

**COVER SHEET TO AMENDMENT 57**

**INTERNATIONAL STANDARDS  
AND RECOMMENDED PRACTICES**

# **AERONAUTICAL CHARTS**

**ANNEX 4  
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION**

**ELEVENTH EDITION — JULY 2009**

**INTERNATIONAL CIVIL AVIATION ORGANIZATION**

Checklist of Amendments to Annex 4

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	<i>Effective date</i>	<i>Date of applicability</i>
Eleventh Edition (incorporates Amendments 1 to 55)	20 July 2009	19 November 2009; 18 November 2010
Amendment 56 (adopted by the Council on 24 February 2010)	12 July 2010	18 November 2010; 12 November 2015
Amendment 57 (adopted by the Council on 27 February 2013) Replacement pages (xvii), 1-5 to 1-11, 2-5 to 2-7, APP 6-1 to APP 6-4	15 July 2013	14 November 2013

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*Transmittal note*

Amendment 57

to the

International Standards  
and Recommended Practices

AERONAUTICAL CHARTS

(Annex 4 to the Convention on International Civil Aviation)

1. Insert the following replacement pages in Annex 4 (Eleventh Edition) to incorporate Amendment 57 which becomes applicable on 14 November 2013:
    - a) Page (xvii) — Foreword
    - b) Pages 1-5 to 1-11 — Chapter 1
    - c) Pages 2-5 to 2-7 — Chapter 2
    - d) Pages APP 6-1 to APP 6-4 — Appendix 6
  2. Record the entry of this amendment on page (iii).
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<i>Amendment</i>	<i>Source(s)</i>	<i>Subject(s)</i>	<i>Adopted Effective Applicable</i>
55 (11th Edition)	Secretariat with the assistance of the RNPSORSG; proposals by AP/1; and Recommendation 9/3 of IFPP/WG/WHL/1.	Definitions and new provisions relating to performance-based navigation terminology; symbols for wind turbines; a hierarchy of symbols for significant points, and publication of bearings and tracks additionally as True values.	4 March 2009 20 July 2009 19 November 2009; 18 November 2010
56	Secretariat with the assistance of the Aeronautical Information Services-Aeronautical Information Management Study Group (AIS-AIMSG)	Definitions and new provisions relating to cyclic redundancy check (CRC) and an extended applicability date for the Aerodrome Terrain and Obstacle Chart — ICAO (Electronic).	24 February 2010 12 July 2010 18 November 2010; 12 November 2015
57	Secretariat with assistance from the Aeronautical Information Services to Aeronautical Information Management Study Group (AIS-AIMSG)	Integrity of aeronautical data.	27 February 2013 15 July 2013 14 November 2013



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

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

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

**Helicopter stand.** An aircraft stand which provides for parking a helicopter and where ground taxi operations are completed or where the helicopter touches down and lifts off for air taxi operations.

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

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

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

**Human Factors principles.** Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

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

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

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

**Integrity classification (aeronautical data).** Classification based upon the potential risk resulting from the use of corrupted data. Aeronautical data is classified as:

- a) 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;
- b) 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
- c) 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.

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

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

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

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

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

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

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

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

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

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

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

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

**Metadata.** Data about data (ISO 19115\*).

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

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

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

**Minimum sector altitude.** The lowest altitude which may be used which will provide a minimum clearance of 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 centred on a radio aid to navigation.

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

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

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

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

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

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

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

*Note 2.— The term RNP, previously defined as “a statement of the navigation performance necessary for operation within a defined airspace”, has been removed from this Annex as the concept of RNP has been overtaken by the concept of PBN. The term RNP in this Annex is now solely used in the context of navigation specifications that require performance monitoring and alerting, e.g. RNP 4 refers to the aircraft and operating requirements, including a 4 NM lateral performance with on-board performance monitoring and alerting that are detailed in Doc 9613.*

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

- a) are located on an area intended for the surface movement of aircraft; or
- b) extend above a defined surface intended to protect aircraft in flight; or
- c) stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.

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

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

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

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

*Note 3.— See Procedures for Air Navigation Services — Aircraft Operations (Doc 8168), Volume I, Part I, Section 4, Chapter 1, 1.5, and Volume II, Part I, Section 4, Chapter 5, 5.4, for specific applications of this definition.*

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

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

**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.*

**Point light.** A luminous signal appearing without perceptible length.

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

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

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

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

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

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

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

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

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

**Reporting point.** A specified (named) geographical location in relation to which the position of an aircraft can be reported.

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

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

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

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

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

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

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

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

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

**Runway visual range (RVR).** The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

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

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

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

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

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

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

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

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

**Terminal arrival altitude (TAA).** The lowest altitude that will provide a minimum clearance of 300 m (1 000 ft) above all objects located in an arc of a circle defined by a 46 km (25 NM) radius centred on the initial approach fix (IAF), or where there is no IAF on the intermediate approach fix (IF), delimited by straight lines joining the extremity of the arc to the IF. The combined TAAs associated with an approach procedure shall account for an area of 360 degrees around the IF.

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

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

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

**Touchdown and lift-off area (TLOF).** A load bearing area on which a helicopter may touch down or lift off.

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

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

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

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

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

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

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

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

## 1.2 Applicability

1.2.1 The specifications in this Annex are applicable on and after 19 November 2009.

*Note.*— Chapter 2, 2.4.4, and Chapter 5 are applicable on and after 18 November 2010.

1.2.2 All charts coming within the scope of this Annex and bearing the aeronautical information date of 19 November 2009 or later shall conform to the Standards relevant to the particular chart.

1.2.2.1 **Recommendation.**— *All such charts should in addition conform to the Recommended Practices relevant to the particular chart.*

## 1.3 Availability

1.3.1 *Information.* A Contracting State shall on request by another Contracting State provide all information relating to its own territory that is necessary to enable the Standards of this Annex to be met.

1.3.2 *Charts.* Contracting States 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.*

1.3.2.1 For any chart or single sheet of a chart series entirely contained within the territory of a Contracting State, 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 another Contracting State prepared to accept an obligation to produce the chart or sheet with the data necessary for its production.

1.3.2.2 For any chart or single sheet of a chart series which includes the territory of two or more Contracting States, the States having jurisdiction over the territory so included shall determine the manner in which the chart or sheet will be made available. This determination shall be made with due regard being given to regional air navigation agreements and to any programme of allocation established by the Council of ICAO.

*Note.*— *The phrase “regional air navigation agreements” refers to the agreements approved by the Council of ICAO normally on the advice of regional air navigation meetings.*

1.3.3 A Contracting State 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.

1.3.4 **Recommendation.**— *To improve worldwide dissemination of information on new charting techniques and production methods, appropriate charts produced by Contracting States should be made available without charge to other Contracting States on request on a reciprocal basis.*

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

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\* ISO Standard  
19101, *Geographic information — Reference model*  
19104, *Geographic information — Terminology*  
19108, *Geographic information — Temporal schema*  
19115, *Geographic information — Metadata*  
19117, *Geographic information — Portrayal*  
19131, *Geographic information — Data product specifications*



## 2.14 Air traffic services airspaces

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

2.14.2 **Recommendation.**— *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.*

## 2.15 Magnetic variation

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

2.15.2 **Recommendation.**— *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.*

2.15.3 **Recommendation.**— *For instrument procedure charts, the publication of a magnetic variation change should be completed within a maximum of six AIRAC cycles.*

2.15.4 **Recommendation.**— *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.*

## 2.16 Typography

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

## 2.17 Aeronautical data

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

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

2.17.2 States shall ensure that the order of chart resolution of aeronautical data shall be that as specified for a particular chart and as presented in a tabular form in Appendix 6.

2.17.3 Contracting States shall ensure that integrity of aeronautical data is maintained throughout the data process from survey/origin to the next intended user. Based on the applicable integrity classification, the validation and verification procedures shall:

- a) for routine data: avoid corruption throughout the processing of the data;
- b) for essential data: assure corruption does not occur at any stage of the entire process and may include additional processes as needed to address potential risks in the overall system architecture to further assure data integrity at this level; and
- c) for critical data: assure corruption does not occur at any stage of the entire process and include additional integrity assurance processes to fully mitigate the effects of faults identified through analysis of the overall system architecture as potential data integrity risks.

*Note 1.* — *Guidance material in respect to the processing of aeronautical data and aeronautical information is contained in RTCA Document DO-200A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-76 — Standards for Processing Aeronautical Data.*

*Note 2.* — *Error producing faults in the entire process may be mitigated by additional data quality assurance techniques as may be required. These could include application tests for critical data (for example, by flight check); the use of security, logic, semantic, comparison, and redundancy checks; digital error detection; and the qualification of human resources and process tools such as hardware and software.*

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

2.17.5 Electronic aeronautical data sets shall be protected by the inclusion in the data sets of a 32-bit cyclic redundancy check (CRC) implemented by the application dealing with the data sets. This shall apply to the protection of all integrity levels of data sets as specified in 2.17.3.

*Note.* — *Guidance material on the aeronautical data quality requirements (accuracy, resolution, integrity, protection and traceability) is contained in the World Geodetic System — 1984 (WGS-84) Manual (Doc 9674). Supporting material in respect of the provisions of Appendix 6 related to chart resolution and integrity of aeronautical data is contained in RTCA Document DO-201A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-77 — Industry Requirements for Aeronautical Information.*

## 2.18 Common reference systems

### 2.18.1 Horizontal reference system

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

*Note.* — *Comprehensive guidance material concerning WGS-84 is contained in the World Geodetic System — 1984 (WGS-84) Manual (Doc 9674).*

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

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

*Note.— Specifications governing the determination and reporting (accuracy of field work and data integrity) of WGS-84-related aeronautical coordinates for geographical positions established by air traffic services are given in Annex 11, Chapter 2, and Appendix 5, Table 1; and for aerodrome/heliport-related positions, in Annex 14, Volumes I and II, Chapter 2, and in Table A5-1 of Appendix 5 and Table A1-1 of Appendix 1, respectively.*

## 2.18.2 Vertical reference system

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

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

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

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

*Note.— Specifications governing 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, and in Table A5-2 of Appendix 5 and Table A1-2 of Appendix 1, respectively.*

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

## 2.18.3 Temporal reference system

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

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



## APPENDIX 6. AERONAUTICAL DATA QUALITY REQUIREMENTS

**Table 1. Latitude and longitude**

Latitude and longitude	Chart resolution	Integrity Classification
Flight information region boundary points .....	as plotted	routine
P, R, D area boundary points (outside CTA/CTR boundaries) .....	as plotted	routine
P, R, D area boundary points (inside CTA/CTR boundaries) .....	as plotted	essential
CTA/ CTR boundary points.....	as plotted	essential
En-route navaids, intersections and waypoints, and holding, and STAR/SID points.....	1 sec	essential
Obstacles in Area 1 (the entire State territory).....	as plotted	routine
Aerodrome/heliport reference point.....	1 sec	routine
Nav aids located at the aerodrome/heliport.....	as plotted	essential
Obstacles in Area 3.....	1/10 sec	essential
Obstacles in Area 2.....	1/10 sec	essential
Final approach fixes/points and other essential fixes/points comprising the instrument approach procedure .....	1 sec	essential
Runway thresholds .....	1 sec	critical
Taxiway centre line/parking guidance line points.....	1/100 sec	essential
Runway end.....	1 sec	critical
Runway holding position .....	1 sec	critical
Taxiway intersection marking line.....	1 sec	essential
Exit guidance line .....	1 sec	essential
Apron boundaries (polygon).....	1 sec	routine
De-/anti-icing facility (polygon) .....	1 sec	routine
Aircraft standpoints/INS checkpoints .....	1/100 sec	routine
Geometric centre of TLOF or FATO thresholds, heliports.....	1 sec	critical

*Note.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.*

Table 2. Elevation/altitude/height

Elevation/altitude/height	Chart resolution	Integrity Classification
Aerodrome/heliport elevation .....	1 m or 1 ft	essential
WGS-84 geoid undulation at aerodrome/heliport elevation position .....	1 m or 1 ft	essential
Runway or FATO threshold, non-precision approaches .....	1 m or 1 ft	essential
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, non-precision approaches .....	1 m or 1 ft	essential
Runway or FATO threshold, precision approaches .....	0.5 m or 1 ft	critical
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, precision approaches .....	0.5 m or 1 ft	critical
Threshold crossing height (Reference datum height), precision approaches .....	0.5 m or 1 ft	critical
Obstacle clearance altitude/height (OCA/H) .....	as specified in PANS-OPS (Doc 8168)	essential
Obstacles in Area 1 (the entire State territory).....	3 m (10 ft)	routine
Obstacles in Area 2.....	1 m or 1 ft	essential
Obstacles in Area 3.....	1 m or 1 ft	essential
Distance measuring equipment (DME).....	30 m (100 ft)	essential
Instrument approach procedures altitude .....	as specified in PANS-OPS (Doc 8168)	essential
Minimum altitudes.....	50 m or 100 ft	routine

*Note.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.*

**Table 3. Gradients and angles**

Type of gradient/angle	Chart resolution	Integrity Classification
Non-precision final approach descent gradient.....	0.1 per cent	critical
Final approach descent angle (Non-precision approach or approach with vertical guidance).....	0.1 degree	critical
Precision approach glide path/elevation angle.....	0.1 degree	critical

**Table 4. Magnetic variation**

Magnetic variation	Chart resolution	Integrity Classification
Aerodrome/heliport magnetic variation.....	1 degree	essential

**Table 5. Bearing**

Bearing	Chart resolution	Integrity Classification
Airway segments.....	1 degree	routine
Bearing used for the formation of an en-route and of a terminal fix.....	1/10 degree	routine
Terminal arrival/departure route segments.....	1 degree	routine
Bearing used for the formation of an instrument approach procedure fix.....	1/10 degree	essential
ILS localizer alignment.....	1 degree	essential
MLS zero azimuth alignment.....	1 degree	essential
Runway and FATO bearing.....	1 degree	routine

Table 6. Length/distance/dimension

Length/distance/dimension	Chart resolution	Integrity Classification
Airway segment length.....	1 km or 1 NM	routine
Distance used for the formation of an en-route fix.....	2/10 km (1/10 NM)	routine
Terminal arrival/departure route segment length.....	1 km or 1 NM	essential
Distance used for the formation of a terminal and instrument approach procedure fix.....	2/10 km (1/10 NM)	essential
Runway and FATO length, TLOF dimensions.....	1 m	critical
Runway width.....	1 m	essential
Stopway length and width.....	1 m	critical
Landing distance available.....	1 m	critical
Take-off run available.....	1 m	critical
Take-off distance available.....	1 m	critical
Accelerate-stop distance available.....	1 m	critical
ILS localizer antenna-runway end, distance.....	as plotted	routine
ILS glide slope antenna-threshold, distance along centre line.....	as plotted	routine
ILS marker-threshold distance.....	2/10 km (1/10 NM)	essential
ILS DME antenna-threshold, distance along centre line.....	as plotted	essential
MLS azimuth antenna-runway end, distance.....	as plotted	routine
MLS elevation antenna-threshold, distance along centre line.....	as plotted	routine
MLS DME/P antenna-threshold, distance along centre line.....	as plotted	essential

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