			
166	Stopway	SWY		
167	Clearway	CWY		

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 shapes.*	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)	

APPENDIX 3. COLOUR GUIDE

CHART SYMBOLS

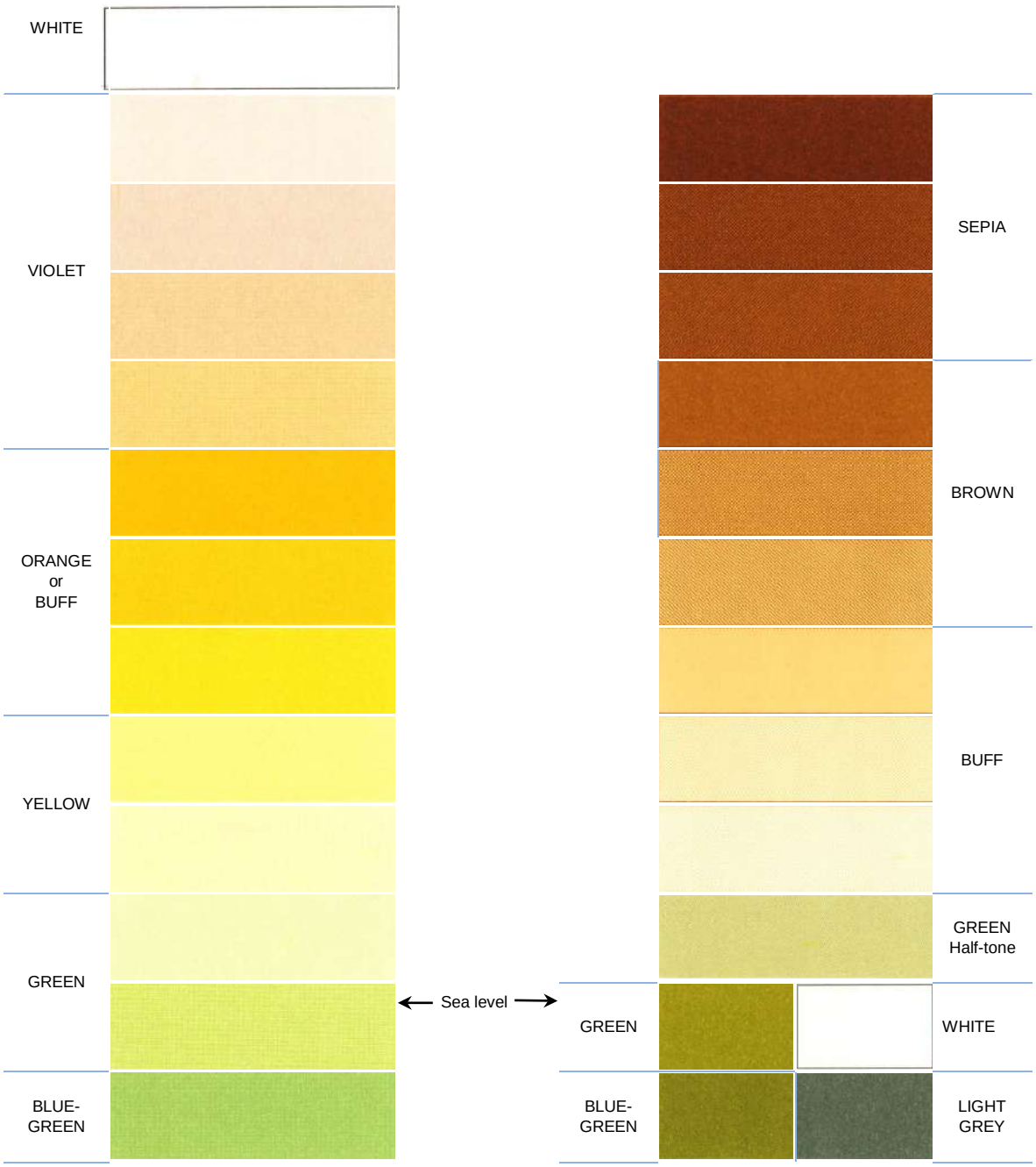
Culture, except highways and roads; outlines of large cities, grids and graticules; spot elevations; danger lines and off-shore rocks; names and lettering except for aeronautical and hydrographic features		BLACK
Built-up areas of cities		BLACK Stipple
		BLACK Half-tone
Highways and roads	Optional colours	RED
Built-up areas for cities (alternative to black stipple)		YELLOW
Contours and topographic features: Items 1 through 10 of 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
		MAGENTA
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	DARK BLUE

CHART SYMBOLS *(Cont.)*

Woods		GREEN	
Areas which have not been surveyed for contour information or relief data are incomplete	Optional colours	GOLDEN BUFF	
		WHITE	

APPENDIX 4. HYPSOMETRIC TINT GUIDE

(Alternative systems, reference 4.2.12.2)



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 section.