

LIBERIA CIVIL AVIATION REGULATION

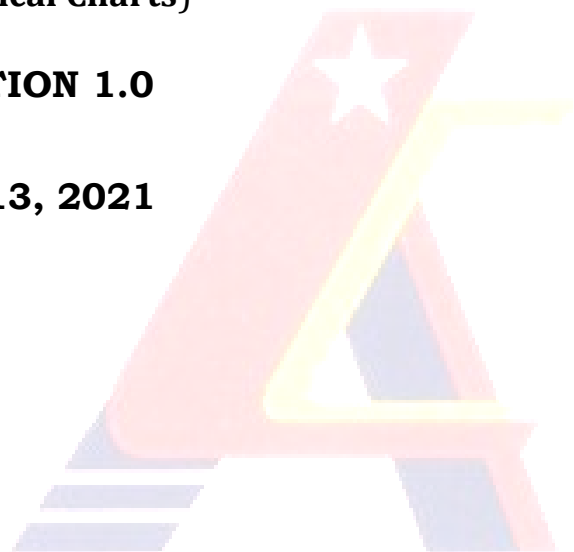


PART 21 AIR NAVIGATION SERVICES

(Aeronautical Charts)

EDITION 1.0

JULY 13, 2021



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EXTRAORDINARY

The Government of the Republic of Liberia announces that the Liberia Civil Aviation Authority, pursuant to its mandate under the Liberia Civil Aviation Act of 2019, and specifically consistent with Subchapter XII, Section 1218 (1), has issued on August 11, 2021 its Regulation N0. LCAA/LCAR/001/2021, herein under:

CONCERNING LIBERIA CIVIL AVIATION REGULATIONS

BY ORDER OF THE PRESIDENT

AMB. DEE-MAXWELL SAAH KEMAYAH, SR.
MINISTER OF FOREIGN AFFAIRS

MINISTRY OF FOREIGN AFFAIRS
MONROVIA, LIBERIA



AUTHORITY TO PROMULGATE CIVIL AVIATION REGULATIONS

IN EXERCISE OF THE POWERS CONFERRED ON THE DIRECTOR GENERAL OF LIBERIA CIVIL AVIATION AUTHORITY UNDER THE LIBERIA CIVIL AVIATION ACT OF 2019 THESE REGULATIONS ARE HEREBY MADE.

DATE: 13th July 2021



SIGNATURE: _____

Hon. Moses Y. Kollie
DIRECTOR GENERAL

PART 21 AEROUNATICAL CHARTS

AMENDMENTS

LOCATION	DATE	DESCRIPTION

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Content

AMENDMENTS	v
21.1 DEFINITIONS APPLICABILITY, AVAILABILITY.....	11
21.1.1 DEFINITIONS.....	11
21.1.2 APPLICABILITY.....	22
21.1.3 AVAILABILITY.....	22
21.2 GENERAL SPECIFICATIONS.....	23
21.2.2 TITLE.....	23
21.2.3 MISCELLANEOUS INFORMATION	24
21.2.4 SYMBOLS	24
21.2.5 UNITS OF MEASUREMENT	24
21.2.6 SCALE AND PROJECTION.....	25
21.2.7 DATE OF VALIDITY OF AERONAUTICAL INFORMATION	25
21.2.8 SPELLING OF GEOGRAPHICAL NAMES	25
21.2.9 ABBREVIATIONS	25
21.2.10 POLITICAL BOUNDARIES.....	26
21.2.11 COLORS.....	26
21.2.12 RELIEF	26
21.2.13 PROHIBITED, RESTRICTED AND DANGER AREAS	26
21.2.14 AIR TRAFFIC SERVICES AIRSPACES	26
21.2.15 MAGNETIC VARIATION	26
21.2.16 TYPOGRAPHY.....	27
21.2.17 AERONAUTICAL DATA.....	27
21.2.18 COMMON REFERENCE SYSTEMS.....	27
21.2.18.1 HORIZONTAL REFERENCE SYSTEM.....	28
21.2.18.2 VERTICAL REFERENCE SYSTEM.....	28
21.2.18.3 TEMPORAL REFERENCE SYSTEM	29
21.3 AERODROME OBSTACLE CHART — ICAO TYPE A (OPERATING LIMITATIONS).....	29
21.3.1 FUNCTION.....	29
21.3.2 AVAILABILITY.....	29
21.3.3 UNITS OF MEASUREMENT	29
21.3.4 COVERAGE AND SCALE.....	29
21.3.5 FORMAT.....	29

21.3.6	IDENTIFICATION	30
21.3.7	MAGNETIC VARIATION.....	30
21.3.8	AERONAUTICAL DATA.....	30
21.3.8.1	OBSTACLES	30
21.3.8.2	TAKE-OFF FLIGHT PATH AREA.....	30
21.3.8.3	DECLARED DISTANCES.....	31
21.3.8.4	PLAN AND PROFILE VIEWS	31
21.3.9	ACCURACY.....	32
21.4	AERODROME OBSTACLE CHART- ICAO TYPE B	32
21.4.1	FUNCTION.....	32
21.4.2	AVAILABILITY.....	32
21.4.3	UNITS OF MEASUREMENT	32
21.4.4	COVERAGE AND SCALE.....	32
21.4.5	FORMAT.....	32
21.4.6	IDENTIFICATION	33
21.4.7	CULTURE AND TOPOGRAPHY.....	33
21.4.8	MAGNETIC VARIATION.....	33
21.4.9	AERONAUTICAL DATA.....	33
21.4.10	ACCURACY	34
21.5	AERODROME TERRAIN AND OBSTACLE CHART — ICAO (ELECTRONIC)	34
21.5.1	FUNCTION.....	34
21.5.2	AVAILABILITY.....	34
21.5.3	IDENTIFICATION	35
21.5.4	CHART COVERAGE.....	35
21.5.5	CHART CONTENT	35
21.5.5.1	GENERAL	35
21.5.5.2	TERRAIN FEATURE.....	36
21.5.5.3	OBSTACLE FEATURES	36
21.5.5.4	AERODROME FEATURES.....	37
21.5.5.5	RADIO NAVIGATION AID FEATURES.....	37
21.5.6	ACCURACY AND RESOLUTION.....	37
21.5.7	ELECTRONIC FUNCTIONALITY.....	38
21.5.8	CHART DATA PRODUCT SPECIFICATIONS	38

21.6	PRECISION APPROACH TERRAIN CHART — ICAO.....	39
21.6.1	FUNCTION.....	39
21.6.2	AVAILABILITY.....	39
21.6.3	IDENTIFICATION.....	40
21.6.4	PLAN AND PROFILE INFORMATION.....	40
21.7	ENROUTE CHART — ICAO.....	40
21.7.1	FUNCTION.....	40
21.7.2	AVAILABILITY.....	40
21.7.3	COVERAGE AND SCALE.....	40
21.7.4	PROJECTION.....	41
21.7.5	IDENTIFICATION.....	41
21.7.6	CULTURE AND TOPOGRAPHY.....	41
21.7.7	BEARINGS, TRACKS AND RADIALS.....	41
21.7.8	AERONAUTICAL DATA.....	41
21.7.8.1	AERODROMES.....	41
21.7.8.2	PROHIBITED (GLP), RESTRICTED (GLR) AND DANGER (GLD) AREAS.....	41
21.7.8.3	AIR TRAFFIC SERVICES SYSTEM.....	42
21.7.8.4	SUPPLEMENTARY INFORMATION.....	43
21.8	AREA CHART — ICAO.....	43
21.8.1	FUNCTION.....	43
21.8.2	AVAILABILITY.....	43
21.8.3	COVERAGE AND SCALE.....	43
21.8.4	PROJECTION.....	43
21.8.5	IDENTIFICATION.....	43
21.8.6	CULTURE AND TOPOGRAPHY.....	44
21.8.7	MAGNETIC VARIATION.....	44
21.8.8	BEARINGS, TRACKS AND RADIALS.....	44
21.8.9	AERONAUTICAL DATA.....	44
21.8.9.1	AERODROMES.....	44
21.8.9.2	PROHIBITED, RESTRICTED AND DANGER AREAS.....	44
21.8.9.3	AREA MINIMUM ALTITUDES.....	44
21.8.9.4	AIR TRAFFIC SERVICES SYSTEM.....	44
21.9	STANDARD DEPARTURE CHART INSTRUMENT (SID) — ICAO..	46

21.9.1	FUNCTION.....	46
21.9.2	AVAILABILITY.....	46
21.9.3	COVERAGE AND SCALE.....	46
21.9.4	PROJECTION	46
21.9.5	IDENTIFICATION	46
21.9.6	CULTURE AND TOPOGRAPHY.....	47
21.9.7	MAGNETIC VARIATION.....	47
21.9.8	BEARINGS, TRACKS AND RADIALS.....	47
21.9.9	AERONAUTICAL DATA.....	47
21.9.9.1	AERODROMES.....	47
21.9.9.2	PROHIBITED, RESTRICTED AND DANGER AREAS.....	47
21.9.9.3	MINIMUM SECTOR ALTITUDE.....	48
21.9.10	AIR TRAFFIC SERVICES SYSTEM.....	48
21.9.11	AERONAUTICAL DATABASE REQUIREMENTS.....	49
21.10	STANDARD ARRIVAL CHART INSTRUMENT (STAR) — ICAO...	49
21.10.1	FUNCTION.....	49
21.10.2	AVAILABILITY.....	49
21.10.3	COVERAGE AND SCALE.....	50
21.10.4	PROJECTION	50
21.10.5	IDENTIFICATION.....	50
21.10.6	CULTURE AND TOPOGRAPHY.....	50
21.10.6.1	MAGNETIC VARIATION.....	50
21.10.6.2	BEARINGS, TRACKS AND RADIALS	50
21.10.7	AERONAUTICAL DATA.....	50
21.10.7.1	AERODROMES	51
21.10.7.2	PROHIBITED, RESTRICTED AND DANGER AREAS.....	51
21.10.7.3	MINIMUM SECTOR ALTITUDE.....	51
21.10.7.4	AIR TRAFFIC SERVICES SYSTEM.....	51
21.10.7.5	AERONAUTICAL DATABASE REQUIREMENTS.....	52
21.11	INSTRUMENT APPROACH CHART — ICAO.....	52
21.11.1	FUNCTION.....	52
21.11.2	AVAILABILITY.....	53
21.11.3	COVERAGE AND SCALE.....	53

21.11.4	PROJECTION	53
21.11.5	IDENTIFICATION.....	53
21.11.6	CULTURE AND TOPOGRAPHY	54
21.11.6.1	MAGNETIC VARIATION.....	54
21.11.6.2	BEARINGS, TRACKS AND RADIALS	54
21.11.7	AERONAUTICAL DATA.....	54
21.11.7.1	AERODROMES	55
21.11.7.2	OBSTACLES.....	55
21.11.7.3	PROHIBITED, RESTRICTED AND DANGER AREAS.....	55
21.11.7.4	RADIO COMMUNICATION FACILITIES AND NAVIGATION AIDS	55
21.11.7.5	MINIMUM SECTOR ALTITUDE OR TERMINAL ARRIVAL ALTITUDE	56
21.11.7.6	PORTRAYAL OF PROCEDURE TRACKS.....	56
21.11.7.7	AERODROME OPERATING MINIMA.....	56
21.11.7.8	SUPPLEMENTARY INFORMATION.....	57
21.11.7.9	AERONAUTICAL DATA BASE REQUIREMENTS.....	57
21.12	VISUAL APPROACH CHART — ICAO	58
21.12.1	FUNCTION	58
21.12.2	AVAILABILITY	58
21.12.3	SCALE.....	58
21.12.4	PROJECTION	58
21.12.5	IDENTIFICATION.....	58
21.12.6	CULTURE AND TOPOGRAPHY	58
21.12.7	MAGNETIC VARIATION	58
21.12.8	BEARINGS, TRACKS AND RADIALS	58
21.12.9	AERONAUTICAL DATA.....	59
21.12.9.1	AERODROMES	59
21.12.9.2	OBSTACLES.....	59
21.12.9.3	PROHIBITED, RESTRICTED AND DANGER AREAS.....	59
21.12.9.4	DESIGNATED AIRSPACE.....	59
21.12.9.5	VISUAL APPROACH INFORMATION.....	59
21.12.9.6	SUPPLEMENTARY INFORMATION.....	59
21.13	AERODROME/HELIPORT CHART — ICAO	59

21.13.1	FUNCTION	59
21.13.2	AVAILABILITY	60
21.13.3	COVERAGE AND SCALE	60
21.13.4	IDENTIFICATION.....	60
21.13.5	MAGNETIC VARIATION	60
21.13.6	AERODROME/HELIPORT DATA.....	60
21.14	AERODROME GROUND MOVEMENT CHART — ICAO	62
21.14.1	FUNCTION.....	62
21.14.2	AVAILABILITY	62
21.14.3	COVERAGE AND SCALE	62
21.14.4	IDENTIFICATION.....	62
21.14.5	MAGNETIC VARIATION	62
21.14.6	AERODROME DATA.....	62
21.15	AIRCRAFT PARRKING/DOCKING CHART-ICAO	63
21.15.1	FUNCTION.....	63
21.15.2	COVERAGE AND SCALE	63
21.15.3	IDENTIFICATION.....	63
21.15.4	MAGNETIC VARIATION	63
21.15.5	AERODROME DATA.....	63
21.16	WORLD AERONAUTICAL CHART — ICAO 1:1 000 000.....	64
21.16.1	FUNCTION.....	64
21.16.2	AVAILABILITY	64
21.16.3	SCALES.....	64
21.16.4	FORMAT.....	65
21.16.5	PROJECTION	65
21.16.6	IDENTIFICATION.....	65
21.16.7	CULTURE AND TOPOGRAPHY	65
21.16.7.1	BUILT-UP AREAS.	65
21.16.7.2	RAILROADS	65
21.16.7.3	HIGHWAYS AND ROADS	66
21.16.7.4	POLITICAL BOUNDARIES.....	66
21.16.7.5	HYDROGRAPHY	66
21.16.7.6	CONTOURS.....	66

21.16.7.7	HYPSONOMETRIC TINTS.....	66
21.16.7.8	SPOT ELEVATIONS.....	66
21.16.7.9	INCOMPLETE OR UNRELIABLE RELIEF.....	66
21.16.8	WOODED AREAS.....	67
21.16.8.1	DATE OF TOPOGRAPHIC INFORMATION.....	67
21.16.8.2	MAGNETIC VARIATION.....	67
21.16.9	AERONAUTICAL DATA.....	67
21.16.9.1	GENERAL.....	67
21.16.9.2	AERODROMES.....	67
21.16.9.3	OBSTACLES.....	67
21.16.9.4	PROHIBITED, RESTRICTED AND DANGER AREAS.....	67
21.16.9.5	AIR TRAFFIC SERVICES SYSTEM.....	68
21.16.9.6	RADIO NAVIGATION AIDS.....	68
21.16.9.7	SUPPLEMENTARY INFORMATION.....	68
21.17	AERONAUTICAL CHART — ICAO 1:500 000.....	68
21.17.1	FUNCTION.....	68
21.17.2	SCALES.....	68
21.17.3	FORMAT.....	69
21.17.4	PROJECTION.....	69
21.17.5	IDENTIFICATION.....	69
21.17.6	CULTURE AND TOPOGRAPHY.....	69
21.17.6.1	BUILT-UP AREAS.....	69
21.17.6.2	RAILROADS.....	69
21.17.6.3	HIGHWAYS AND ROADS.....	69
21.17.6.4	POLITICAL BOUNDARIES.....	70
21.17.6.5	HYDROGRAPHY.....	70
21.17.6.6	CONTOURS.....	70
21.17.6.7	HYPSONOMETRIC TINTS.....	70
21.17.6.8	SPOT ELEVATIONS.....	70
21.17.6.9	INCOMPLETE OR UNRELIABLE RELIEF.....	70
21.17.6.10	ESCARPMENTS.....	70
21.17.6.11	WOODED AREAS.....	70
21.17.6.12	DATE OF TOPOGRAPHIC INFORMATION.....	71

21.17.7	MAGNETIC VARIATION	71
21.17.8	AERONAUTICAL DATA.....	71
21.17.8.1	GENERAL.....	71
21.17.8.2	AERODROMES	71
21.17.8.3	OBSTACLES.....	71
21.17.8.4	PROHIBITED, RESTRICTED AND DANGER AREAS.....	71
21.17.8.5	AIR TRAFFIC SERVICES SYSTEM	71
21.17.8.6	RADIO NAVIGATION AIDS.....	72
21.18	AERONAUTICAL NAVIGATION CHART —ICAO SMALL SCALE	72
21.18.1	FUNCTION.....	72
21.18.2	COVERAGE AND SCALE	72
21.18.3	FORMAT.....	72
21.18.4	PROJECTION	73
21.18.5	CULTURE AND TOPOGRAPHY	73
21.18.5.1	BUILT-UP AREAS.....	73
21.18.5.2	RAILROADS	73
21.18.5.3	HIGHWAYS AND ROADS.....	73
21.18.5.4	POLITICAL BOUNDARIES.....	73
21.18.5.5	HYDROGRAPHY	73
21.18.5.6	CONTOURS.....	73
21.18.5.7	HYPSONOMETRIC TINTS.....	73
21.18.5.8	SPOT ELEVATIONS.....	74
21.18.5.9	INCOMPLETE OR UNRELIABLE RELIEF.....	74
21.18.5.10	DATE OF TOPOGRAPHIC INFORMATION	74
21.18.5.11	MAGNETIC VARIATION	74
21.18.6	AERONAUTICAL DATA.....	74
21.18.6.1	AERODROMES	74
21.18.6.2	OBSTACLES.....	74
21.18.6.3	RADIO NAVIGATION AIDS.....	74
21.19	PLOTTING CHART — ICAO	74
21.19.1	FUNCTION.....	75
21.19.2	PROJECTION	75
21.19.3	IDENTIFICATION.....	75

21.19.4	CULTURE AND TOPOGRAPHY	75
21.19.5	MAGNETIC VARIATION	75
21.19.6	AERONAUTICAL DATA	75
21.20	ELECTRONIC AERONAUTICAL CHART DISPLAY-ICAO	75
21.20.1	FUNCTION	75
21.20.2	INFORMATION AVAILABLE FOR DISPLAY	76
21.20.3	DISPLAY REQUIREMENTS	76
21.20.3.1	DISPLAY CATEGORIES.....	76
21.20.3.2	DISPLAY MODE AND GENERATION OF NEIGHBORING AREA	76
21.20.3.3	SCALE.....	76
21.20.3.4	SYMBOLS.....	76
21.20.3.5	DISPLAY HARDWARE	77
21.20.4	PROVISION AND UPDATING OF DATA	77
21.20.5	PERFORMANCE TESTS, MALFUNCTION ALARMS AND INDICATIONS.....	77
21.20.6	BACK-UP ARRANGEMENTS.....	77
21.21	ATC SURVEILLANCE MINIMUM ALTITUDE CHART — ICAO ...	78
21.21.1	FUNCTION	78
21.21.2	COVERAGE AND SCALE	78
21.21.3	IDENTIFICATION.....	78
21.21.4	CULTURE AND TOPOGRAPHY	78
21.21.5	MAGNETIC VARIATION	78
21.21.6	BEARINGS, TRACKS AND RADIALS	79
21.21.7	AERONAUTICAL DATA.....	79
21.21.7.1	AERODROMES	79
21.21.7.2	PROHIBITED, RESTRICTED AND DANGER AREAS.....	79
21.21.7.3	AIR TRAFFIC SERVICES SYSTEM	79
21.22	CARTOGRAPHIC SERVICE PROVIDER.....	80
IS: 21.1.1	FORMAT-MARGINAL NOTELAYOUT.....	83

INTRODUCTION

Part 21 is about aeronautical charts which provides a convenient medium for supplying aeronautical charts/maps that are unlike those used in ground transportation for safe performance of air operations.

Aeronautical charts not only provide the two-dimensional information common in most maps, but also often portray three dimensional air traffic service systems.

Almost all ICAO States produce aeronautical charts and most segments of aviation make reference to them for planning, air traffic control and navigation purposes. Without the global standardization of aeronautical charts it would be difficult for pilots and other chart users to effectively find and interpret important navigation information. The safe and efficient flow of air traffic is facilitated by aeronautical charts drawn to accept ICAO Standards.

The requirements in Part 21 define the obligations of Authority to make available certain ICAO aeronautical chart types, and specify chart coverage, format, identification and content including standardized symbology and color use. The goal is to satisfy the need for uniformity and consistency in the provision of aeronautical charts that contain appropriate information of a defined quality. When a published aeronautical chart contains "ICAO" in its title, this indicates that the chart producer has conformed to both general Annex 4 Standards and those pertaining to a particular ICAO chart type.

The ICAO series of aeronautical charts now consists of twenty-one types, each intended to serve specialized purposes. They range from detailed charts for individual aerodromes/heliports to small-scale charts for flight planning purposes and include electronic aeronautical charts for cockpit display.

There are three series of charts available for planning and visual navigation, each with a different scale. The Aeronautical Navigation Chart — ICAO Small Scale charts cover the largest area for a given amount of paper; they provide a general purpose chart series suitable for long- range flight planning. The World Aeronautical Chart — ICAO 1 : 1 000 000 charts provide complete world coverage with uniform presentation of data at a constant scale, and are used in the production of other charts. The Aeronautical Chart — ICAO 1:500 000 series supplies more detail and provides a suitable medium for pilot and navigation training. This series is most suitable for use by low-speed, short- or medium range aircraft operating at low and intermediate altitudes.

The vast majority of scheduled flights take place along routes defined by radio and electronic navigation systems that make visual reference to the ground unnecessary.

This type of navigation is conducted under instrument flight rules and the flight is required to comply with air traffic control services procedures. The

Enroute Chart — ICAO portrays the air traffic service system, radio navigation aids and other aeronautical information essential to en-route navigation under instrument flight rules. It is designed for easy handling in the crowded space of an aircraft flight deck, and the presentation of information is such that it can easily be read in varying conditions of natural and artificial light. Where flights cross extensive oceanic and sparsely settled areas, the Plotting Chart — ICAO provides a means of maintaining a continuous flight record of aircraft position and is sometimes produced to complement the more complex enroute charts.

As a flight approaches its destination, more detail is required about the area around the aerodrome of intended landing.

21.1 DEFINITIONS APPLICABILITY, AVAILABILITY

21.1.1 DEFINITIONS

When the following terms are used in this Part, they have the following meanings:

- (1) **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.
- (2) **Aerodrome elevation.** The elevation of the highest point of the landing area.
- (3) **Aerodrome operating minima.** The limits of usability of an aerodrome for:
 - a) take-off, expressed in terms of runway visual range and/or visibility and, if necessary, cloud conditions;
 - b) landing in precision approach and landing operations, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H) as appropriate to the category of the operation; and
 - c) landing in approach and landing operations with vertical guidance, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H); and
 - d) landing in non-precision approach and landing operations, expressed in terms of visibility and/or runway visual range, minimum descent altitude/height (MDA/H) and, if necessary, cloud conditions.
- (4) **Aerodrome reference point.** The designated geographical location of an aerodrome.
- (5) **Aeronautical chart.** A representation of a portion of the Earth, its culture and relief, specifically designated to meet the requirements of air navigation.
- (6) **Aircraft stand.** A designated area on an apron intended to be used for parking an aircraft.
- (7) **Air defense 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).
- (8) **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).
- (9) **Air transit route.** A defined route for the air transiting of helicopters.
- (10) **Airway.** A control area or portion thereof established in the form of a corridor.
- (11) **Air taxiway.** A defined path on the surface established for the air taxiing of helicopters.
- (12) **Altitude.** The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

- (13) **Application.** Manipulation and processing of data in support of user requirements
- (14) **Apron.** A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fueling, parking or maintenance.
- (15) **Area minimum altitude (AMA).** The lowest altitude to be used under instrument meteorological conditions (IMC) that will provide a minimum vertical clearance of 300 m (1 000 ft) or in designated mountainous terrain 600 m (2 000 ft) above all obstacles located in the area specified, rounded up to the nearest (next higher) 30 m (100 ft)
- (16) **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.*

- (17) **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.
- (18) **ATS route.** A specified route designed for channeling the flow of traffic as necessary for the provision of air traffic services.

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

- (19) **ATS surveillance system.** A generic term meaning variously, ADS-B, PSR, SSR or any comparable ground-based system that enables the identification of aircraft.
- (20) **Bare Earth.** Surface of the Earth including bodies of water and permanent ice and snow, and excluding vegetation and man-made objects.
- (21) **Calendar.** Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).
- (22) **Canopy.** Bare Earth supplemented by vegetation height.
- (23) **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.*

- (24) **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 airplane may make a portion of its initial climb to a specified height.
- (25) **Contour line.** A line on a map or chart connecting points of equal elevation.
- (26) **Culture.** All man-made features constructed on the surface of the Earth, such as cities, railways and canals.
- (27) **Cyclic redundancy checks (CRC).** A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.
- (28) **Danger area.** An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.
- (29) **Data product specification.** Detailed description of a data set or data set series together with additional information that will enable it to be created, supplied to and used by another party (ISO 19131*).

Note. — *A data product specification provides a description of the universe of discourse and a specification for mapping the universe of discourse to a data set. It may be used for production, sales, end-use or other purpose.*

- (30) **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 (or equivalent assurance level), traceability, timeliness, completeness and format.
- (31) **Data resolution.** A number of units or digits to which a measured or calculated value is expressed and used.
- (32) **Data set.** Identifiable collection of data (ISO 19101*).
- (33) **Data set series.** Collection of data sets sharing the same product specification (ISO 19115*).
- (34) **Datum.** Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104*).
- (35) **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.*

- (36) **Displaced threshold.** A threshold not located at the extremity of a runway.

- (37) **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.
- (38) **Elevation.** The vertical distance of a point or a level, on or affixed to the surface of the earth, measured from mean sea level.
- (39) **Ellipsoid height (Geodetic height).** The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.
- (40) **Feature.** Abstraction of real world phenomena (ISO 19101*).
- (41) **Feature attribute.** Characteristic of a feature (ISO 19101*).

Note. — *A feature attribute has a name, a data type and a value domain associated with it.*

- (42) **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:
 - I. a landing can be made; or
 - II. a missed approach procedure is initiated.
- (43) **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.
- (44) **Final approach fix or point.** That fix or point of an instrument approach procedure where the final approach segment commences.
- (45) **Final approach segment.** That segment of an instrument approach procedure in which alignment and descent for landing are accomplished.
- (46) **Flight information region.** An airspace of defined dimensions within which flight information service and alerting service are provided.
- (47) **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.*

(48) **Geodesic distance.** The shortest distance between any two points on a mathematically defined ellipsoidal surface.

(49) **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.

(50) **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.*

(51) **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.*

(52) **Glide path.** A descent profile determined for vertical guidance during a final approach.

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

1) **Height.** The vertical distance of a level, a point or an object considered as a point, from a specified datum.

2) **Helicopter stand.** An aircraft stand which provides for parking a helicopter and, where air taxiing operations are contemplated, the helicopter touchdown and lift-off.

(54) **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.

(55) **Heliport reference point (HRP).** The designated location of a heliport or a landing location.

(56) **Holding procedure.** A predetermined maneuver which keeps an aircraft within a specified airspace while awaiting further clearance.

(57) **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.

(58) **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.

- (59) **Hypsometric tints.** A succession of shades or color gradations used to depict ranges of elevation.
- (60) **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 fix or point.
- (61) **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.
- (62) **Integrity classification (aeronautical data).** Classification based upon the potential risk resulting from the use of corrupted data. Aeronautical data is classified as:
- routine data:** there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;
- essential data:** there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and
- critical data:** 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.
- (63) **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.
- (64) **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.
- (65) **Isogonal.** A line on a map or chart on which all points have the same magnetic variation for a specified epoch.
- (66) **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.
- (67) **Landing area.** That part of a movement area intended for the landing or take-off of aircraft.
- (68) **Landing direction indicator.** A device to indicate visually the direction currently designated for landing and for take-off.

- (69) **Level.** A generic term relating to the vertical position of an aircraft in flight and meaning variously, height, altitude or flight level.
- (70) **Logon address.** A specified code used for data link logon to an ATS unit
- (71) **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
- (72) **Maneuvering area.** That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.
- (73) **Marking.** A symbol or group of symbols displayed on the surface of the movement area in order to convey aeronautical information.
- (74) **Metadata.** Data about data (ISO 19115*).

Note. — *Data that describes and documents data.*

- (75) **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. Segment of flight that provides the required obstacle clearance
- (76) **Minimum obstacle clearance altitude (MOCA).** The minimum altitude for a defined segment of flight that provides the required obstacle clearance.
- (77) **Minimum sector altitude (MSA).** 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 significant point, the aerodrome reference point (ARP) or the heliport reference point (HRP).
- (78) **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.
- (79) **Missed approach procedure.** The procedure to be followed if the approach cannot be continued.
- (80) **Movement area.** That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the maneuvering area and the apron(s).
- (81) **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 Manual of Standards as the concept of RNP has been overtaken by the concept of PBN. The term RNP in this Manual of Standards 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.*
- (82) **Obstacle.** All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:
- are located on an area intended for the surface movement of aircraft; or
 - extend above a defined surface intended to protect aircraft in flight; or
 - 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
- (83) **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.
- (84) 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.*
- (85) **Obstacle free zone (OFZ).** The airspace above the inner approach surface, inner transitional surfaces, and balked landing surface and that portion of the strip bounded by these surfaces, which is not penetrated by any fixed obstacle other than a low-mass and frangibly mounted one required for air navigation purposes.
- (86) **Orthometric height.** Height of a point related to the geoid, generally presented as an MSL elevation.

- (87) **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.
- 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.
- (88) **Point light.** A luminous signal appearing without perceptible length.
- (89) **Portrayal.** Presentation of information to humans (ISO 19117*).
- (90) **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.
- (91) **Precision approach procedure.** An instrument approach procedure utilizing azimuth and glide path information provided by ILS or PAR.
- (92) **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.
- (93) **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.*
- (94) **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.
- (95) **Relief.** The inequalities in elevation of the surface of the Earth represented on aeronautical charts by contours, hypsometric tints, shading or spot elevations.
- (96) **Reporting point.** A specified 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”.*

- (97) **Restricted area.** An airspace of defined dimensions, above the land areas or territorial waters of Liberia, within which the flight of aircraft is restricted in accordance with certain specified conditions
- (98) **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.
- (99) **Runway.** A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.
- (100) **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.*

- (101) **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.
- (102) **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.
- (103) **Shoulder.** An area adjacent to the edge of a pavement so prepared as to provide a transition between the pavement and the adjacent surface.
- (104) **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.*

- (105) **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.
- (106) **Taxiing.** Movement of an aircraft on the surface of an aerodrome under its own power, excluding take-off and landing.
- (107) **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.
- (108) **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.
- (109) **Terminal arrival altitude (TAA).** The lowest altitude that will provide a minimum clearance of 300 m (1000 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.
- (110) **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”.*
- (111) **Threshold.** The beginning of that portion of the runway usable for landing.
- (112) **Touchdown and lift-off area (TLOF).** A load bearing area on which a helicopter may touchdown or lift off.
- (113) **Touchdown zone.** The portion of a runway, beyond the threshold, where it is intended landing aeroplanes first contact the runway.
- (114) **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).
- (115) **Transition altitude.** The altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes.
- (116) **Vectoring.** Provision of navigational guidance to aircraft in the form of specific headings, based on the use of an ATS surveillance system
- (117) **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.
- (118) **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:
- (119) **Fly-by waypoint.** A waypoint which requires turn anticipation to allow tangential interception of the next segment of a route or procedure; or

- (120) **Flyover waypoint.** A waypoint at which a turn is initiated in order to join the next segment of a route or procedure.

21.1.2 APPLICABILITY

- (1) The specifications in this regulation are applicable on and after 19 November 2009
- (2) All charts coming within the scope of this Part and bearing the aeronautical information date of 19 November 2009 or later shall conform to the Regulations relevant to the particular chart.
- (3) The AIS Section shall comply with the provision of this Part to the extent applicable.

21.1.3 AVAILABILITY

- (1) Information. The Authority shall on request by another Contracting State provide all information relating to its own territory that is necessary to enable the requirements of these Regulations to be met.
- (2) Charts. The Authority 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.

Note. — The availability of charts includes specified electronic charts.

- (3) For any chart or single sheet of a chart series entirely contained within the territory of Authority, the State having jurisdiction over the territory shall either:
 - a. produce the chart or sheet itself; or
 - b. arrange for its production by another Contracting State or by an agency; or
 - c. provide the necessary data to another Contracting State prepared to accept an obligation to produce the chart or sheet.
- (4) 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 meeting

- (5) The Authority 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.

Note. — Guidance material on the preparation of aeronautical charts, including sample formats, is contained in the Aeronautical Chart Manual (Doc 8697).

- (6) To improve worldwide dissemination of information on new charting techniques and production methods, appropriate charts produced by the Authority should be made available without charge to other Contracting States on request on a reciprocal basis.

21.2 GENERAL SPECIFICATIONS

21.2.1 OPERATIONAL REQUIREMENTS FOR CHARTS

- (7) For the purposes of this Regulation, the total flight is divided into the following phases:
- Phase 1 Taxi from aircraft stand to take – off point
 - Phase 2 Take – off and climb to en – route ATS route structure
 - Phase 3 En – route ATS route structure
 - Phase 4 Descent to approach
 - Phase 5 Approach to land
 - Phase 6 Landing and Taxi to aircraft stand.

- (8) Each type of chart shall provide information relevant to the chart and its design shall observe Human factors principles which facilitate its optimum use.

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

- (9) Each type of chart shall provide information appropriate to the phases of flight, to ensure the safe and expeditious operation of the aircraft.

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

- (11) Colors or tints and type size used shall be such that the chart can be easily read and interpreted by the pilot in varying conditions of natural and artificial light.

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

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

- (14) The charts should be True North orientated.

- (15) The basic sheet size of the charts should be 210 × 148 mm (8.27 × 5.82 in) (A5)

21.2.2 TITLE

- (1) The title of a chart series prepared in accordance with the specifications contained in these Directives and intended to satisfy the function of the chart, shall be that of the relevant chapter heading as modified by application of any requirements contained therein, except that such title shall not include “ICAO” unless the chart conforms with all requirements specified in Subpart 21.2 and any requirements specified for the particular chart.

21.2.3 MISCELLANEOUS INFORMATION

- (1) The marginal note layout shall be as given in IS: 21.2.3.1, except as otherwise stated in the specification of the chart concerned.
- (2) The following information shall be shown on the face of each chart unless otherwise stated in the specification of the chart concerned:
 - a. designation or title of the chart;

Note. — The title may be abbreviated.

- b. name and reference of the sheet;
 - c. on each margin an indication of the adjoining sheet (when applicable).
- (3) A legend to the symbols and abbreviations used shall be provided. The legend shall be on the face of reverse of each chart is published as part of an aeronautical document; this information may be placed in the front of that document.
- (4) The name and adequate address of the producing agency shall be shown in the margin of the chart except that, where the chart is published as part of an aeronautical document, this information may be placed in the front of that document.

21.2.4 SYMBOLS

- (1) Symbols used shall conform to those shown in IS: 21.2.4.1. – ICAO Chart Symbols, except that where it is desired to show on an aeronautical chart special features or items of importance to civil aviation for which no ICAO symbol is at present provided, any appropriate symbol may be chosen for this purpose, provided, that it does not cause confusion with any existing ICAO chart symbol or impair the legibility of the chart.

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

- (2) To represent ground-based navigation aids, intersections and waypoints, the same basic symbol shall be used on all charts on which they appear, regardless of chart purpose.
- (3) The symbol used for significant points shall be based on a hierarchy of symbols and selected in the following order: ground-based navigation aid, intersection, waypoint symbol. A waypoint symbol shall be used only when a particular significant point does not already exist as either a ground-based navigation aid or intersection.
- (4) The Authority shall ensure that as of 18 November 2010, symbols are shown in the manner specified in Subparts 21.2.4(2), 21.2.4(3) and IS: 21.2.4.1 — ICAO Chart Symbols, symbol number 121.
- (5) The Authority should ensure that symbols are shown in the manner specified in 2.4.2, 2.4.3 and Appendix 2 — ICAO Chart Symbols, symbol number 121.

21.2.5 UNITS OF MEASUREMENT

- (1) Distances shall be derived as geodesic distances.
- (2) Distances shall be expressed in either kilometers or nautical miles or both, provided the units are clearly differentiated.
- (3) Altitudes, elevations and heights shall be expressed in either meters or feet or both, provided the units are clearly differentiated.
- (4) Linear dimensions on aerodromes and short distances shall be expressed in meters.
- (5) The order of resolution of distances, dimensions, elevations and heights shall be that as specified for a particular chart.
- (6) The units of measurements used to express distances, altitudes, elevations and heights shall be conspicuously stated on the face of each chart.
- (7) Conversion scales (kilometers or nautical miles, meters or feet) shall be provided on each chart on which distances, elevations or altitudes are shown. The conversion scales shall be placed on the face of each chart.

21.2.6 SCALE AND PROJECTION

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

21.2.7 DATE OF VALIDITY OF AERONAUTICAL INFORMATION

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

21.2.8 SPELLING OF GEOGRAPHICAL NAMES

- (1) The symbols of the Roman alphabet shall be used for all writing.
- (2) The names of places and of geographical features in countries which officially used varieties of the Roman alphabet shall be accepted in their official spelling, including the accents and diacritical marks used in the respective alphabets.
- (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 of the most important example of each type. Punctuation marks shall not be used in abbreviations within the body of chart.
- (4) In areas where romanized names have not been officially produced or adopted, and outside the territory of Liberia, names should be transliterated from the non-Roman alphabet form by the system generally used by the producing agency.

21.2.9 ABBREVIATIONS

- (1) Abbreviations shall be used on aeronautical charts whenever they are appropriate.

- (2) Where applicable, abbreviations should be selected from the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (Doc 8400).

21.2.10 POLITICAL BOUNDARIES

- (1) International boundaries shall be shown, but may be interrupted if data more important to the use of the chart would be obscured.
- (2) Where the territory of more than one state appears on a chart, the names identifying the countries shall be indicated.

21.2.11 COLORS

- (1) Colors used on charts should conform to ICAO Color Guide
- (2) Subdued colors should be used for the chart background to facilitate plotting.

21.2.12 RELIEF

- (1) Relief, where shown, shall be portrayed in a manner that will satisfy the chart users' need for:
 - a. orientation and identification;
 - b. safe terrain clearance;
 - c. clarity of aeronautical information when shown;
 - d. planning

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

- (2) Where spot elevations are used they shall be shown for selected critical points
- (3) The value of spot elevations of doubtful accuracy shall be followed by the sign +.

21.2.13 PROHIBITED, RESTRICTED AND DANGER AREAS

- (1) When prohibited (P), restricted (R) or danger (D) areas are shown, the reference or other identification shall be included, except that the nationality letters (GL) may be omitted.

Note. — *Nationality letters are those contained in Doc 7910 — Location Indicators.*

21.2.14 AIR TRAFFIC SERVICES AIRSPACES

- (1) When ATS airspace is shown on a chart, the class of airspace, the type, name or call sign, the vertical limits and the radio frequency(ies) to be used shall be indicated and the horizontal limits depicted in accordance with Appendix 2 — ICAO Chart Symbols.
- (2) On charts used for visual flight, those parts of the ATS Airspace Classes table (Appendix 4) in Annex 11 applicable to the airspace depicted on the chart should be on the face or reverse of each chart.

21.2.15 MAGNETIC VARIATION

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

- (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.*

- (3) For instrument procedure charts, the publication of a magnetic variation change should be completed within a maximum of six AIRAC cycles.
- (4) In large terminal areas with multiple aerodromes, a single rounded value of magnetic variation should be applied so that the procedures that service multiple aerodromes use a single, common variation value.

21.2.16 TYPOGRAPHY

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

21.2.17 AERONAUTICAL DATA

- (1) The Authority 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 Part26. The execution of such quality management shall be made demonstrable for each function stage, when required. In addition, states shall ensure that established procedures exist in order that aeronautical data at any moment is traceable to its origin so as to allow any data anomalies or errors, detected during the production/maintenance phases or in the operational use, to be corrected.

Note. — *Specifications governing the quality system are given in Part26 of Liberia Civil Aviation (ANS) Regulations.*

- (2) The Authority shall ensure that the chart resolution of aeronautical data shall be that as specified for a particular chart.

Note. — *Specifications concerning the chart resolution for aeronautical data are contained in PANS-AIM (Doc 10066), Appendix 1.*

- (3) The Authority shall ensure that integrity of aeronautical data is maintained throughout the data process from origination to distribution to the next intended user.

Note. — *Specifications concerning the integrity classification related to aeronautical data are provided in PANS-AIM (Doc 10066), Appendix 1.*

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

Note. — *Detailed specifications concerning digital data error detection techniques are contained in PANS-AIM (Doc 10066)*

21.2.18 COMMON REFERENCE SYSTEMS

21.2.18.1 HORIZONTAL REFERENCE SYSTEM

- (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).*

- (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 identified by an asterisk.
- (3) The chart resolution of geographical coordinates shall be that specified for a particular chart series.

Note 1. — *Specifications concerning the determination and reporting (accuracy of field work and data integrity) of WGS-84-related aeronautical coordinates for geographical positions established by air traffic services are given in Annex 11, Chapter 2; and for aerodrome/heliport-related positions, in Annex 14, Volumes I and II, Chapter 2.*

Note 2. — *Specifications concerning the accuracy and integrity classification of WGS-84-related aeronautical data are contained in PANS-AIM (Doc 10066), Appendix 1.*

21.2.18.2 VERTICAL REFERENCE SYSTEM

- (1) Mean sea level (MSL) datum, which keeps the relationship of gravity – related height (elevation) to a surface known as geoids, shall also be used as the vertical reference system.

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

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

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

Note 1. — *Specifications concerning the determination and reporting (accuracy of field work and data integrity) of elevation and geoid undulation at specific positions at aerodromes/heliports are given in Annex 14, Volumes I and II, Chapter 2.*

Note 2. — *Specifications concerning the accuracy and integrity classification of elevation and geoid undulation at specific positions at aerodromes/heliports are contained in PANS-AIM (Doc 10066), Appendix 1.*

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

Note. — *Specifications concerning the chart resolution of elevation and geoid undulation are contained in PANS-AIM (Doc 10066), Appendix 1*

21.2.18.3 TEMPORAL REFERENCE SYSTEM

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

21.3 AERODROME OBSTACLE CHART — ICAO TYPE A (OPERATING LIMITATIONS)

21.3.1 FUNCTION

This chart, in combination with the Aerodrome Obstacle Chart — ICAO Type C or with the relevant information published in the AIP, shall provide the data necessary to enable an operator to comply with the operating limitations of Part 8.

21.3.2 AVAILABILITY

- (1) Aerodrome Obstacle Charts — ICAO Type A (Operating Limitations) shall be made available in the manner prescribed in 21.1.3.2 for all aerodromes regularly used by international civil aviation, except for those aerodromes where there are no obstacles in the take-off flight path areas or where the Aerodrome Terrain and Obstacle Chart — ICAO (Electronic) is provided in accordance with Subpart 21.5 of this Part.
- (2) Where a chart is not required because no obstacles exist in the take-off flight path area, a notification to this effect shall be published in the Liberia AIP.

21.3.3 UNITS OF MEASUREMENT

- (1) Elevations shall be shown to the nearest half-meter or to the nearest foot.
- (2) Linear dimensions shall be shown to the nearest half-meter.

21.3.4 COVERAGE AND SCALE

- (1) The extent of each plan shall be sufficient to cover all obstacles.

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

- (2) The horizontal scale shall be within the range of 1:10 000 to 1:15 000.
- (3) The vertical scale shall be ten times the horizontal scale.
- (4) Linear scales. Horizontal and vertical linear scales showing both meters and feet shall be included in the charts.

21.3.5 FORMAT

- (1) The charts shall depict a plan and profile of each runway, any associated stopway or clearway, the take-off flight path area and obstacles.
- (2) The profile for each runway, stopway, clearway and the obstacles in the take-off flight path area shall be shown above its corresponding plan. The profile of an alternative

take-off flight path area shall comprise a linear projection of the full take-off flight path and shall be disposed above its corresponding plan in the manner most suited to the ready interpretation of the information.

- (3) A profile grid shall be ruled over the entire profile area exclusive of the runway. The zero for vertical coordinates shall be mean sea level. The zero for horizontal coordinates shall be the end of the runway furthest from the take-off flight path area concerned. Graduation marks indicating the subdivisions of intervals shall be shown along the base of the grid and along the vertical margins.
- (4) The chart shall include:
 - a) a box for recording the operational data specified in 21.3.8(3);
 - b) a box for recording amendments and dates thereof.

21.3.6 IDENTIFICATION

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

21.3.7 MAGNETIC VARIATION

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

21.3.8 AERONAUTICAL DATA

21.3.8.1 OBSTACLES

- (1) Objects in the take-off flight path area which project above a plane surface having a 1.2 per cent slope and having a common origin with the take-off flight path area, shall be regarded as obstacles, except that obstacles lying wholly below the shadow of other obstacles as defined in 21.3.8.1(2) need not be shown. Mobile objects such as boats, trains and trucks, which may project above the 1.2 per cent plane, shall be considered obstacles but shall not be considered as being capable of creating a shadow.
- (2) The shadow of an obstacle is considered to be a plane surface originating at a horizontal line passing through the top of the obstacle at right angles to the Centre line of the take-off flight path area. The plane covers the complete width of the take-off flight path area and extends to the plane defined in 21.3.8.1(1) or to the next higher obstacle if it occurs first. For the first 300 m (1 000 ft.) of the take-off flight path area, the shadow planes are horizontal and beyond this point such planes have an upward slope of 1.2 per cent.
- (3) If the obstacle creating a shadow is likely to be removed, objects that would become obstacles by its removal shall be shown.

21.3.8.2 TAKE-OFF FLIGHT PATH AREA

- (1) The take-off flight path area consists of a quadrilateral area on the surface of the earth lying directly below, and symmetrically disposed about, the take-off flight path. This area has the following characteristics
- (2)
 - a) it commences at the end of the area declared suitable for take-off (i.e. at the end of the runway or clearway as appropriate);
 - b) its width at the point of origin is 180 m (600 ft.) and this width increases at the rate of 0.25D to a maximum of 1 800 m (6 000 ft.), where D is the distance from the point of origin;
 - c) it extends to the point beyond which no obstacles exist or to a distance of 10.0 km (5.4 NM), whichever is the lesser.

- (3) For runways serving aircraft having operating limitations which do not preclude the use of a take-off flight path gradient of less than 1.2 per cent, the extent of the takeoff flight path area specified in 21.3.8.2.1(c) shall be increased to not less than 12.0 km (6.5 NM) and the slope of the plane surface specified in 21.3.8.1(1) and 21.3.8.1(2) shall be reduced to 1.0 per cent or less.

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

21.3.8.3 DECLARED DISTANCES

- (1) The following information for each direction of each runway shall be entered in the space provided:
- (a) take-off run available;
 - (b) accelerate-stop distance available;
 - (c) take-off distance available;
 - (d) landing distance available.
- (2) Where a declared distance is not provided because a runway is usable in one direction only, that runway should be identified “not usable for take-off, landing or both”.

21.3.8.4 PLAN AND PROFILE VIEWS

- (1) The plan view shall show:
- a) the outline of the runways by a solid line, including the length and width, the magnetic bearing to the nearest degree, and the runway number;
 - b) the outline of the clearways by a broken line, including the length and identification as such;
 - c) take-off flight path areas by a dashed line and the Centre line by a fine line consisting of short and long dashes;
 - d) alternative take-off flight path areas. When alternative take-off flight
 - e) path areas not centered on the extension of the runway Centre line are shown, notes shall be provided explaining the significance of such areas;
 - f) obstacles, including:
 - g) the exact location of each obstacle together with a symbol indicative of its type;
 - h) the elevation and identification of each obstacle;
 - i) the limits of penetration of obstacles of large extent in a distinctive manner identified in the legend.
- (2) Stopways should be identified as such and should be shown by a broken line.

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

- (3) When stopways are shown, the length of each stopway shall be indicated.
- (4) The profile view shall show:
- a) the profile of the center line of the runway by a solid line and the profile of the center line of any associated stopways and clearways by a broken line;

- b) the elevation of the runway center line at each end of the runway, at the stopway and at the origin of each takeoff flight path area, and at each significant change in slope of runway and stopway;
- c) obstacles, including:
- d) each obstacle by a solid vertical line extending from a convenient grid line over at least one other grid line to the elevation of the top of the obstacle;
- e) identification of each obstacle;
- f) the limits of penetration of obstacles of large extent in a distinctive manner identified in the legend.

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

21.3.9 ACCURACY

- 1) The order of accuracy attained shall be shown on the chart.
- 2) The horizontal dimensions and the elevation of the runway stopway and clearway to be printed on the chart should be determined to the nearest 0.5m (1ft)
- 3) Datum. Where no accurate datum for vertical reference is available, the elevation of the datum used shall be stated and shall be identified as assumed.

21.4 AERODROME OBSTACLE CHART- ICAO TYPE B

21.4.1 FUNCTION

This chart shall provide information to satisfy the following functions:

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

21.4.2 AVAILABILITY

When a chart combining the specifications of 21.3 and 21.4 is made available, it shall be called the Aerodrome Obstacle Chart — ICAO (Comprehensive).

21.4.3 UNITS OF MEASUREMENT

- (1) Elevations shall be shown to the nearest half-meter or to the nearest foot.
- (2) Linear dimensions shall be shown to the nearest half-meter.

21.4.4 COVERAGE AND SCALE

- (1) The extent of each plan shall be sufficient to cover all obstacles.

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

- (2) The horizontal scale shall be within the range of 1:10 000 to 1:20 000.
- (3) A horizontal linear scale showing both meters and feet shall be included in the chart. When necessary, a linear scale for kilometers and a linear scale for nautical miles shall also be shown.

21.4.5 FORMAT

The charts shall include:

- a) any necessary explanation of the projection use;
- b) any necessary identification of the grid used;
- c) a notation indicating that obstacles are those which penetrate the surfaces specified in Part 13 of the Liberia Civil Aviation Aerodrome Regulations,
- d) a box for recording amendments and dates thereof;
- e) outside the neat line, every minute of latitude and longitude marked in degrees and minutes.

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

21.4.6 IDENTIFICATION

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

21.4.7 CULTURE AND TOPOGRAPHY

- (1) Drainage and hydrographic details shall be kept to a minimum.
- (2) Buildings and other salient features associated with the aerodrome shall be shown. Wherever possible, they shall be shown to scale.
- (3) All objects, either cultural or natural, that project above the take-off and approach surfaces specified in 21.4.9 or the clearing and marking surfaces specified in Part 13, shall be shown.
- (4) Roads and railroads within the take-off and approach area, and less than 600 m (2 000 ft) from the end of the runway or runway extensions, shall be shown.
- (5) Note. — Geographical names of features may be shown if of significance.

21.4.8 MAGNETIC VARIATION

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

21.4.9 AERONAUTICAL DATA

The charts shall show:

- (a) the aerodrome reference point and its geographical coordinates in degrees, minutes and seconds;
- (b) the outline of the runways by a solid line;
- (c) the length and width of the runway;
- (d) the magnetic bearing to the nearest degree of the runway and the runway number;
- (e) the elevation of the runway center line at each end of the runway, at the stopway, at the origin of each takeoff and approach area, and at each significant change of slope of runway and stopway;
- (f) taxiways, aprons and parking areas identified as such, and the outlines by a solid line;
- (g) stopways identified as such and depicted by a broken line;
- (h) the length of each stopway;
- (i) clearways identified as such and depicted by a broken line;

- (j) the length of each clearway;
- (k) take-off and approach surfaces identified as such and depicted by a broken line;
- (l) take-off and approach areas;

Note. — *The take-off area is described in 21.3.8.2(1) The approach area consists of an area on the surface of the earth lying directly below the approach surface as specified in Part 13 of the Liberia Civil Aviation (Aerodrome) Regulations.*

- (m) significant obstacles at their exact location, including:
 - i. a symbol indicative of their type;
 - ii. elevation;
 - iii. identification;
 - iv. limits of penetration of large extent in a distinctive manner identified in the legend;

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

- (n) any additional obstacles, as determined by 21.3.8.1(1) including the obstacles in the shadow of an obstacle, which would otherwise be exempted.

Note. — *The specifications in Part 13 of the Liberia Civil Aviation (Aerodrome) Regulations, are minimum requirements. Where the competent authority has established lower surfaces, they may be used in the determination of obstacles.*

21.4.10 ACCURACY

- (1) The order of accuracy attained shall be shown on the chart.
- (2) Datum. Where no accurate datum for vertical reference is available, the elevation of the datum used shall be stated and identified as assumed.

21.5 AERODROME TERRAIN AND OBSTACLE CHART — ICAO (ELECTRONIC)

21.5.1 FUNCTION

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

- (a) enable an operator to comply with the operating limitations of Part 8 of the Liberia Civil Aviation (Safety) Regulations by developing contingency procedures for use in the event of an emergency during a missed approach or take-off, and by performing aircraft operating limitations analysis; and
- (b) support the following air navigation applications:
 - I. instrument procedure design (including circling procedure);
 - II. aerodrome obstacle restriction and removal; and
 - III. provision of source data for the production of other aeronautical charts.

21.5.2 AVAILABILITY

Aerodrome Terrain and Obstacle Charts — ICAO (Electronic) shall be made available in the manner prescribed in 21.1.3.2 for aerodromes regularly used by international civil aviation.

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

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

Recommendation. — Aerodrome Terrain and Obstacle Charts — ICAO (Electronic) should be made available in the manner prescribed in 21.1.3.2 for all aerodromes regularly used by international civil aviation.

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

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

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

21.5.3 IDENTIFICATION

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

21.5.4 CHART COVERAGE

The extent of each chart shall be sufficient to cover Area 2 as specified in subpart Part 26 of the Liberia Civil Aviation (ANS) Regulations.

21.5.5 CHART CONTENT

21.5.5.1 GENERAL

(1) When developing computer graphic applications that are used to portray features on the chart, the relationships between features, feature attributes, and the underlying spatial geometry and associated topological relationships shall be specified by an application schema. Portrayed information shall be provided on the basis of portrayal specifications applied according defined portrayal rules. Portrayal specifications and portrayal rules shall not be part of the data set. Portrayal rules shall be stored in a portrayal catalogue which shall make reference to separately stored portrayal specifications.

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

(2) Symbols used to portray features shall be in accordance with 21.2.4 and 21.2.1.4(1) — ICAO Chart Symbols.

21.5.5.2 TERRAIN FEATURE

- (1) The terrain feature, and associated attributes, to be portrayed and database-linked to the chart shall be based on the electronic terrain data sets which satisfy the requirements of Part 26.

Note. — *Specifications concerning terrain data sets are contained in PANS-AIM (Doc 10066), Chapter 5 and Appendices 1,*

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

Note. — *In accordance with Part 26, the DEM for Area 2 post spacing (grid) is specified at 1 arc second (approximately 30 m).*

- (3) Representation of terrain surface should be provided as a selectable layer of contour lines in addition to the DEM.
- (4) An ortho-rectified image which matches the features on the DEM with features on the overlying image should be used to enhance the DEM. The image should be provided as a separate selectable layer.
- (5) The portrayed terrain feature shall be linked to the following associated attributes in the database(s):
 - (a) horizontal positions of grid points in geographic coordinates and elevations of the points;
 - (b) surface type;
 - (c) contour line values, if provided; and
 - (d) names of cities, towns and other prominent topographic features.
- (6) Additional terrain attributes provided in the database(s) should be linked to the portrayed terrain feature.

Note. — *Specifications concerning terrain attributes are contained in PANS-AIM (Doc10066), Appendix 6, Table A6-1.*

21.5.5.3 OBSTACLE FEATURES

- (1) Obstacle features, and associated attributes, portrayed or database-linked to the chart shall be based on electronic obstacle data sets which satisfy the requirements of Part 26.

Note. — *Specifications concerning obstacle data sets are contained in PANS-AIM (Doc10066), Chapter 5 and Appendices 1, 6 and 8.*

- (2) Each obstacle shall be portrayed by an appropriate symbol and obstacle identifier.
- (3) The portrayed obstacle feature shall be linked to the following associated attributes in the database(s)
 - a) horizontal position in geographic coordinates and associated elevation;
 - b) obstacle type; and
 - c) obstacle extent, if appropriate.

- (4) Additional obstacle attributes provided in the database(s) should be linked to the portrayed obstacle feature.

Note. — *Specifications concerning obstacle attributes are contained in PANS-AIM (Doc 10066), Appendix 6, Table A6-2.*

21.5.5.4 AERODROME FEATURES

- (1) Aerodrome features, and associated attributes, portrayed and database-linked to the chart shall be based on aerodrome data which satisfy the requirements of Part 13.

Note. — *Specifications concerning aerodrome features and associated attributes are contained in PANS-AIM (Doc 10066), Chapter 5 and Appendix 1.*

- (2) The following aerodrome features shall be portrayed by an appropriate symbol:
 - (a) aerodrome reference point;
 - (b) runway(s), with designation numbers, and if available, stopway(s) and clearway(s); and
 - (c) taxiways, aprons, large buildings and other prominent aerodrome features.
- (3) The portrayed aerodrome feature shall be linked to the following associated attributes in the database(s):
 - (a) geographical coordinates of the aerodrome reference point;
 - (b) aerodrome magnetic variation, year of information and annual change;

Note. — *Magnetic variation may be database-linked to the aerodrome reference point.*

- (c) length and width of runway(s), stopway(s) and clearway(s);
- (d) type of surface of runway(s) and stopway(s);
- (e) magnetic bearings of the runway(s) to the nearest degree;
- (f) elevations at each end of runway(s), stopway(s) and clearway(s), and at each significant change in slope of runway(s) and stopway(s);
- (g) declared distances for each runway direction, or the abbreviation “NU” where a runway direction cannot be used for take-off or landing or both.

Note. — *Part 14, Attachment A, provides guidance on declared distances.*

21.5.5.5 RADIO NAVIGATION AID FEATURES

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

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

21.5.6 ACCURACY AND RESOLUTION

- (1) The order of accuracy of aeronautical, terrain and obstacle data shall be in accordance with its intended use.

Note. — *Specifications concerning the accuracy of aeronautical, terrain and obstacle data are contained in the PANS-AIM (Doc 10066), Appendix 1.*

- (2) The aeronautical, terrain and obstacle data resolution shall be commensurate with the actual data accuracy.

Note. — *Specifications concerning the order of resolution for aeronautical, terrain and obstacle data are provided in the PANS-AIM (Doc 10066), Appendix 1.*

21.5.7 ELECTRONIC FUNCTIONALITY

- (1) It shall be possible to vary the scale at which the chart is viewed. Symbols and text size shall vary with chart scale to enhance readability.
- (2) Information on the chart shall be geo-referenced, and it shall be possible to determine cursor position to at least the nearest second.
- (3) The chart shall be compatible with widely available desktop computer hardware, software and media.
- (4) The chart should include its own “reader” software.
- (5) It shall not be possible to remove information from the chart without an authorized update.
- (6) When, due to congestion of information, the details necessary to support the function of the chart cannot be shown with sufficient clarity on a single comprehensive chart view, selectable information layers shall be provided to allow for the customized combination of information.

Note. — *An electronic chart format with user-selectable information layers is the preferred method of presentation for most aerodrome features.*

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

Note 1. — *Printed output may consist of “tiled” sheets or specific selected areas according to user requirements.*

Note 2. — *Feature attribute information available through database link may be supplied separately on appropriately referenced sheets.*

21.5.8 CHART DATA PRODUCT SPECIFICATIONS

- (1) A comprehensive statement of the data sets comprising the chart shall be provided in the form of data product specifications on which basis air navigation users will be able to evaluate the chart data product and determine whether it fulfills the requirements for its intended use (application).
- (2) The chart data product specifications shall include an overview, a specification scope, a data product identification, data content information, the reference systems used, the data quality requirements, and information on data capture, data maintenance, data portrayal, data product delivery, as well as any additional information available, and metadata.

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

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

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

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

- (5) The chart data product specifications shall include information that defines the reference systems used. This shall include the spatial reference system (horizontal and vertical) and, if appropriate, temporal reference system. The chart data product specifications shall identify the data quality requirements. This shall include a statement on acceptable conformance quality levels and corresponding data quality measures. This statement shall cover all the data quality elements and data quality sub-elements, even if only to state that a specific data quality element or sub-element is not applicable.
- (6) Note. — ISO Standard 19113 contains quality principles for geographic information while ISO Standard 19114 covers quality evaluation procedures.
- (7) The chart data product specifications shall include a data capture statement which shall be a general description of the sources and of processes applied for the capture of chart data. The principles and criteria applied in the maintenance of the chart shall also be provided in the chart data product specifications, including the frequency with which the chart product is updated. Of particular importance shall be the maintenance information of obstacle data sets included on the chart and an indication of the principles, methods and criteria applied for obstacle data maintenance.
- (8) The chart data product specifications shall contain information on how data are portrayed on the chart, as detailed in 21.5.5.1. The chart data product specifications shall also contain data product delivery information which shall include delivery formats and delivery medium information.
- (9) The core chart metadata elements shall be included in the chart data product specifications
- (10) Any additional metadata items required to be supplied shall be stated in the product specifications together with the format and encoding of the metadata.

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

Note 2. — The chart data product specifications document the chart data product which is implemented as data set. Those data sets are described by metadata.

21.6 PRECISION APPROACH TERRAIN CHART — ICAO

21.6.1 FUNCTION

The chart shall provide detailed terrain profile information within a defined portion of the final approach so as to enable aircraft operating agencies to assess the effect of the terrain on decision height determination by the use of radio altimeters.

21.6.2 AVAILABILITY

- (1) The Precision Approach Terrain Chart — ICAO shall be made available for all precision approach runways Categories II and III at aerodromes used by international civil aviation, except where the requisite information is provided in the Aerodrome Terrain and Obstacle Chart— ICAO (Electronic) in accordance with 21.5.

- (2) The Precision Approach Terrain Chart — ICAO shall be revised whenever any significant change occurs.

21.6.3 IDENTIFICATION

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

21.6.4 PLAN AND PROFILE INFORMATION

The chart shall include:

- (a) a plan showing contours at 1 m (3 ft.) intervals in the area 60 m (200 ft.) on either side of the extended center line of the runway, to the same distance as the profile, the contours to be related to the runway threshold;
- (b) an indication where the terrain or any object thereon, within the plan defined in (a) above, differs by D3 m (10 ft.) in height from the center line profile and is likely to affect a radio altimeter;
- (c) a profile of the terrain to a distance of 900 m (3 000 ft.) from the threshold along the extended center line of the runway.

21.7 ENROUTE CHART — ICAO

21.7.1 FUNCTION

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

21.7.2 AVAILABILITY

- (1) The Enroute Chart — ICAO shall be made available in the manner prescribed in 21.1.3.2 for all areas where flight information regions have been established.

Note. — *Under certain conditions, an Area Chart — ICAO may have to be provided. (See 21.8.)*

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

21.7.3 COVERAGE AND SCALE

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

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

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

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

21.7.4 PROJECTION

- (1) Parallels and meridians shall be shown at suitable intervals.
- (2) Graduation marks shall be placed at consistent intervals along selected parallels and meridians.

21.7.5 IDENTIFICATION

Each sheet shall be identified by chart series and number.

21.7.6 CULTURE AND TOPOGRAPHY

- (1) Generalized shore lines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart.
- (2) Within each quadrilateral formed by the parallels and meridians the area minimum altitude shall be shown, except as provided for in 21.7.6(3).

Note 1. — Quadrilaterals formed by the parallels and meridians normally correspond to the whole degree of latitude and longitude. Regardless of the chart scale being used, the area minimum altitude relates to the consequent quadrilateral.

Note 2. — Refer to the Procedures for Air Navigation — Aircraft Operations (PANS OPS, Doc 8168), Volume II, Part I, Section 2, Chapter 1, 1.8, for method for determination of area minimum altitude.

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

21.7.7 BEARINGS, TRACKS AND RADIALS

- (1) Bearings, tracks and radials shall be magnetic, except as provided for in 21.7.8.2. Where bearings and tracks are additionally provided as true values for RNAV segments, they shall be shown in parentheses to the nearest tenth of a degree, e.g. 290° (294.9°T).
- (2) Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used its reference grid meridian shall be identified.

21.7.8 AERONAUTICAL DATA

21.7.8.1 AERODROMES

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

Note. — *Other aerodromes may be shown.*

21.7.8.2 PROHIBITED (GLP), RESTRICTED (GLR) AND DANGER (GLD) AREAS

The prohibited, restricted and danger areas relevant to the layer of airspace, shall be depicted with their identification and vertical limits.

21.7.8.3 AIR TRAFFIC SERVICES SYSTEM

- 1) Where appropriate, the components of the established air traffic services system
- 2) shall be shown.
- 3) The components shall include the following:
 - a) the radio navigation aids associated with the air traffic services system together with their names, identifications, frequencies and geographical coordinates in degrees, minutes and seconds
 - b) in respect of DME, additionally the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft.);
 - c) an indication of all designated airspace, including lateral and vertical limits and the appropriate class of airspace;
 - d) all ATS routes for en-route flight including route designators, required navigation performance (RNP) types, the track to the nearest degree in both directions along each segment of the routes and, where applicable, the direction of traffic flow;

Note. — *Guidance material on the organization of ATS routes for en-route flight publication which may be used to facilitate charting is contained in the Aeronautical Information Services Manual (Doc 8126).*

- e) all significant points which define the ATS routes and are not marked by the position of a radio navigation aid, together with their name-codes and geographical coordinates in degrees, minutes and seconds;
- f) in respect of waypoints defining VOR/DME area navigation routes, additionally,
 - i. the station identification and radio frequency of the reference VOR/DME;
 - ii. the bearing to the nearest tenth of a degree and the distance to the nearest two-tenths of a kilometer (tenth of a nautical mile) from the reference VOR/DME, if the waypoint is not collocated with it;
- g) an indication of all compulsory and “on-request” reporting points and ATS/MET reporting points;
- h) the distances to the nearest kilometer or nautical mile between significant points constituting turning points or reporting points;

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

- i) change-over points on route segments defined by reference to very high frequency Omni-directional radio ranges, indicating the distances to the nearest kilometer or nautical mile to the navigation aids;
- j) Note. — Change-over points established at the mid-point between two aids, or at the intersection of two radials in the case of a route which changes direction between the aids, need not be shown for each route segment if a general statement regarding their existence is made.
- k) minimum flight altitudes on ATS routes to the nearest higher 50 metres or 100 feet (see Part 24, 24.2.2);
- l) communication facilities listed with their channels and, if applicable, logon address and satellite voice communications (SATVOICE) number; and
- m) air defense identification zone (ADIZ) properly identified.

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

21.7.8.4 SUPPLEMENTARY INFORMATION

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

Note 1. — *For specifications of these charts, see 21.8, 21.9 and 21.10.*

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

- 2) Where established, altimeter setting regions shall be shown and identified.

21.8 AREA CHART — ICAO

21.8.1 FUNCTION

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

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

Note. — *The function described in 21.8.1(c) may be satisfied by a separate chart or an inset on an Enroute Chart — ICAO.*

21.8.2 AVAILABILITY

- (1) The Area Chart — ICAO shall be made available in the manner prescribed in 21.1.3.2 where the air traffic services routes or position reporting requirements are complex and cannot be adequately shown on an Enroute Chart — ICAO.
- (2) Where air traffic services routes or position reporting requirements are different for arrivals and for departures, and these cannot be shown with sufficient clarity on one chart, separate charts shall be provided.

Note. — *Under certain conditions, a Standard Departure Chart — Instrument (SID) — ICAO and a Standard Arrival Chart — Instrument (STAR) — ICAO may have to be provided (see Chapters 21.9 and 21.10).*

21.8.3 COVERAGE AND SCALE

- (1) The coverage of each chart shall extend to points that effectively show departure and arrival routes.
- (2) The chart shall be drawn to scale and a scale-bar shown.

21.8.4 PROJECTION

- (1) Parallels and meridians shall be shown at suitable intervals.
- (2) Graduation marks shall be placed at consistent intervals along the neat lines, as appropriate.

21.8.5 IDENTIFICATION

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

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

21.8.6 CULTURE AND TOPOGRAPHY

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

21.8.7 MAGNETIC VARIATION

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

21.8.8 BEARINGS, TRACKS AND RADIALS

- (1) Bearings, tracks and radials shall be magnetic, except as provided for in 21.8.8(2). Where bearings and tracks are additionally provided as true values for RNAV segments, they shall be shown in parentheses to the nearest tenth of a degree, e.g. 290° (294.9°T).
- (2) Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used, its reference grid meridian shall be identified.

21.8.9 AERONAUTICAL DATA

21.8.9.1 AERODROMES

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

21.8.9.2 PROHIBITED, RESTRICTED AND DANGER AREAS

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

21.8.9.3 AREA MINIMUM ALTITUDES

Area minimum altitudes shall be shown within quadrilaterals formed by the parallels and meridians. Depending on the selected chart scale, quadrilaterals formed by the parallels and meridians normally correspond to the whole degree of latitude and longitude.

Note 1. — *Quadrilaterals formed by the parallels and meridians normally correspond to the whole degree of latitude and longitude. Regardless of the chart scale being used, the area minimum altitude relates to the consequent quadrilateral.*

Note 2. — *Refer to the Procedures for Air Navigation — Aircraft Operations (PANS OPS, Doc 8168), Volume II, Part I, Section 2, Chapter 1, 1.8, for method for determination of area minimum altitude.*

21.8.9.4 AIR TRAFFIC SERVICES SYSTEM

- (1) The components of the established relevant air traffic services system shall be shown.
- (2) The components shall include the following:
 - (a) the radio navigation aids associated with the air traffic services system together with their names, identifications, frequencies and geographical coordinates in degrees, minutes and seconds;
 - (b) in respect of DME, additionally the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft.);
 - (c) terminal radio aids which are required for outbound and inbound traffic and for holding patterns;
 - (d) the lateral and vertical limits of all designated airspace and the appropriate class of airspace;
 - (e) the designation of the navigation specification(s) including any limitations, where established;
 - (f) holding patterns and terminal routings, together with the route designators, and the track to the nearest degree along each segment of the prescribed airways and terminal routings;
 - (g) all significant points which define the terminal routings and are not marked by the position of a radio navigation aid, together with their name-codes and geographical coordinates in degrees, minutes and seconds;
 - (h) in respect of waypoints defining VOR/DME area navigation routes, additionally,
 - i. the station identification and radio frequency of the reference VOR/DME;
 - ii. the bearing to the nearest tenth of a degree and the distance to the nearest two-tenths of a kilometer (tenth of a nautical mile) from the reference VOR/DME, if the waypoint is not collocated with it;
 - (i) an indication of all compulsory and “on-request” reporting points;
 - (j) the distances to the nearest kilometer or nautical mile between significant points constituting turning points or reporting points;

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

- (k) change-over points on route segments defined by reference to very high frequency omnidirectional radio ranges, indicating the distances to the nearest kilometer or nautical mile to the radio navigation aids;
- (l) minimum flight altitudes on ATS routes to the nearest higher 50 m or 100 ft (see Part 24);
- (m) established radar minimum altitudes to the nearest higher 50 m or 100 ft, clearly identified;

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

Note 2. — *Where excessive chart clutter will result, an ATC Surveillance Minimum Altitude Chart — ICAO may be provided (see 21.21), in which case the elements indicated need not be duplicated on the Area Chart — ICAO.*

- (n) area speed and level/altitude restrictions where established;

- (o) communication facilities listed with their channels and, if applicable, logon address and SATVOICE number; and an indication of “flyover” significant points.
 - (p) an indication of “flyover” significant points.
- (3) A textual description of standard arrival route(s) — instrument (STAR) and relevant communication failure procedures should be provided and should, whenever feasible, be shown on the chart or on the same page which contains the chart.

21.9 STANDARD DEPARTURE CHART INSTRUMENT (SID) — ICAO

21.9.1 FUNCTION

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

- Note 1. — *Provisions governing the identification of standard departure routes are in Part 26 guidance material relating to the establishment of such routes is contained in the Air Traffic Services Planning Manual (Doc 9426).*
- Note 2. — *Provisions governing obstacle clearance criteria and details of the minimum information to be published are contained in the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume II, Part II.*

21.9.2 AVAILABILITY

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

21.9.3 COVERAGE AND SCALE

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

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

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

21.9.4 PROJECTION

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

21.9.5 IDENTIFICATION

The chart shall be identified by the name of the city or town, or area, which the aerodrome serves, the name of the aerodrome and the identification of the standard departure

route(s) — instrument as established in accordance with the Procedures for Air Navigation Services — Aircraft Operations(PANS-OPS, Doc 8168), Volume II, Part II, Chapter 5.

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

21.9.6 CULTURE AND TOPOGRAPHY

- (1) Where the chart is drawn to scale, generalized shore lines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart.
- (2) The next higher suitable contour line appearing on base topographic maps exceeding 300 m (1 000 ft.) above the aerodrome elevation may be selected to start layer tinting.

Note 1. — *The next higher suitable contour line appearing on base topographic*

Note 2. — *Appropriate spot elevations and obstacles are those provided by the procedures specialist*

21.9.7 MAGNETIC VARIATION

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

21.9.8 BEARINGS, TRACKS AND RADIALS

- (1) Bearings, tracks and radials shall be magnetic, except as provided for in 21.9.8.2. Where bearings and tracks are additionally provided as true values for RNAV segments, they shall be shown in parentheses to the nearest tenth of a degree, e.g. 290° (294.9°T).

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

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

21.9.9 AERONAUTICAL DATA

21.9.9.1 AERODROMES

- (1) The aerodrome of departure shall be shown by the runway pattern.
- (2) All aerodromes which affect the designated standard departure route — instrument shall be shown and identified. Where appropriate the aerodrome runway patterns shall be shown.

21.9.9.2 PROHIBITED, RESTRICTED AND DANGER AREAS

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

21.9.9.3 MINIMUM SECTOR ALTITUDE

- (1) The established minimum sector altitude, based on a navigation aid associated with the procedure, shall be shown with a clear indication of the sector to which it applies.
- (2) Where the minimum sector altitude has not been established, the chart shall be drawn to scale and area minimum altitudes shall be shown within quadrilaterals formed by the parallels and meridians. Area minimum altitudes shall also be shown in those parts of the chart not covered by the minimum sector altitude.

Note 1. — *Quadrilaterals formed by the parallels and meridians normally correspond to the half degree of latitude and longitude. Regardless of the chart scale being used, the area minimum altitude relates to the consequent quadrilateral.*

Note 2. — *Refer to the Procedures for Air Navigation — Aircraft Operations (PANS OPS, Doc 8168), Volume II, Part I, Section 2, Chapter 1, 1.8, for method for determination of area minimum altitude.*

21.9.10 AIR TRAFFIC SERVICES SYSTEM

- (1) The components of the established relevant air traffic services system shall be shown.
- (2) The components shall comprise the following:
 - (a) a graphic portrayal of each standard departure route — instrument, including:
 - i. for departure procedures designed specifically for helicopters, the term “CAT H” shall be depicted in the departure chart plan view;
 - ii. route designator;
 - iii. significant points defining the route;
 - iv. track or radial to the nearest degree along each segment of the route;
 - v. distances to the nearest kilometer or nautical mile between significant points;
 - vi. minimum flight altitudes along the route or route segments and altitudes required by the procedure to the nearest higher 50 m or 100 ft. and flight level restrictions where established;
 - vii. where the chart is drawn to scale and radar vectoring on departure is provided, established radar minimum altitudes to the nearest higher 50 m or 100 ft., clearly identified

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

Note 2. — *Where excessive chart clutter will result, an ATC Surveillance Minimum Altitude Chart — ICAO may be provided (see 21.21), in which case the elements indicated need not be duplicated on the Standard Departure Chart— Instrument (SID) — ICAO.*

- (b) the radio navigation aid(s) associated with the route(s) including:
 - i. plain language name;
 - ii. identification;
 - iii. frequency;
 - iv. geographical coordinates in degrees, minutes and seconds;

- v. for DME, the channel and the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft.);
- vi. the name-codes of the significant points not marked by the position of a radio navigation aid, their geographical coordinates in degrees, minutes and seconds and the bearing to the nearest tenth of a degree and distance to the nearest two-tenths of a kilometer (tenth of a nautical mile) from the reference radio navigation aid;
- vii. applicable holding patterns;
- viii. transition altitude/height to the nearest higher 300 m or 1 000 ft.;
- ix. the position and height of close-in obstacles which penetrate the obstacle identification surface (OIS). A note shall be included whenever close-in obstacles penetrating the OIS exist but which were not considered for the published procedure design gradient;

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

- (c) area speed restrictions, where established;
- (d) the designation of the navigation specification(s) including any limitations, where established;
- (e) all compulsory and “on-request” reporting points;
- (f) radio communication procedures, including:
 - i. call sign(s) of ATS unit(s);
 - ii. frequency and if applicable, SATVOICE number
 - iii. transponder setting, where appropriate.
- (g) an indication of “flyover” significant points.

21.9.11 AERONAUTICAL DATABASE REQUIREMENTS

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

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

21.10 STANDARD ARRIVAL CHART INSTRUMENT (STAR) — ICAO

21.10.1 FUNCTION

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

Note 1. — *Standard arrival routes — instrument are to be interpreted as including “standard descent profiles”, “continuous descent approach”, and other non-standard descriptions. In the case of a standard descent profile, the depiction of a cross-section is not required*

Note 2. — *Provisions governing the identification of standard arrival routes are in Part 24; guidance material relating to the establishment of such routes is contained in the Air Traffic Services Planning Manual (Doc 9426).*

21.10.2 AVAILABILITY

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

21.10.3 COVERAGE AND SCALE

- (1) The coverage of the chart shall be sufficient to indicate the points where the en-route phase ends and the approach phase begins.
- (2) If the chart is drawn to scale, a scale-bar shall be shown.
- (3) When the chart is not drawn to scale the annotation “NOT TO SCALE” shall be shown and the symbol for scale break shall be used on tracks and other aspects of the chart which are too large to be drawn to scale.

21.10.4 PROJECTION

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

21.10.5 IDENTIFICATION

The chart shall be identified by the name of the city or town or area which the aerodrome serves, the name of the aerodrome, and the identification of the standard arrival route(s) — instrument as established in accordance with the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume II, Part I, Section 4, Chapter 2.

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

21.10.6 CULTURE AND TOPOGRAPHY

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

21.10.6.1 MAGNETIC VARIATION

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

21.10.6.2 BEARINGS, TRACKS AND RADIALS

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

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

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

21.10.7 AERONAUTICAL DATA

21.10.7.1 AERODROMES

- (1) The aerodrome of landing shall be shown by the runway pattern.
- (2) All aerodromes which affect the designated standard arrival route — instrument shall be shown and identified. Where appropriate the aerodrome runway patterns shall be shown.

21.10.7.2 PROHIBITED, RESTRICTED AND DANGER AREAS

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

21.10.7.3 MINIMUM SECTOR ALTITUDE

- (1) The established minimum sector altitude shall be shown with a clear indication of the sector to which it applies.
- (2) Where the minimum sector altitude has not been established, the chart shall be drawn to scale and area minimum altitudes shall be shown within quadrilaterals formed by the parallels and meridians. Area minimum altitudes shall also be shown in those parts of the chart not covered by the minimum sector altitude.

Note 1. — *Quadrilaterals formed by the parallels and meridians normally correspond to the half degree of latitude and longitude. Regardless of the chart scale being used, the area minimum altitude relates to the consequent quadrilateral.*

Note 2. — *Refer to the Procedures for Air Navigation — Aircraft Operations (PANS OPS, Doc 8168), Volume II, Part I, Section 2, Chapter 1, 1.8, for method for determination of area minimum altitude.*

21.10.7.4 AIR TRAFFIC SERVICES SYSTEM

- (1) The components of the established relevant air traffic services system shall be shown.
- (2) The components shall comprise the following:
 - (a) a graphic portrayal of each standard arrival route —instrument, including:
 - i. route designator;
 - ii. significant points defining the route;
 - iii. track or radial to the nearest degree along each segment of the route;
 - iv. distances to the nearest kilometer or nautical mile between significant points;
 - v. minimum flight altitudes along the route or route segments and altitudes required by the procedure to the nearest higher 50 m or 100 ft. and flight level restrictions where established;
 - vi. where the chart is drawn to scale and radar vectoring on arrival is provided, established radar minimum altitudes to the nearest higher 50 m or 100 ft., clearly identified;

Note 1. — Where ATS surveillance systems are used to vector aircraft to or from significant points on a published standard arrival route or to issue clearance below the minimum sector altitude during arrival, the relevant procedures may be shown on the Standard Arrival Chart — Instrument (STAR) — ICAO unless excessive chart clutter will result.

Note 2. — Where excessive chart clutter will result, an ATC Surveillance Minimum Altitude Chart — ICAO may be provided (see 21.21), in which case the elements indicated need not be duplicated on the Standard Arrival Chart — Instrument (STAR) — ICAO.

- (b) the radio navigation aid(s) associated with the route(s) including:
 - i. plain language name;
 - ii. identification;
 - iii. frequency;
 - iv. geographical coordinates in degrees, minutes and seconds;
 - v. for DME, the channel and the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft.);
 - vi. the name-codes of the significant points not marked by the position of a radio navigation aid, their geographical coordinates in degrees, minutes and seconds and the bearing to the nearest tenth of a degree and distance to the nearest two-tenths of a kilometer (tenth of a nautical mile) from the reference radio navigation aid;
 - vii. applicable holding patterns;
 - viii. transition altitude/height to the nearest higher 300 m or 1 000 ft.;
 - ix. area speed restrictions, where established;
 - x. the designation of the navigation specification(s) including any limitations, where established;
 - xi. all compulsory and “on-request” reporting points;
- (c) radio communication procedures, including:
 - i. call sign(s) of ATS unit(s);
 - ii. frequency and, if applicable, SATVOICE number
 - iii. transponder setting, where appropriate.
- (d) an indication of “flyover” significant waypoints; and
- (e) for arrival procedures to an instrument approach designed specifically for helicopters, the term “CAT H” shall be depicted in the arrival chart plan view.

21.10.7.5 AERONAUTICAL DATABASE REQUIREMENTS

Appropriate data to support navigation database coding shall be published in accordance with the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume II, Part III, Section 5, Chapter 2, 2.2, on the verso of the chart or as a separate, properly referenced sheet.

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

21.11 INSTRUMENT APPROACH CHART — ICAO

21.11.1 FUNCTION

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

Note. — Detailed criteria for the establishment of instrument approach procedures and the resolutions of associated altitudes/heights are contained in the

Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168).

21.11.2 AVAILABILITY

- (1) Instrument Approach Charts — ICAO shall be made available for all aerodromes used by international civil aviation where instrument approach procedures have been established by the Authority
- (2) A separate Instrument Approach Chart — ICAO shall normally be provided for each precision approach procedure established by the Authority.
- (3) A separate Instrument Approach Chart — ICAO shall normally be provided for each non-precision approach procedure established by the Authority.

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

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

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

- (5) Instrument Approach Charts — ICAO shall be revised whenever information essential to safe operation becomes out of date.

21.11.3 COVERAGE AND SCALE

- (1) The coverage of the chart shall be sufficient to include all segments of the instrument approach procedure and such additional areas as may be necessary for the type of approach intended.
- (2) The scale selected shall ensure optimum legibility consistent with:
 - (a) the procedure shown on the chart;
 - (b) sheet size.
- (3) A scale indication shall be given.
- (4) Except where this is not practicable, a distance circle with a radius of 20 km (10 NM) centered on a DME located on or close to the aerodrome, or on the aerodrome reference point where no suitable DME is available, shall be shown; its radius shall be indicated on the circumference.

21.11.4 PROJECTION

- (1) A conformal projection on which a straight line approximates a great circle shall be used.
- (2) Graduation marks should be placed at consistent intervals along the neat lines, as appropriate.

21.11.5 IDENTIFICATION

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

Note. — *The identification of the instrument approach procedure is provided by the procedures specialist.*

21.11.6 CULTURE AND TOPOGRAPHY

- (1) Culture and topographic information pertinent to the safe execution of the instrument approach procedure, including the missed approach procedure, associated holding procedures and visual maneuvering (circling) procedure when established, shall be shown. Topographic information shall be named, only when necessary, to facilitate the understanding of such information, and the minimum shall be a delineation of land masses and significant lakes and rivers.
- (2) Relief shall be shown in a manner best suited to the particular elevation characteristics of the area. In areas where relief exceeds 1 200 m (4 000 ft) above the aerodrome elevation within the coverage of the chart or 600 m (2 000 ft) within 11 km (6 NM) of the aerodrome reference point or when final approach or missed approach procedure gradient is steeper than optimal due to terrain, all relief exceeding 150 m (500 ft) above the aerodrome elevation shall be shown by smoothed contour lines, contour values and layer tints printed in brown. Appropriate spot elevations, including the highest elevation within each top contour line, shall also be shown printed in black.

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

Note 2. — *Appropriate spot elevations are those provided by the procedures specialist.*

21.11.6.1 MAGNETIC VARIATION

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

21.11.6.2 BEARINGS, TRACKS AND RADIALS

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

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

- (2) In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, shall be used.
- (3) Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used its reference grid meridian shall be identified.

21.11.7 AERONAUTICAL DATA

21.11.7.1 AERODROMES

- (1) All aerodromes which show a distinctive pattern from the air shall be shown by the appropriate symbol. Abandoned aerodromes shall be identified as abandoned.
- (2) The runway pattern, at a scale sufficiently large to show it clearly, shall be shown for:
 - (a) the aerodrome on which the procedure is based;
 - (b) aerodromes affecting the traffic pattern or so situated as to be likely, under adverse weather conditions, to be mistaken for the aerodrome of intended landing.
- (3) The aerodrome elevation shall be shown to the nearest meter or foot in a prominent position on the chart.
- (4) The threshold elevation or, where applicable, the highest elevation of the touchdown zone shall be shown to the nearest meter or foot.

21.11.7.2 OBSTACLES

- 1) Obstacles shall be shown on the plan view of the chart.

Note. — *Appropriate obstacles are those provided by the procedures specialist.*

- 2) The elevation of the top of obstacles shall be shown to the nearest (next higher) meter or foot.
- 3) When the heights of obstacles above a datum other than mean sea level are shown, the datum shall be the aerodrome elevation except that, at aerodromes having an instrument runway (or runways) with a threshold elevation more than 2 m (7 ft.) below the aerodrome elevation, the chart datum shall be the threshold elevation of the runway to which the instrument approach is related.
- 4) Where a datum other than mean sea level is used, it shall be stated in a prominent position on the chart.
- 5) Where an obstacle free zone has not been established for a precision approach runway Category I, this shall be indicated.
- 6) Obstacles that penetrate the visual segment surface shall be identified on the chart.

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

21.11.7.3 PROHIBITED, RESTRICTED AND DANGER AREAS

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

21.11.7.4 RADIO COMMUNICATION FACILITIES AND NAVIGATION AIDS

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

- (2) When a radio navigation aid is used as a significant point for area navigation, only its plain language name and identification shall be shown.
- (3) The initial approach fix (IAF), the intermediate approach fix (IF), the final approach fix (FAF) (or final approach point (FAP) for an ILS approach procedure), the missed approach point (MAPt), where established, and other essential fixes or points comprising the procedure shall be shown and identified.
- (4) Radio navigation aids that might be used in diversionary procedures together with their track-defining characteristics, if any, shall be shown or indicated on the chart.
- (5) Radio communication frequencies, including call signs that are required for the execution of the procedures shall be shown.
- (6) When required by the procedures, the distance to the aerodrome from each radio navigation aid concerned with the final approach shall be shown to the nearest kilometer or nautical mile. When no track-defining aid indicates the bearing of the aerodrome, the bearing shall also be shown to the nearest degree.

21.11.7.5 MINIMUM SECTOR ALTITUDE OR TERMINAL ARRIVAL ALTITUDE

The minimum sector altitude or terminal arrival altitude established by this Authority shall be shown, with a clear indication of the sector to which it applies.

21.11.7.6 PORTRAYAL OF PROCEDURE TRACKS

- (1) The plan view shall show the following information in the manner indicated:
 - (a) the approach procedure track by an arrowed continuous line indicating the direction of flight;
 - (b) the missed approach procedure track by an arrowed broken line;
 - (c) any additional procedure track, other than those specified in a) and b), by an arrowed dotted line;
 - (d) bearings, tracks, radials to the nearest degree and distances to the nearest two-tenths of a kilometer or tenth of a nautical mile or times required for the procedure;
 - (e) where no track-defining aid is available, the magnetic bearing to the nearest degree to the aerodrome from the radio navigation aids concerned with the final approach;
 - (f) the boundaries of any sector in which visual maneuvering (circling) is prohibited;
 - (g) where specified the holding pattern and minimum holding altitude/height associated with the approach and missed approach;
 - (h) caution notes where required, prominently displayed on the face of the chart.
- (2) The plan view shall show the distance to the aerodrome from each radio navigation aid concerned with the final approach.

21.11.7.7 AERODROME OPERATING MINIMA

- (1) Aerodrome operating minima when established by the Authority shall be shown.
- (2) The obstacle clearance altitudes/heights for the aircraft categories for which the procedure is designed shall be shown; for precision approach procedures, additional OCA/H for Cat DL aircraft (wing span between 65 m and 80 m and/or vertical

distance between the flight path of the wheels and the glide path antenna between 7 m and 8m) shall be published, when necessary.

21.11.7.8 SUPPLEMENTARY INFORMATION

- (1) When the missed approach point is defined by:
 - (a) a distance from the final approach fix, or
 - (b) a facility or a fix and the corresponding distance from the final approach fix, the distance to the nearest two-tenths of a kilometer or tenth of a nautical mile and a table showing ground speeds and times from the final approach fix to the missed approach point shall be shown.
- (2) When DME is required for use in the final approach segment, a altitudes/heights for each 2 km or 1 NM, as appropriate, shall be shown. The table shall not include distances which would correspond to altitudes/ heights below the OCA/H.
- (3) For non-precision approach procedures with a final approach fix, the final approach descent gradient to the nearest one-tenth of a per cent and, in parentheses, descent angle to the nearest one-tenth of a degree shall be shown.
- (4) For precision approach procedures and approach procedures with vertical guidance, the reference datum height to the nearest half meter or foot and the glide path or elevation or vertical path angle to the nearest one-tenth of a degree shall be shown.
- (5) For precision approach procedures and approach procedures with vertical guidance, the reference datum height to the nearest half meter or foot and the glide path or elevation or vertical path angle to the nearest one-tenth of a degree shall be shown.
- (6) When a final approach fix is specified at the final approach point for ILS, a clear indication shall be given whether it applies to the ILS, the associated ILS localizer only procedure, or both. In the case of MLS, a clear indication shall be given when an FAF has been specified at the final approach point.
- (7) If the final approach descent gradient/angle for any type of instrument approach procedure exceeds the maximum value specified in the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume II, a cautionary note shall be included.
- (8) A note shall be included on the chart indicating the approach procedures that are authorized for simultaneous independent or dependent operations. The note shall include the runway(s) involved and if they are closely spaced.

21.11.7.9 AERONAUTICAL DATA BASE REQUIREMENTS

Appropriate data to support navigation database coding shall be published in accordance with the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume II, Part III, Section 5, Chapter 2, 2.3, for RNAV procedures and Volume II, Part I, Section 4, Chapter 9, 9.4.1.3, for non-RNAV procedures, on the verso of the chart or as a separate, properly referenced sheet.

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

21.12 VISUAL APPROACH CHART — ICAO

21.12.1 FUNCTION

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

21.12.2 AVAILABILITY

The Visual Approach Chart — ICAO shall be made available in the manner prescribed in 21.1.3(2) for all aerodromes used by international civil aviation where:

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

21.12.3 SCALE

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

21.12.4 PROJECTION

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

21.12.5 IDENTIFICATION

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

21.12.6 CULTURE AND TOPOGRAPHY

- (1) Natural and cultural landmarks shall be shown (e.g. bluffs, cliffs, sand dunes, cities, towns, roads, railroads, isolated lighthouses, etc.).
- (2) Shore lines, lakes, rivers and streams shall be shown.
- (3) Relief shall be shown in a manner best suited to the particular elevation and obstacle characteristics of the area covered by the chart.
- (4) The figures relating to different reference levels shall be clearly differentiated in their presentation.

21.12.7 MAGNETIC VARIATION

The magnetic variation shall be shown.

21.12.8 BEARINGS, TRACKS AND RADIALS

- (1) Bearings, tracks and radials shall be magnetic except as provided for in 21.12.9(2).
- (2) In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, shall be used.

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

21.12.9 AERONAUTICAL DATA

21.12.9.1 AERODROMES

- (1) All aerodromes shall be shown by the runway pattern. Restrictions on the use of any landing direction shall be indicated. Where there is any risk of confusion between two neighboring aerodromes this shall be indicated. Abandoned aerodromes shall be identified as abandoned.
- (2) The aerodrome elevation shall be shown in a prominent position on the chart.

21.12.9.2 OBSTACLES

- (1) Obstacles shall be shown and identified.
- (2) The elevation of the top of obstacles shall be shown to the nearest (next higher) metre or foot.
- (3) When the heights of obstacles are shown, the height datum shall be stated in a prominent position on the chart and the heights shall be given in parentheses on the chart.

21.12.9.3 PROHIBITED, RESTRICTED AND DANGER AREAS

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

21.12.9.4 DESIGNATED AIRSPACE

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

21.12.9.5 VISUAL APPROACH INFORMATION

- (1) Visual approach procedures shall be shown where applicable.
- (2) Visual aids for navigation shall be shown as appropriate.
- (3) Location and type of the visual approach slope indicator systems with their nominal approach slope angle(s), minimum eye height(s) over the threshold of the on-slope signal(s), and where the axis of the system is not parallel to the runway centre line, the angle and direction of displacement, i.e. left or right, shall be shown.

21.12.9.6 SUPPLEMENTARY INFORMATION

- (1) Radio navigation aids together with their frequencies and identifications shall be shown as appropriate.
- (2) Radio communication facilities with their frequencies shall be shown as appropriate.

21.13 AERODROME/HELIPORT CHART — ICAO

21.13.1 FUNCTION

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

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

21.13.2 AVAILABILITY

The Aerodrome/Heliport Chart — ICAO shall be made available in the manner prescribed in 21.1.3(2) for all aerodromes/heliports regularly used by international civil aviation.

21.13.3 COVERAGE AND SCALE

- (1) The coverage and scale shall be sufficiently large to show clearly all the elements listed in 21.13.6(1).
- (2) A linear scale shall be shown.

21.13.4 IDENTIFICATION

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

21.13.5 MAGNETIC VARIATION

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

21.13.6 AERODROME/HELIPORT DATA

- (1) This chart shall show:
 - (a) geographical coordinates in degrees, minutes and seconds for the aerodrome/heliport reference point;
 - (b) elevations, to the nearest meter or foot, of the aerodrome/heliport and apron (altimeter checkpoint locations) where applicable; and for non-precision approaches, elevations and geoid undulations of runway thresholds and the geometric center of the touchdown and lift-off area;
 - (c) elevations and geoid undulations, to the nearest half meter or foot, of the precision approach runway threshold, the geometric center of the touchdown and lift-off area, and at the highest elevation of the touchdown zone of a precision approach runway;
 - (d) all runways including those under construction with designation number, length and width to the nearest meter, bearing strength, displaced thresholds, stopways, clearways, runway directions to the nearest degree magnetic, type of surface and runway markings;

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

- (e) all aprons, with aircraft/helicopter stands, lighting, markings and other visual guidance and control aids, where applicable, including location and type of visual docking guidance systems, type of surface for heliports, and bearing strengths or aircraft type restrictions where the bearing strength is less than that of the associated runways;

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

- (f) geographical coordinates in degrees, minutes and seconds for thresholds, geometric center of touchdown and lift-off area and/or thresholds of the final approach and take-off area (where appropriate);
- (g) all taxiways, helicopter air and ground taxiways with type of surface, helicopter air transit routes, with designations, width, lighting, markings, including runway-holding positions and stop bars, other visual guidance and control aids, and bearing strength or aircraft type restrictions where the bearing strength is less than that of the associated runways;

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

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

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

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

(2) In addition to the items in 21.13.6(1) relating to heliports, the chart shall show:

- (a) heliport type;

Note. — *Heliport types are identified Part 13, as surface-level, elevated or helideck.*

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

- (c) final approach and take-off area including type, true bearing to the nearest degree, designation number (where appropriate), length and width to the nearest meter, slope and type of surface;
- (d) safety area including length, width and type of surface;
- (e) helicopter clearway including length and ground profile;
- (a) obstacles including type and elevation of the top of the obstacles to the nearest (next higher) meter or foot;
- (b) visual aids for approach procedures, marking and lighting of final approach and take-off area, and of touchdown and lift-off area;
- (c) declared distances to the nearest meter for heliports, where relevant, including:
 - i. take-off distance available;
 - ii. rejected take-off distance available;
 - iii. landing distance available.

21.14 AERODROME GROUND MOVEMENT CHART — ICAO

21.14.1 FUNCTION

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

21.14.2 AVAILABILITY

- (1) The Aerodrome Ground Movement Chart — ICAO should be made available in the manner prescribed in 1.3.2 where, due to congestion of information, details necessary for the ground movement of aircraft along the taxiways to and from the aircraft stands cannot be shown with sufficient clarity on the Aerodrome/Heliport Chart — ICAO.

21.14.3 COVERAGE AND SCALE

- (1) The coverage and scale shall be sufficiently large to show clearly all the elements listed in 21.14.6.

21.14.4 IDENTIFICATION

- (1) The chart shall be identified by the name of the city or town, or area, which the aerodrome serves and the name of the aerodrome.

21.14.5 MAGNETIC VARIATION

A True North arrow shall be shown.

21.14.6 AERODROME DATA

- (1) This chart shall show in a similar manner all the information on the Aerodrome or Heliport Chart — ICAO relevant to the area depicted, including:
 - (a) apron elevation to the nearest meter or foot;
 - (b) aprons with aircraft stands, bearing strengths or aircraft type restrictions, lighting, marking and other visual guidance and control aids, where applicable, including location and type of visual docking guidance systems;
 - (c) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for aircraft stands;

- (d) taxiways with designations, width to the nearest meter, bearing strength or aircraft type restrictions where applicable, lighting, markings, including runway holding positions and stop bars and other visual guidance and control aids;
- (e) where established, hot spot locations with additional information properly annotated.

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

- (f) where established, standard routes for taxiing aircraft, with their designators;
 - (g) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for appropriate taxiway center line points;
 - (h) the boundaries of the air traffic control service;
 - (i) relevant radio communication facilities listed with their frequencies ;
 - (j) obstacles to taxiing;
 - (k) aircraft servicing areas and building of operational significance;
 - (l) VOR checkpoint and radio frequency of the aid concerned;
 - (m) Any part of the depicted movement area permanently unsuitable for a clearly identified as such.
- (2) For aerodromes accommodating aircraft with folding wing tips, the location where the wing tips may be safely extended should be shown on the chart.

21.15 AIRCRAFT PARRKING/DOCKING CHART-ICAO

21.15.1 FUNCTION

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

21.15.2 COVERAGE AND SCALE

The coverage and scale shall be sufficiently large to show clearly all the elements listed in 21.15.6.

21.15.3 IDENTIFICATION

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

21.15.4 MAGNETIC VARIATION

A True North arrow shall be shown.

21.15.5 AERODROME DATA

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

- (a) apron elevation to the nearest meter or foot;

- (b) aprons with aircraft stands, bearing strengths or aircraft type restrictions, lighting, marking and other visual guidance and control aids, where applicable including location and type of visual docking guidance systems;
- (c) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for aircraft stands;
- (d) taxiways entries with designations, including runway holding positions and stop bars;
- (e) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for appropriate taxiway center line points;

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

- (f) taxiway entries with designations, including runway-holding positions and, where established, intermediate holding positions, and stop bars;
- (g) where established, hot spot locations with additional information properly annotated;
- (h) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for appropriate taxiway center line points;
- (i) the boundaries of the air traffic control service;
- (j) relevant radio communication facilities listed with their frequencies;
- (k) obstacles to taxiing;
- (l) aircraft servicing areas and buildings of operational significance;
- (m) VOR checkpoint and radio frequency of the aid concerned;
- (n) any part of the depicted movement area permanently unsuitable for aircraft, clearly identified as such.

21.16 WORLD AERONAUTICAL CHART — ICAO 1:1 000 000

21.16.1 FUNCTION

This chart shall provide information to satisfy the requirements of visual air navigation. This chart may also serve:

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

21.16.2 AVAILABILITY

The World Aeronautical Chart — ICAO 1:1 000 000 shall be made available in the manner prescribed in 21.1.3.2 for all areas delineated in IS: 21.16.2.1

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

21.16.3 SCALES

- (1) Linear scales for kilometers and nautical miles arranged in the following order:
 - (a) kilometers,

- (b) nautical miles, with their zero points in the same vertical line shall be shown in the margin.
- (2) A conversion scale (metres/feet) shall be shown in the margin.

21.16.4 FORMAT

- (1) The information regarding the number of the adjoining sheets and the unit of measurement to express elevations shall be so located as to be clearly visible when the sheet is folded.
- (2) The sheet lines used shall be notified to ICAO for publication in the ICAO Aeronautical Chart Catalogue (Doc 7101).

21.16.5 PROJECTION

- (1) The projections shall be as follows:
 - (a) between the Equator and 80° latitudes: the Lambert conformal conic projection, in separate bands for each tier of charts. The standard parallels for each 4° band shall be 40' south of the northern parallel and 40" north of the southern parallel;
 - (b) between 80° and 90° latitudes: The Polar stereographic projection with scale matching that of the Lambert conformal conic projection at latitude 80°, except that in the northern hemisphere the Lambert conformal conic projection may be used between 80° and 84° latitudes and the Polar stereographic projection between 84° and 90° with the scales matching at 84° North.
 - (c) Graticules and graduations shall be shown as follows:
 - i. Parallels
 - ii. Meridians
 - (d) The graduation marks at 1' and 5' intervals shall extend away from the Greenwich Meridian and from the Equator. Each 10' interval shall be shown by a mark on both sides of the graticule line.
- (2) All meridians and parallels shall be numbered in the borders of the charts. In addition, each parallel shall be numbered within the body of the chart in such a manner that the parallel can be readily identified when the chart is folded.

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

- (3) The name and basic parameters of the projection shall be indicated in the margin.

21.16.6 IDENTIFICATION

Sheet numbering shall be in conformity with the index in IS: 21.16.2(1).

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

21.16.7 CULTURE AND TOPOGRAPHY

21.16.7.1 BUILT-UP AREAS.

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

21.16.7.2 RAILROADS

- (1) All railroads having landmark value shall be shown.

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

- (2) Important tunnels should be shown.

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

21.16.7.3 HIGHWAYS AND ROADS

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

21.16.7.4 POLITICAL BOUNDARIES

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

21.16.7.5 HYDROGRAPHY

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

- (2) The tint covering large open water areas should be kept very light.

21.16.7.6 CONTOURS

- (1) Contours shall be shown. The selection of intervals shall be governed by the requirement to depict clearly the relief features required in air navigation.
- (2) The values of the contours used shall be shown.

21.16.7.7 HYPSONETRIC TINTS

- (1) When hypsonetric tints are used the range of elevations for the tints shall be shown.
- (2) The scale of the hypsonetric tints used on the chart shall be shown in the margin.

21.16.7.8 SPOT ELEVATIONS

- (1) Spot elevations shall be shown at selected critical points. The elevations selected shall always be the highest in the immediate vicinity and shall generally indicate the top of a peak, ridge, etc. Elevations in valleys and at lake surface levels which are of special value to the aviator shall be shown. The position of each selected elevation shall be indicated by a dot.
- (2) The elevation (in meters or feet) of the highest point on the chart and its geographical position to the nearest five minutes shall be indicated in the margin.

21.16.7.9 INCOMPLETE OR UNRELIABLE RELIEF

- (1) Areas that have not been surveyed for contour information shall be labelled "Relief data incomplete".
- (2) Charts on which spot elevations are generally unreliable shall bear a warning note prominently displayed on the face of the chart in the color used for aeronautical information, as follows:

“WARNING — The reliability of relief information on this chart is doubtful and elevations shall be used with caution.”

21.16.8 WOODED AREAS

- (1) Wooded areas of large extent should be shown.
- (2) Where shown, the approximate extreme northern or southern limits of tree growth shall be indicated by a dashed black line and shall be appropriately labeled.

21.16.8.1 DATE OF TOPOGRAPHIC INFORMATION

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

21.16.8.2 MAGNETIC VARIATION

- (1) Isogonic lines shall be shown.
- (2) The date of the isogonic information shall be indicated in the margin.

21.16.9 AERONAUTICAL DATA

21.16.9.1 GENERAL

Aeronautical data shown shall be kept to a minimum consistent with the use of the chart for visual navigation and the revision cycle (ref. 21.16.9.6).

21.16.9.2 AERODROMES

- (1) Land and water aerodromes and heliports shall be shown with their names, to the extent that they do not produce undesirable congestion on the chart, priority being given to those of greatest aeronautical significance.
- (2) The aerodrome elevation, the lighting available, the type of runway surface and the length of the longest runway or channel, shown in abbreviated form for each aerodrome in conformity with the example given in IS: 21.2.4.1, provided they do not cause undesirable clutter on the chart, shall be indicated.
- (3) Abandoned aerodromes which are still recognizable as aerodromes from the air shall be shown and identified as abandoned.

21.16.9.3 OBSTACLES

- (1) Significant obstacles shall be shown.

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

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

21.16.9.4 PROHIBITED, RESTRICTED AND DANGER AREAS

Prohibited, restricted and danger areas shall be shown.

21.16.9.5 AIR TRAFFIC SERVICES SYSTEM

- (1) Significant elements of the air traffic services system including, where practicable, control zones, aerodrome traffic zones, control areas, flight information regions and other airspaces in which VFR flights operate shall be shown together with the appropriate class of airspace.
- (2) Where appropriate, the Air Defense Identification Zone (ADIZ) shall be shown and properly identified.

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

21.16.9.6 RADIO NAVIGATION AIDS

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

21.16.9.7 SUPPLEMENTARY INFORMATION

- (1) Aeronautical ground lights together with their characteristics or their identifications or both shall be shown.
- (2) Marine lights on outer prominent coastal or isolated features of not less than 28 km (15 NM) visibility range shall be shown:
 - (a) where they are not less distinguishable than more powerful marine lights in the vicinity;
 - (b) where they are readily distinguishable from other marine or other types of lights in the vicinity of built-up coastal areas;
 - (c) where they are the only lights of significance available.

21.17 AERONAUTICAL CHART — ICAO 1:500 000

21.17.1 FUNCTION

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

Note 1- this chart may be used:

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

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

Note 3. — Where States produce charts of this series covering their national territories, the entire area being portrayed is usually treated on a regional basis

21.17.2 SCALES

- (1) Linear scales for kilometers and nautical miles arranged in the following order:

- kilometers,
- nautical miles, with their zero points in the same vertical line shall be shown in the margin.

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

21.17.3 FORMAT

- (1) The title and marginal notes shall be in English.
- (2) The information regarding the number of the adjoining sheets and the unit of measurement used to express elevation shall be so located as to be clearly visible when the sheet is folded.

21.17.4 PROJECTION

- (1) A conformal (orthomorphic) projection shall be used.
- (2) Parallels shall be shown at intervals of 30'.
- (3) Meridians shall normally be shown at intervals of 30'.

Note- At high latitudes this interval may be increased.

- (4) Graduation marks shall be shown at 1' intervals along each whole degree meridian and parallel, extending away from the Greenwich Meridian and from the Equator. Each 10'D interval shall be shown by a mark on both sides of the graticule line.
- (5) All meridians and parallels shown shall be numbered in the borders of the chart.
- (6) The name and basic parameters of the projection shall be indicated in the margin.

21.17.5 IDENTIFICATION

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

21.17.6 CULTURE AND TOPOGRAPHY

21.17.6.1 BUILT-UP AREAS

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

21.17.6.2 RAILROADS

Tunnels shall be shown when they serve as prominent landmarks.

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

Note 2. — Railroads may be named.

Note 3. — Rail stations may be shown.

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

21.17.6.3 HIGHWAYS AND ROADS

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

Note. — Roads under construction may be shown

21.17.6.4 POLITICAL BOUNDARIES

International boundaries shall be shown. Un-demarcated or undefined boundaries shall be distinguished by descriptive notes.

Note. — Other boundaries may be shown.

21.17.6.5 HYDROGRAPHY

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

21.17.6.6 CONTOURS

- (1) Contours shall be shown. The selection of intervals shall be governed by the requirement to depict clearly the relief features required in air navigation.
- (2) The values of the contours used shall be shown.

21.17.6.7 HYPSONETRIC TINTS

- (1) When hypsonetric tints are used, the range of elevations for the tints shall be shown.
- (2) The scale of the hypsonetric tints used on the chart shall be shown in the margin.

21.17.6.8 SPOT ELEVATIONS

- (1) Spot elevations shall be shown at selected critical points. The elevation selected shall always be the highest in the immediate vicinity and shall generally indicate the top of a peak, ridge, etc. Elevations in valleys and at lake surface levels which are of navigational value shall be shown. The position of each selected elevation shall be indicated by a dot.
- (2) The elevation (in meters or feet) of the highest point on the chart and its geographical position to the nearest five minutes shall be indicated in the margin.

21.17.6.9 INCOMPLETE OR UNRELIABLE RELIEF

- (1) Areas that have not been surveyed for contour information shall be labelled “Relief data incomplete”.
- (2) Charts on which spot elevations are generally unreliable shall bear a warning note prominently displayed on the face of the chart in the color used for aeronautical information, as follows:

“WARNING — The reliability of relief information on this chart is doubtful and elevations shall be used with caution.”

21.17.6.10 ESCARPMENTS

- (1) Escarpments should be shown when they are prominent landmarks or when cultural detail is very sparse.

21.17.6.11 WOODED AREAS

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

21.17.6.12 DATE OF TOPOGRAPHIC INFORMATION

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

21.17.7 MAGNETIC VARIATION

- (1) Isogonic lines shall be shown.
- (2) The date of the isogonic information shall be indicated in the margin.

21.17.8 AERONAUTICAL DATA

21.17.8.1 GENERAL

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

21.17.8.2 AERODROMES

- (1) Land and water aerodromes and heliports shall be shown with their names, to the extent that they do not produce undesirable congestion on the chart, priority being given to those of greatest aeronautical significance.
- (2) The aerodrome elevation, the lighting available, the type of runway surface and the length of the longest runway or channel, shown in abbreviated form for each aerodrome in conformity with the example given in IS: 21.2.4.1, provided they do not cause undesirable clutter on the chart, shall be indicated.
- (3) Abandoned aerodromes which are still recognizable as aerodromes from the air shall be shown and identified as abandoned.

21.17.8.3 OBSTACLES

- (1) Obstacles shall be shown.

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

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

21.17.8.4 PROHIBITED, RESTRICTED AND DANGER AREAS

Prohibited, restricted and danger areas shall be shown.

21.17.8.5 AIR TRAFFIC SERVICES SYSTEM

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

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

(3)

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

21.17.8.6 RADIO NAVIGATION AIDS

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

21.17.8.7 SUPPLEMENTARY INFORMATION

- (1) Aeronautical ground lights together with their characteristics or their identifications or both shall be shown.
- (2) Marine lights on outer prominent coastal or isolated features of not less than 28 km (15 NM) visibility range shall be shown:
 - (a) where they are not less distinguishable than more powerful marine lights in the vicinity;
 - (b) where they are readily distinguishable from other marine or other types of lights in the vicinity of built-up coastal areas;
 - (c) where they are the only lights of significance available.

21.18 AERONAUTICAL NAVIGATION CHART —ICAO SMALL SCALE

21.18.1 FUNCTION

This chart shall:

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

21.18.2 COVERAGE AND SCALE

- (1) The scale shall be in the range of 1:2 000 000 to 1:5 000 000.
- (2) The scale of the chart shall be substituted in the title for the words “Small Scale”.
- (3) Linear scales for kilometers and nautical miles arranged in the following order:
 - kilometers,
 - nautical miles, with their zero points in the same vertical line shall be shown in the margin.
- (4) A conversion scale (meters/feet) shall be shown in the margin.

21.18.3 FORMAT

- (1) The title and marginal notes shall be in English.
- (2) The information regarding the number of the adjoining sheets and the unit of measurement to express elevations shall be so located as to be clearly visible when the sheet is folded.

Note. — There is no internationally agreed sheet numbering.

21.18.4 PROJECTION

- (1) A conformal (orthomorphic) projection shall be used.
- (2) The name and basic parameters of the projection shall be shown in the margin.
- (3) Parallels shall be shown at intervals of 1°.
- (4) Graduations on the parallels shall be shown at sufficiently close intervals compatible with the latitude and the scale of the chart.
- (5) Meridians shall be shown at intervals compatible with the latitude and the scale of the chart.
- (6) Graduations on the meridians shall be shown at intervals not exceeding 5'.
- (7) The graduation marks shall extend away from the Greenwich Meridian and from the Equator.
- (8) All meridians and parallels shown shall be numbered in the borders of the chart. In addition, when required, meridians and parallels shall be numbered within the body of the chart in such a manner that they can be readily identified when the chart is folded.

21.18.5 CULTURE AND TOPOGRAPHY

21.18.5.1 BUILT-UP AREAS

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

21.18.5.2 RAILROADS

All railroads having landmark value shall be shown.

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

21.18.5.3 HIGHWAYS AND ROADS

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

21.18.5.4 POLITICAL BOUNDARIES

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

21.18.5.5 HYDROGRAPHY

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

21.18.5.6 CONTOURS

- (1) Contours shall be shown. The selection of intervals shall be governed by the requirement to depict clearly the relief features required in air navigation.
- (2) The values of the contours used shall be shown.

21.18.5.7 HYPSONETRIC TINTS

- (1) When hypsometric tints are used the range of elevations for the tints shall be shown.
- (2) The scale of the hypsometric tints used on the chart shall be shown in the margin.

21.18.5.8 SPOT ELEVATIONS

- (1) Spot elevations shall be shown at selected critical points. The elevations selected shall always be the highest in the immediate vicinity, and shall generally indicate the top of a peak, ridge, etc. Elevations in valleys and at lake surface levels which are of value to visual air navigation shall be shown. The position of each selected elevation shall be indicated by a dot.
- (2) The elevation (in meters or feet) of the highest point on the chart and its geographical position to the nearest five minutes shall be indicated in the margin.

21.18.5.9 INCOMPLETE OR UNRELIABLE RELIEF

- (1) Areas that have not been surveyed for contour information shall be labelled “Relief data incomplete”.
- (2) Charts on which spot elevations are generally unreliable shall bear a warning note prominently displayed on the face of the chart in the color used for aeronautical information, as follows.

“WARNING — The reliability of relief information on this chart is doubtful and elevations shall be used with caution.”

21.18.5.10 DATE OF TOPOGRAPHIC INFORMATION

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

21.18.5.11 MAGNETIC VARIATION

- (1) Isogonic lines shall be shown.
- (2) The date of isogonic information shall be indicated in the margin.

21.18.6 AERONAUTICAL DATA

21.18.6.1 AERODROMES

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

21.18.6.2 OBSTACLES

Obstacles shall be shown.

21.18.6.3 RADIO NAVIGATION AIDS

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

21.19 PLOTTING CHART — ICAO

21.19.1 FUNCTION

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

21.19.2 PROJECTION

- (1) Parallels and meridians shall be shown.
- (2) Graduation marks shall be shown at consistent intervals along an appropriate number of parallels and meridians. The interval selected shall, regardless of scale, minimize the amount of interpolation required for accurate plotting.
- (3) If a navigational grid is shown on charts covering the higher latitudes, it shall comprise lines parallel to the Meridian or anti-Meridian of Greenwich.

21.19.3 IDENTIFICATION

Each sheet shall be identified by chart series and number.

21.19.4 CULTURE AND TOPOGRAPHY

- (1) Generalized shore lines of all open water areas, large lakes and rivers shall be shown.
- (2) Spot elevations for selected features constituting a hazard to air navigation shall be shown.

21.19.5 MAGNETIC VARIATION

- (1) Isogonals or, in higher latitudes, isogrivs, or both, shall be shown at consistent intervals throughout the chart. The interval selected shall, regardless of scale, minimize the amount of interpolation required.
- (2) The date of the isogonic information shall be shown.

21.19.6 AERONAUTICAL DATA

The following aeronautical data shall be shown:

- (1) aerodromes regularly used by international commercial air transport together with their names;
- (2) selected radio aids to navigation that contribute to position-finding together with their names and identifications;
- (3) lattices of long-range electronic aids to navigation, as required;
- (4) boundaries of flight information regions, control areas and control zones necessary to the function of the chart;
- (5) designated reporting points necessary to the function of the chart;
- (6) ocean station vessels.

Note. — Other aeronautical data may be shown provided that they do not detract from the legibility of essential information.

21.20 ELECTRONIC AERONAUTICAL CHART DISPLAY-ICAO

21.20.1 FUNCTION

The Electronic Aeronautical Chart Display-ICAO, with adequate back-up arrangements and in compliance with the requirements of part 8, shall enable flight crews to execute, in a convenient and timely manner, route planning, route monitoring and navigating by displaying the required information.

21.20.2 INFORMATION AVAILABLE FOR DISPLAY

- (1) The Electronic Aeronautical Chart Display —ICAO shall be capable of displaying all aeronautical, cultural and topographic information required by Part 21, subparts 21.5, 21.7 through 21.19.

Note.— The Electronic Aeronautical Chart Display — ICAO may display supplementary information, in addition to that required for the equivalent paper chart, which may be considered useful for safe navigation.

21.20.3 DISPLAY REQUIREMENTS

21.20.3.1 DISPLAY CATEGORIES

- (1) Information available for display shall be subdivided into the following categories:
 - (a) basic display information, permanently retained on the display and consisting of the minimum information essential for the safe conduct of flight; and
 - (b) other display information, which may be removed from the display or displayed individually on demand, and consisting of information not considered essential for the safe conduct of flight.
- (2) It shall be a simple function to add or remove other display information but shall not be possible to remove information contained in the basic display.

21.20.3.2 DISPLAY MODE AND GENERATION OF NEIGHBORING AREA

- (1) The Electronic Aeronautical Chart Display —ICAO shall be capable of continuously plotting the aircraft's position in a true motion mode where reset and generation of the surrounding area shall take place automatically

Note. — Other modes, such as static chart displays, may be available

- (2) It shall be possible manually to change the chart area and the position of the aircraft relative to the edge of the display.

21.20.3.3 SCALE

It shall be possible to vary the scale at which a chart is displayed.

21.20.3.4 SYMBOLS

Symbols used shall conform to those specified for electronic charts in IS: 21.2.4.1 — ICAO Chart Symbols except where it is desired to show items for which no ICAO chart symbol is provided. In these cases, electronic chart symbols shall be chosen which:

- (a) employ a minimum use of lines, arcs and area fills;
- (b) do not cause confusion with any existing aeronautical chart symbol;
- (c) do not impair the legibility of the display.

Note. — Additional details for each symbol may be added according to the resolution of the output media, but any enhancements may not change the basic recognizability of the symbol.

21.20.3.5 DISPLAY HARDWARE

- (1) The effective size of the chart presentation shall be sufficient to display the information required by 21.20.2 without excessive scrolling.
- (2) The display shall have the capabilities required to accurately portray required elements of IS: 21.2.4.1 — ICAO Chart Symbols.
- (3) The method of presentation shall ensure that the displayed information is clearly visible to the observer in the conditions of natural and artificial light experienced in the cockpit.
- (4) The display luminance shall be adjustable by the flight crew.

21.20.4 PROVISION AND UPDATING OF DATA

- (1) The provision and updating of data for use by the display shall be in conformance with the aeronautical data quality system requirements.
- (2) *Note.* — For aeronautical data quality system requirements, see subpart 21.2.17, and Part 26 – Aeronautical Information Services Part 26.
- (3) The display shall be capable of automatically accepting authorized updates to existing data. A means of ensuring that authorized data and all relevant updates to that data have been correctly loaded into the display shall be provided.
- (4) The display shall be capable of accepting updates to authorized data entered manually with simple means for verification prior to final acceptance of the data. Updates entered manually shall be distinguishable on the display from authorized data and its authorized updates and shall not affect display legibility.
- (5) A record shall be kept of all updates, including date and time of application.
- (6) The display shall allow the flight crew to display updates so that the flight crew may review the contents of the updates and determine that they have been included in the system.

21.20.5 PERFORMANCE TESTS, MALFUNCTION ALARMS AND INDICATIONS

- (1) A means shall be provided for carrying out onboard tests of major functions. In case of a failure, the test shall display information to indicate which part of the system is at fault.
- (2) A suitable alarm or indication of system malfunction shall be provided.

21.20.6 BACK-UP ARRANGEMENTS

To ensure safe navigation in case of a failure of the Electronic Aeronautical Chart Display — ICAO, the provision of adequate back-up arrangements shall include:

- (1) facilities enabling a safe takeover of display functions in order to ensure that a failure does not result in a critical situation; and
- (2) a back-up arrangement facilitating the means for safe navigation of the remaining part of the flight.

Note. — A suitable back-up system may include the carriage of paper charts.

21.21 ATC SURVEILLANCE MINIMUM ALTITUDE CHART — ICAO

21.21.1 FUNCTION

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

Note. — *The objectives of the air traffic control service as prescribed in Manual of Standards – Air Traffic Services do not include prevention of collision with terrain. The procedures prescribed in the Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444) do not relieve pilots of their responsibility to ensure that any clearances issued by air traffic control units are safe in this respect. When an IFR flight is vectored or is given a direct routing which takes the aircraft off an ATS route, the PANS-ATM, Chapter 8, 8.6.5.2, applies.*

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

21.21.2 COVERAGE AND SCALE

- (1) The coverage of the chart shall be sufficient to effectively show the information associated with vectoring procedures.
- (2) The chart shall be drawn to scale.
- (3) The chart should be drawn to the same scale as the associated Area Chart — ICAO.

21.21.3 IDENTIFICATION

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

Note. — *The name may be that of the city which the aerodrome serves or, when the procedures apply to more than one aerodrome, that of the air traffic services center or the largest city or town situated in the area covered by the chart.*

21.21.4 CULTURE AND TOPOGRAPHY

- (1) Generalized shorelines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart.
- (2) Appropriate spot elevations and obstacles shall be shown.

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

21.21.5 MAGNETIC VARIATION

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

21.21.6 BEARINGS, TRACKS AND RADIALS

- (1) Bearings, tracks and radials shall be magnetic.
- (2) In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, shall be used.
- (3) Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used, its reference grid meridian shall be identified.

21.21.7 AERONAUTICAL DATA

21.21.7.1 AERODROMES

- (1) All aerodromes that affect the terminal routings shall be shown. Where appropriate, a runway pattern symbol shall be used.
- (2) The elevation of the primary aerodrome to the nearest metro or foot shall be shown.

21.21.7.2 PROHIBITED, RESTRICTED AND DANGER AREAS

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

21.21.7.3 AIR TRAFFIC SERVICES SYSTEM

- (1) The chart shall show components of the established air traffic services system including:
 - (a) relevant radio navigation aids together with their identifications;
 - (b) lateral limits of relevant designated airspace;
 - (c) relevant significant points associated with standard instrument departure and arrival procedures;

Note. — *Routes used in the vectoring of aircraft to and from the significant points may be shown. Transition altitude, where established;*

- (2) information associated with vectoring including:
 - (d) minimum vectoring altitudes to the nearest higher 50 m or 100 ft., clearly identified;
 - (e) lateral limits of minimum vectoring altitude sectors normally defined by bearings and radials to/from radio navigation aids to the nearest degree or, if not practicable, geographical coordinates in degrees, minutes and seconds and shown by heavy lines so as to clearly differentiate between established sectors;

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

- (f) distance circles at 20-km or 10-NM intervals or, when practicable, 10-km or 5-NM intervals shown as fine dashed lines with the radius indicated on the circumference and centered on the identified aerodrome main VOR radio navigation aid or, if not available, on the aerodrome/heliport reference point;
- (g) notes concerning correction for low temperature effect, as applicable;
- (3) communications procedures including call sign(s) and channel(s) of the ATC unit(s) concerned.

- (4) A textual description of relevant communication failure procedures should be provided and should, whenever feasible, be shown on the chart or on the same page that contains the chart.

21.22 CARTOGRAPHIC SERVICE PROVIDER

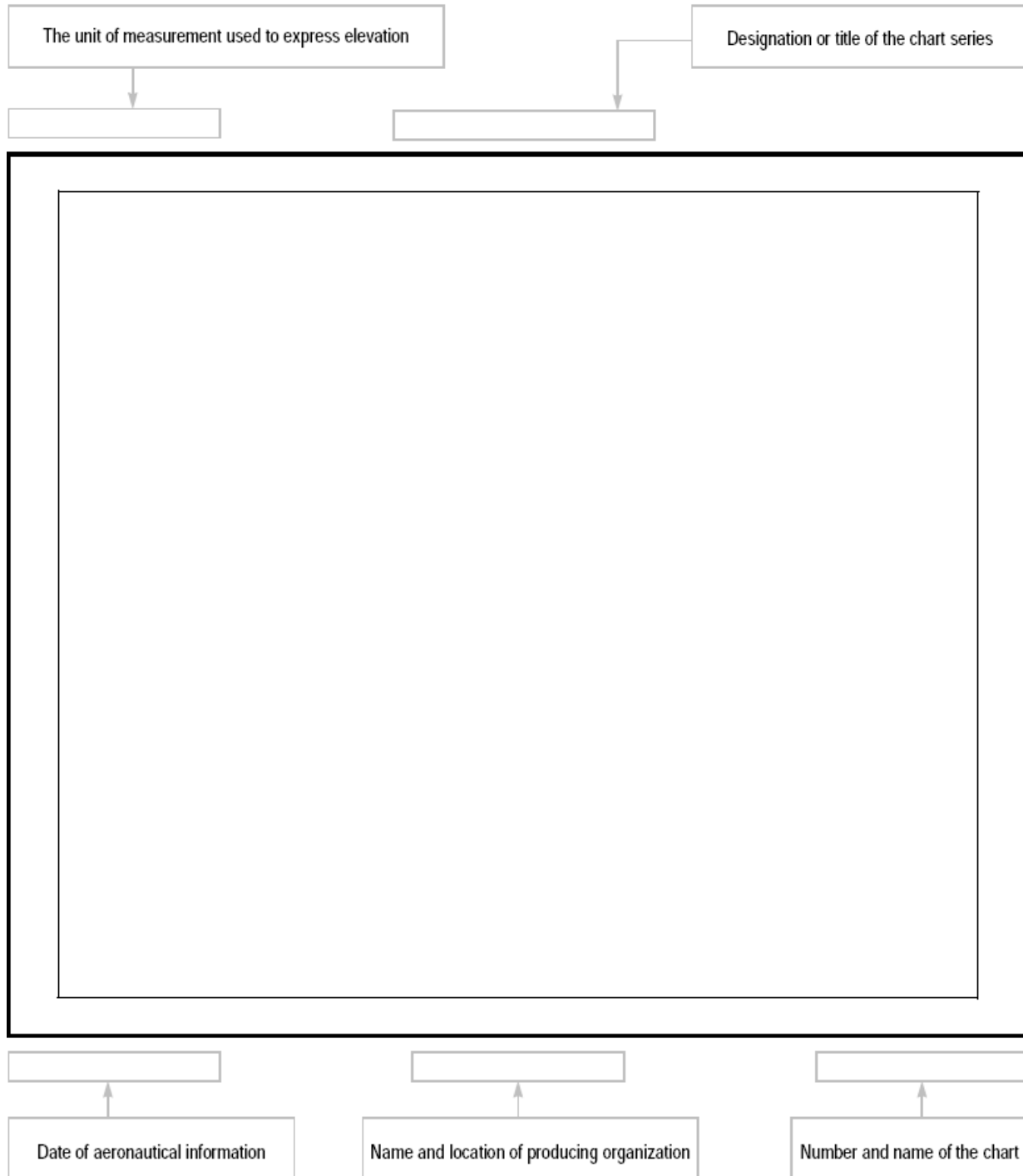
- (1) The Authority shall maintain an appropriate Cartographic office to enable the chart production unit carry out its cartographic functions in accordance with the requirements set out in this Regulation.
- (2) The Authority shall ensure that the production of Charts is in accordance with:
 - (a) applicable standards set out or referred to in relevant ICAO Documents, and or
 - (b) applicable standards as set out in this Regulation.
- (3) The Cartographic Office shall develop and maintain an operations manual which shall serve to demonstrate how that Office will comply with the requirements set out in this Regulation.
- (4) The contents of the operations manual shall include but not be limited to the following:
 - (a) a table of contents based on the items in the manual, indicating the page number on which each item begins;
 - (b) a description of the Cartographic unit organizational structure and a statement setting out the functions that the it performs.
 - (c) a description of the chain of command established by the Cartographic unit and a statement of the duties and responsibilities of any supervisory positions within the organizational structure;
 - (d) a statement showing how the Cartographic unit determines the number of operational staff required including the number of operational supervisory staff;
 - (e) a list of the Cartographic services that the it provides;
 - (f) the job description for each position;
 - (g) a description of the arrangements made by the Cartographic unit to ensure that it has, and will continue to receive, the information necessary for providing the service;
 - (h) a description of the Cartographic unit record keeping system;
 - (i) a statement detailing any agreement entered into by the Cartographic unit in relation to the provision of cartographic service provided by another party;
 - (j) a copy of the documents that sets out the Cartographic Quality Management System and Safety Management system;
 - (k) a description of the processes and documentation used to provide operational instructions to staff;
 - (l) a description of the procedures to be followed to ensure all operational staff are familiar with any operational changes that have been issued since they last performed operational duties;
 - (m) a description of the Cartographic unit training program detailing initial, OJT, recurrent and specialized training, including timelines to be provided, as applicable and
 - (n) a statement describing how the Cartographic unit maintains the training records for cartographic technical staff;
 - (o) a description of the format(s) that will be used for the issue of completed Charts for publication;
 - (p) a description of the procedures to be used to ensure that all equipment, including software is operated in accordance with the manufacturer's operating instructions and manuals; and
 - (q) the procedures to be followed for revising the operations manual.

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**LIBERIA CIVIL AVIATION
(AIR NAVIGATION SERVICES)
REGULATION**

PART 21 – IMPLEMENTING STANDARDS

IS: 21.1.1 FORMAT-MARGINAL NOTE LAYOUT



IS: 21.2.1 ICAO CHART SYMBOLS

1. CATEGORY INDEX

<i>No:</i>	<i>Symbol</i>
TOPOGRAPHY (1-18)	
Approximate contours	2
Areas not surveyed for contour information or relief data incomplete	18
Bluff, cliff or escarpment	4
Coniferous trees	15
Contours	1
Gravel	8
Highest elevation on chart	12
Laval flow	5
Levee or esker	9
Mountain pass	11
Other trees	16
Palms	17
Relief shown by hachures	3
Sand area	7
Sand dunes	6
Spot elevation	13
Unusual land features approximately labelled	10
HYDROGRAPHY (19-46)	
Abandoned canal	30
Canal	29
Charted isolated rock	44
Coral reefs and ledges	22
Dry lake bed	39
Falls	28
Glaciers and ice caps	42
Lakes (non-perennial)	32
Lakes (perennial)	31
Large rivers (perennial)	23
Rapids	27
Reservoir	38
Rice field	36
Rivers and streams (non- perennial)	25
Rivers and streams (unsurveyed)	26
Rock awash	45
Salt lake	33
Salt pans (evaporator)	34
Shoals	41
Shore lines (reliable)	19
Shoreline (reliable)	20
Small river (perennial)	24
Spring, well or water hole	37
Swamp	35
Tidal flats	21

HYDROGRAPHY (19-46)

Unusual water features appropriately labelled	46
Wash	40

CULTURE (47-83)

Built -up Areas (57-50)

Buildings	50
City or large town	47
Town	48
Village	49

Railroads (51-56)

Railroad (single track)	51
Railroad 9two or more tracks0	52
Railroad (under construction)	53
Railroad bridge	54
Railroad station	56
Railroad tunnel	55

Highways and Roads (57-62)

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

Miscellaneous (63-83)

Boundaries (international)	63
Church	80
Coast guard station	73
Dam	67
Fence	65
Ferry	68
Forest ranger station	76
Fort	79
Lookout tower	74
Mine	75
Mosque	81
Nuclear power station	72
Oil or gas field	70
Outer boundaries	64
Pagoda	82
Pipeline	69
Race track or stadium	77
Ruins	78
Tank farms	71
Telegraph or telephone line (when a landmark)	66
Temple	83

AERODROMES (84-95)

Civil -Land	84
-------------	----

Civil- Water	85
Emergency aerodrome or aerodrome with no facilities	90
Heliport	94
Joint civil and military- land	88
Joint civil or military -Water	89
Military- Land	86
Military -Water	87
Runway pattern in lieu of aerodrome symbol	95
Sheltered anchorage	92
aerodrome data in abbreviated form which may be in association with aerodrome symbols	96
<i>Aerodrome symbols for Approach Charts (97 and 98)</i>	
Aerodromes affecting the traffic pattern on the aerodrome on which the procedure is based	97
The aerodrome on which the procedure is based	98
 RADIO NAVIGATION AIDS (99-110)	
Basic radio navigation aid symbol	99
Collocated VOR and DME radio navigation aids-- VOR/DME	103
Collocated VOR and TACAN radio navigation aids-VORTAC	107
Compass rose	110
Distance measuring equipment-DME	102
DME distance	104
Instrument landing system--ILS	108
Non-directional radio beacon-NDB	100
Radio marker beacon	109
UHF tactical air navigational aid-TACAN	106
VHF omnidirectional radio range-VOR	101
VOR radial	105
 AIR TRAFFIC SERVICES (111-144)	
Advisory airspace- ADA	115
Advisory route-ADR	118
Aerodrome traffic zone-ATZ	112
Air defense identification zone--ADIZ	117
Altitudes/flight levels	125
ATS/MET reporting point-MRP	123
Change over point-COP	122
Control area, Airway, Controlled route	113
Control zone-CTR	116
Final approach fix--FAF	124
Flight information region-FIR	111
Reporting and fly by/flyover functionality	121
Scale-break (on ATS route)	120
Uncontrolled route	114
Visual flight path	119
 <i>Airspace Classifications (126-127)</i>	
Aeronautical data in abbreviated form to be used in association with airspace classification symbols	127
Airspace classification	126
 <i>Airspace Restrictions (128-129)</i>	

International boundary closed to passage of aircraft except through air corridor	129
<i>Restricted airspace (prohibited, restricted or danger area)</i>	128
<i>Obstacles (130-136)</i>	
Elevation of top/Height above specified datum	136
Exceptionally high obstacle — lighted (optional symbol)	135
Exceptionally high obstacle (optional symbol)	134
Group obstacles	132
Lighted group obstacles	133
Lighted obstacles	131
Obstacle	130
<i>Miscellaneous (137-141)</i>	
Isogonic line or isogonal	138
Ocean station vessel (normal position)	139
Prominent transmission line	137
Wind turbine-unlighted and lighted	140
Wind turbines-minor group in major area, lighted	141
<i>Visual Aids (142-144)</i>	
Aeronautical ground light	143
Lightship	144
Marine light	142
SYMBOLS FOR AERODROME/HELIPORT CHARTS (45-161)	
Aerodrome reference point	151
Hard surface runway	145
Heliport alighting area on an aerodrome	150
Hot spot	161
Intermediate holding position	160
Landing direction indicator (lighted)	156
Landing direction indicator (unlighted)	157
Obstacle light	155
Pierced steel plank or steel mesh runway	146
Point light	154
Runway-holding position	159
Runway visual range (RVR) observation site	153
Stop bar	158
Stop way	148
Taxiways and parking area	148
Unpaved runway	147
VOR check-point	152
SYMBOLS FOR AERODROME OBSTACLE CHARTS –TYPE A,B, AND C(162-170)	
Building or large structure	164
Clearway	170
Escarpment	168
Pole, tower, spire, antenna, etc	163
Railroad	165
Stopwaw	165

Terrain penetrating obstacle plane	169
Transmission line or overhead cable	166
Tree or shrub	162

ADDITIONAL SYMBOLS FOR USE ON PAPER AND ELECTRONIC CHARTS (171-180)

Collocated DME fix and marker beacon	180
Collocated radio navigation aid and marker beacon	178
DME fix	179
Holding pattern	173
Minimal sector altitude	173
Missed approach track	174
Radio marker beacon	177
Radio navigation aid	176
Runway	175
Terminal arrival altitude	172

2. ALPHABETICAL INDEX

Symbol No: A	
Abandoned canal	30
Advisory airspace ADA	115
Advisory route -ADR	118
Aerodrome data in abbreviated form	96
Aerodrome/Heliport Charts	145-161
Aerodrome obstacle Charts	162-170
Aerodrome reference point	151
Aerodromes	84-98
Abandoned or closed aerodrome	91
Emergency aerodrome or aerodrome with no facilities	90
Aerodrome symbols for Approach Charts	97, 98
Aerodrome traffic zone-ATZ	112
Aeronautical ground light	143
Air defense identification zone-ADIZ	117
Airspace , advisor- ADA	115
Airspace classifications	126,127
Airspace (prohibited, restricted or danger area), restricted, and common boundary of two area	128
Airspace restrictions	128,129
Air Traffic Services	111-144
Airway-AWY	113
Altitude	
Minimum sector	171
Terminal arrival	172
Altitudes flight levels	125
Anchorage, sheltered	92
Antenna	63
Areas	
Built-up	47-50

Not surveyed for contour information or relief data incomplete	18
Prohibited	128
Restricted	128
ATS/MET reporting point-MRP (compulsory, on request	123
B	
Bluff	4
Boundaries International	63
Outer	64
Building (on Aerodrome Obstacle Charts	164
Buildings	50
C	
Cable, overhead	166
Canal	29
Canal, abandoned	30
Change-over point-OP	122
Charted isolated rock	44
Chart, highest elevation on	12
Chart, system electronic	108,143171-180
Church	80
City or large town	47
Clearway-CWY	170
Cliff	4
Coast guard station	73
Collocated DME fix and marker beacon	180
Collocated radio navigation aid and marker beacon	178
Collocated VOR and DME radio navigation aids-OR/DME	103,110
Collocated VOR and TACAN radio navigation aids-VOR/TAC	107,110
Compass rose	110
Coniferous trees	15
Contours	1
Contours, approximate	2
Control area-CTA	113
Controlled route	113
Control zone-CTR	116
Coral reefs and ledges	22
Culture	47-83
Culture, miscellaneous	63-83
D	
Dam	67
Danger area	128
Danger line	43
Distance measuring equipment-ME	102,110,176,177
DME distance	104
DME fix	179
Collocated DME fix and marker beacon	180
Dry lake bed	39
Dual highway	57
Dunes, sand	6
E	

Electronic chart symbol	108,143,171,180
Elevation (of doubtful accuracy), spot	14
Elevation, spot	13
Escarpment	4
Escarpment (on Aerodrome Obstacle Charts)	168
Esker	9
F	
Falls	28
Fence	65
Ferry	68
Final approach fix-FAF	124
Flight information region-FIR	111
Flight levels	125
Forest ranger station	76
Fort	96
G	
Gas field	70
Glaciers	42
Gravel	8
H	
Hard surface runway	145
Helicopter alighting area on an aerodrome	150
Heliport	94
Highest elevation on chart	12
Highway, dual	57
Highways and roads	57-62
Holding pattern	173
Hot pot	163
Hydrography	19-46
I	
Ice caps	42
Instrument landing system-ILS	108
Intermediate holding position	160
International boundary closed to passage of aircraft except through air corridor	126

Intersection INT	121
Land	
Civil	86
Military	88
Joint civil and military	88
Land features appropriately labeled unusual	10
Landing direction indicator Lighted	156
Unlighted	157
Large River (perennial)	23
Large structure	164
Lava flow	5
Ledges	22
Levee	9
Lightship	144
Lookout tower	74
M	
Marine light	142
Mine	75
Minimum sector altitude-MSA	171
Miscellaneous symbols	
Air Traffic Services	137,141
Culture	63-83
Missed approach track	174
Mosque	81
Mountains pass	11

N

NDB	121
Non directional radio beacon-NDB	100
Nuclear power station	72
O	
Obstacle light	155
Obstacles	130,136
Ocean station vessel	139
Oil field	70
Overhead Cable	166
P	
Pagoda	82
Palms	17
Parking areas	149
Pierced steel plank or steel mesh runway	146
Pipeline	69
Point light	154
Pole	163
Power station, nuclear	72
Primary road	58
Prohibited area	128
Prominent transmission line	137
R	
Race track	77
Radio Marker beacon	109, 177
Radionavigation aid	176
Basic	99
Collocated radio navigation aid and marker beacon	178

Collocated VOR and DME	103
Collocated VOR and TACAN	107
Radio navigation aids	99-110 176,178
Railroad (on Aerodrome Obstacle Charts)	165
Railroads (Culture)	51-56
Rapids	27
Relief data incomplete	18
Relief shown by hachures	3
Reporting and fly-by/flyover functionality	121
Reservoir	38
Restricted airspace (prohibited, restricted or danger area) and common boundary of two areas	128
Restricted area	128
Rice field	36
River (Perennial), small	24
(Perennial), large	23
Rivers and streams	
Non-perennial	25
Unsurveyed	26
Road bridge	61
Road, primary	58
Road, secondary	59
Roads (Highways and Roads)	57-62
Road	
Tunnel	62
Rock awash	45
Rock, charted isolated	44
Route	

Advisory-ADR	118
Controlled	113
Uncontrolled	114
Ruins	78
Runway	175
Hard surface	145
Unpaved	147
Runway-holding position	159
Runway visual range (RVR) observation site	153
S	
Salt lake	33
Salt pans (evaporator)	34
Sand area	7
Sand dunes	6
Scale-break (on ATS route)	120
Secondary road	59
Sheltered anchorage	92
Shoals	41
Shore line	
Reliable	19
Unreliable	20
Shrub	162
Small river (perennial)	24
Spire	63
Spot elevation	13
Spot elevation (of doubtful accuracy)	14
Spring (perennial or intermittent)	37

Stadium	77
Steel mesh runway	146
Steel plank, pierced	146
Stop bar	158
Stopway-SWY (on Aerodrome/Heliport Charts)	148
Stopway-SWY (on Aerodrome Obstacle Charts)	169
Streams	25,26
Structure large	164
Swamp	35
T	
TACAN	121
TACAN (UHF tactical air navigation aid)	106,110
Tank farms	71
Taxiways	149
Telegraph or telephone line (when a landmark)	66
Temple	83
Terminal arrival altitude-TAA	172
Terrain penetrating obstacle plane	167
Tidal flats	21
Topography	1-18
Tower	
Lookout	74
On Aerodrome Obstacle Charts	163
Town	48
Town large	47
Trail	60
Transmission line	

On Aerodrome Obstacle Charts	166
Prominent Tree Coniferous	137 15
On Aerodrome Obstacle Charts	162
Other	16
U	
UHF tactical air navigation aid-TACAN	106.110
Uncontrolled route	114
Unpaved runway	147
Unusual land features appropriately labeled	10
Unusual water features appropriately labeled	46
V	
VFR reporting point	121
VHF omnidirectional radio range-VOR	101,110
Village	49
Visual aids	142-144
Visual flight path	119
VOR	121
VOR check-point	152
VOR/DME	121
VOR/DME (collocated VOR and DME radio navigation aids)	103
VOR radial	105
VORTA	121
VORTAC (collocated VOR and TACAN radio navigation aids)	107
VOR (VHF omnidirectional radio range)	101

W

Wash	40
Water Civil	85
Military	87
Joint civil and military	89
Water features appropriately labeled, unusual	46
Water hole (perennial or intermittent)	37
Waypoint-WPT	121
Well (perennial or intermittent)	37
Wind turbine, unlighted and lighted	140
Wind turbines, minor group in major area, lighted	141

AIR TRAFFIC SERVICES

111	Flight information region	FIR		117	Air defence identification zone	ADZ	
112	Aerodrome traffic zone	ATZ		118	Advisory route	ADR	Alternative
113	Control area Airway Controlled route	CTA WAY	Alternative 				
				114	Uncontrolled route		
115	Advisory airspace	ACA		119	Visual flight path	compulsory with radio communication requirement	
						compulsory, without radio communication requirement	
						recommended	
116	Control zone	CTR		120	Scale-break (on ATS route)	Alternative 	

		On request fly-by	Compulsory fly-by	On request flyover	Compulsory flyover	
121	Reporting and fly-by/over functionality	VFR reporting point				
		Intersection INT				
		VORTAC				
		TACAN				
		VOR				
		VOR/DME				
		NDB				
		Waypoint WPT				

Note — See 2.4.4 and 2.4.5

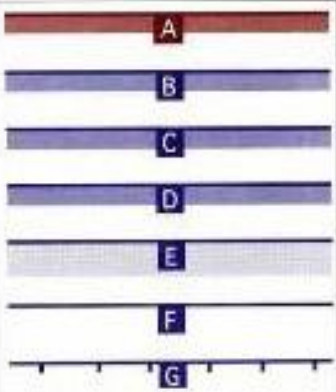
122	Change-over point To be superimposed on the appropriate route symbol at right angles to the route	COP		123	ATS/MET reporting point	MRP	Compulsory		124	Final approach fix	FAF	
							On request					

AIR TRAFFIC SERVICES (cont.)


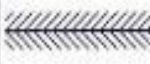
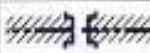
125	Altitude/flight levels	Altitude/flight level "window"	17 000 10 000	FL 220 10 000
		"At or above" altitude/flight level	7 000	FL 70
		"At or below" altitude/flight level	5 000	FL 50
		"Mandatory" altitude/flight level	3 000	FL 30
		"Recommended" procedure altitude/flight level	5 000	FL 50
		"Expected" altitude	Expect 5 000	Expect FL 50

Note.— For use only on SD and STAR charts. Not intended for depiction of minimum obstacle clearance altitude.







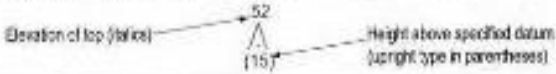
AIRSPACE CLASSIFICATIONS

126	Airspace classifications		<p>Aeronautical data in abbreviated form to be used in association with airspace classification symbols:</p>

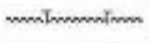

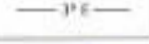


AIRSPACE RESTRICTIONS

128	Restricted airspace (prohibited, restricted or danger area)		Common boundary of two areas	
	Note.— The angle and density of hatching may be varied according to scale and the color, area and orientation of the area.			
129	International boundary closed to passage of aircraft except through a corridor			

OBSTACLES

130	Obstacle		134	Exceptionally high obstacle (optional symbol)	
131	Lighted obstacle		135	Exceptionally high obstacle — lighted (optional symbol)	
132	Group obstacles		Note.— For obstacles having a height of the order of 300 m (1 000 ft) above terrain.		
133	Lighted group obstacles		136	 <p>Elevation of top (feet) → 52</p> <p>Height above specified datum (upright type in parentheses) → (15)</p>	








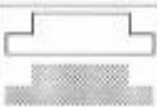












MISCELLANEOUS

137	Prominent transmission line		140	Wind turbine – unlighted and lighted	
138	Isogonic line or isogonal		141	Wind turbines – minor group and group in major area, lighted	
139	Ocean station vessel (normal position)				


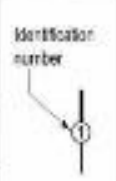





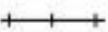

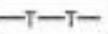
VISUAL AIDS

142	Marine light Note 2: Characteristics are to be indicated as follows:	<table border="0"> <tr> <td>Alt</td> <td>Alternating</td> </tr> <tr> <td>B</td> <td>Blue</td> </tr> <tr> <td>F</td> <td>Flashed</td> </tr> </table>	Alt	Alternating	B	Blue	F	Flashed	<table border="0"> <tr> <td>F</td> <td>Flashing</td> <td>Occ</td> <td>Occulting</td> <td>Sec</td> <td>Second</td> </tr> <tr> <td>G</td> <td>Green</td> <td>R</td> <td>Red</td> <td>(U)</td> <td>Unwatched</td> </tr> <tr> <td>Grp</td> <td>Group</td> <td>SEC</td> <td>Sector</td> <td>W</td> <td>White</td> </tr> </table>	F	Flashing	Occ	Occulting	Sec	Second	G	Green	R	Red	(U)	Unwatched	Grp	Group	SEC	Sector	W	White	<p>Note 1: Marine alternating light to be red and white unless otherwise indicated. Marine lights are white unless colors are stated.</p>
Alt	Alternating																											
B	Blue																											
F	Flashed																											
F	Flashing	Occ	Occulting	Sec	Second																							
G	Green	R	Red	(U)	Unwatched																							
Grp	Group	SEC	Sector	W	White																							
143	Aeronautical ground light	<table border="0"> <tr> <td>☆</td> <td>Electronic</td> <td>★</td> </tr> </table>	☆	Electronic	★	144	Lightship																					
☆	Electronic	★																										

SYMBOLS FOR AERODROME/HELIPORT CHARTS

145	Hard surface runway		154	Point light	<table border="0"> <tr> <td>●</td> </tr> <tr> <td>○</td> </tr> </table>	●	○		
●									
○									
146	Paved steel plank or steel mesh runway		155	Obstacle light					
147	Unpaved runway		156	Landing direction indicator (lighted)					
148	Stopway SWY		157	Landing direction indicator (unlighted)					
149	Taxiways and parking areas		158	Runway-holding position	<table border="0"> <tr> <td>Pattern A</td> <td></td> </tr> <tr> <td>Pattern B</td> <td></td> </tr> </table>	Pattern A		Pattern B	
Pattern A									
Pattern B									
150	Helicopter alighting area on an aerodrome		159	Intermediate holding position					
151	Aerodrome reference point ARP		160	Hot spot					
152	VOR check-point			Note: Hot spot location to be circled.					
153	Runway visual range (RVR) observation site								

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

	Plan	Profile		Plan	Profile	
162	Tree or shrub			167	Terrain penetrating obstacle plane	
163	Pole, tower, spire, antenna, etc.			168	Escarpment	
164	Building or large structure			169	Stopway SWY	
165	Railroad			170	Clearway CWY	
166	Transmission line or overhead cable					

ADDITIONAL SYMBOLS FOR USE ON PAPER AND ELECTRONIC CHARTS

PLAN VIEW		Electronic
171	<p>Minimum sector altitude</p> <p>Note.— This symbol may be modified to reflect particular sector shapes.</p>	MSA
172	<p>Terminal arrival altitude</p> <p>Note.— This symbol may be modified to reflect particular TAA shapes.</p>	TAA
173	Holding pattern	
174	Missed approach track	

PROFILE

175	Runway	
176	Radio navigation aid (type of aid and its use in the procedure to be annotated on top of the symbol)	
177	Radio marker beacon (type of beacon to be annotated on top of the symbol)	
178	Collocated radio navigation aid and marker beacon (type of aid to be annotated on top of the symbol)	
179	DME fix (distance from DME and the fix use in the procedure to be annotated on top of the symbol)	
180	Collocated DME fix and marker beacon (distance from DME and the type of beacon to be annotated on top of the symbol)	