ESWATINI CIVIL AVIATION AUTHORITY

DOCUMENT TYPE: DIRECTIVE	TITLE: PROCEDURE DESIGN	ISSUE DATE: 15 MARCH 2019
	PREPARED BY: CHIEF AERODROMES AND AIR NAVIGATION SERVICES SIGNATURE: _____ DATE: 15/03/2019	REVISION No. 00
DOCUMENT NO. ES/FSSD/ANS/Dir/002	**REVIEWED BY:** DIRECTOR FLIGHT SAFETY STANDARDS SIGNATURE: _____ DATE: 15/03/2019	
STATUS: CONTROLLED DOCUMENT	**AUTHORISED BY:** DIRECTOR GENERAL SIGNATURE: _____ DATE: 15/03/2019	EFFECTIVE DATE: 16 APRIL 2019

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ESWATINI CIVIL AVIATION AUTHORITY

Directive

ES/FSSD/ANS/Dir/002

March 2019

Eswatini Civil Aviation Authority

Procedure Design
DIRECTIVE

First Edition, March 2019

Procedure Design

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Procedure Design

DIRECTIVE

Foreword

Section 31(3) of the Civil Aviation Act gives the power to the Director General, Eswatini Civil Aviation Authority (ESWACAA) to issue directives pursuant to and in accordance with the provisions of the Act. A Directive is intended to provide information to govern the implementation of a Standard.

This Directive provides information governing the implementation of the requirements contained in Civil Aviation (Air Navigation Services) Regulations 2013, on the construction of instrument and visual flight procedures. It complements the regulatory framework applicable in Eswatini for construction of instrument and visual flight procedures.

Pursuant to Regulation 42 of Civil Aviation Authority (Air navigation services) Regulations 2013, the Authority, this document provides information to govern the provision of instrument and visual flight procedures.

This Directive is approved and issued under the authority of the Director General, Eswatini Civil Aviation Authority. It repeals and replaces the Advisory circular CAA-AC- ANS004A of September 2014.

Solomon Dube
Director General, ESWACAA

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1. Definitions

The definitions used in this directive are similar to those found in relevant Eswatini Civil Aviation Regulatory and guidance material such as Civil Aviation (Air Navigation Services) Regulations 2013, and associated documentation or those given below:

Accuracy. A degree of conformance between the estimated or measured value and the true value.

Advisory Circular (AC). A document issued and published under the Authority of the Director General, pursuant to section 34 (a) and (c) of the Civil Aviation Act, to provide guidance for compliance with Eswatini standards. It defines acceptable means, but not the only means, of accomplishing or showing compliance with Eswatini Standards.

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome mapping data (AMD). Data collected for the purpose of compiling aerodrome mapping information.

Aerodrome mapping database (AMDB). A collection of aerodrome mapping data organized and arranged as a structured data set.

Aeronautical data. A representation of aeronautical facts, concepts or instructions in a formalized manner suitable for communication, interpretation or processing.

Aeronautical information. Information resulting from the assembly, analysis and formatting of aeronautical data.

Aeronautical Information Circular (AIC). A notice containing information that does not qualify for the origination of a NOTAM (notices to airmen) or for inclusion in the AIP (aeronautical information publication) but that relates to flight safety, air navigation, or technical, administrative, or legislative matters.

Aeronautical Information Management (AIM). The dynamic, integrated management of aeronautical information through the provision and exchange of quality-assured digital aeronautical data in collaboration with all parties.

Aeronautical Information Publication (AIP). A publication issued by the Authority and containing aeronautical information of a lasting character essential to air navigation.

Aeronautical Information Service (AIS). The service established in Eswatini responsible for the provision of aeronautical data and aeronautical information necessary for the safety, regularity and efficiency of air navigation.

AIP Amendment. Permanent changes to the information contained in the AIP.

AIP Supplement. Temporary changes to the information contained in the AIP which are published by means of special pages.

AIRAC. An acronym (Aeronautical Information Regulation And Control) signifying a system aimed at advance notification, based on common effective dates, of circumstances that necessitate significant changes in operating practices.

Air Navigation Services. A generic term for services provided to air traffic during all phases of operation including air traffic services; communication, navigation and surveillance services; meteorological services for air navigation; aeronautical information services; aeronautical cartography/MAPS; and search & rescue services.

Air Navigation facility. Any facility used, available for use, or designed for use in aid of navigation of aircraft, including airports, landing fields, any structures, mechanisms, lights, beacons, marks, communicating systems, or other instruments or devices used or useful as an aid to the safe taking off, navigation, and landing of aircraft and any combination of such facilities.

Air navigation services provider. An entity established for the purpose of operating and managing air navigation services.

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

Authority. Eswatini civil Aviation Authority

Automatic dependent surveillance (ADS). A surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position fixing systems, including aircraft identification, four dimensional position and additional data as appropriate.

Automatic dependent surveillance — broadcast (ADS-B). A means by which aircraft, aerodrome vehicles and other objects can automatically transmit and/or receive data such as identification, position and additional data, as appropriate, in a broadcast mode via a data link.

Automatic dependent surveillance — contract (ADS-C). A means by which the terms of an ADS-C agreement will be exchanged between the ground system and the aircraft, via a data link, specifying under what conditions ADS-C reports would be initiated, and what data would be contained in the reports.

Automatic terminal information service (ATIS). The automatic provision of current, routine information to arriving and departing aircraft throughout 24 hours or a specified portion thereof:

- Data link-automatic terminal information service (D-ATIS).
- The provision of ATIS via data link.
- Voice-automatic terminal information service (Voice-ATIS).
- The provision of ATIS by means of continuous and repetitive voice broadcasts.

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

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

Canopy. Bare Earth supplemented by vegetation height.

Civil Aviation Act. The Eswatini Civil Aviation Act 2009.

Confidence level. The probability that the true value of a parameter is within a certain interval around the estimate of its value.

Controller-pilot data link communications (CPDLC). A means of communication between controller and pilot, using data link for ATC communications.

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

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

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

Data product. Data set or data set series that conforms to a data product specification (ISO 19131*).

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

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

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

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

Direct transit arrangements. Special arrangements approved by the public authorities concerned by which traffic which is pausing briefly in its passage through the Contracting State may remain under their direct control.

Directive. A document issued and published under the authority of the Director General to govern the implementation of a Standard

Director General. The Director General of the Eswatini Civil Aviation Authority.

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

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

ESWACAA Eswatini Civil Aviation Authority

Feature relationship. Relationship that links instances of one feature type with instances of the same or a different feature type (ISO 19101*).

Feature type. Class of real world phenomena with common properties (ISO 19110*).

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

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

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

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

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).

Guidance Material. A document issued and published under the authority of the Director General to guide ESWACAA technical staff members and relevant industry players to implement the requirements

Handbook. A document issued and published under the authority of the Director General containing one or more operational processes, procedures and or checklist developed for the use of ESWACAA technical personnel and safety inspectors.

Heading. The direction in which the longitudinal axis of an aircraft is pointed, usually expressed in degrees from North (true, magnetic, compass or grid).

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

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.

IFP. Instrument Flight Procedure

Integrated Aeronautical Information Package. A package in paper, or electronic media which consists of the following elements:

- AIP, including amendment service;
- Supplements to the AIP;
- NOTAM and PIB;
- AIC; and
- checklists and lists of valid NOTAM.

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost nor altered since the data origination or authorized amendment.

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.

ISO. Refer to the International Standards Organization a nonprofit organization that develops and publishes standards in a wide range of areas. ISO standards included in this SUCAR are

19104, Geographic Information – Terminology, and 19108, Geographic Information – Temporal Schema

Location indicator. A four-letter code group formulated in accordance with rules prescribed by ICAO and assigned to the location of an aeronautical fixed station.

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

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.

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:

a. 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.
b. 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.

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.

Obstacle/terrain data collection surface. A defined surface intended for the purpose of collecting obstacle/terrain data.

Order. A document issued and published under the authority of the Director General to provide detailed instructions on the implementation of the requirements contained in the Authority's Regulations.

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.

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.

Post spacing. Angular or linear distance between two adjacent elevation points.

Precision. The smallest difference that can be reliably distinguished by a measurement process.

Pre-flight information bulletin (PIB). A presentation of current NOTAM information of operational significance, prepared prior to flight.

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.

Quality. Degree to which a set of inherent characteristics fulfils requirements.

Quality assurance. Part of quality management focused on providing confidence that quality requirements will be fulfilled (ISO 9000*).

Quality control. Part of quality management focused on fulfilling quality requirements.

Quality management. Coordinated activities to direct and control an organization with regard to quality

Radio navigation service. A service providing guidance information or position data for the efficient and safe operation of aircraft supported by one or more radio navigation aids.

Requirement. Need or expectation that is stated, generally implied or obligatory .

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.

Route stage. A route or portion of a route flown without an intermediate landing.

2. General

2.1. Legal framework applicable in Eswatini

2.1.1. Obligation of service provider to provide instrument flight procedures

2.1.1.1. Under Civil Aviation (Air Navigation Services) Regulation 2013, regulation 42 the designated service provider is required to develop visual and instrument flight procedures to be used by aircraft operating in the designated airspace and aerodrome in conformity with the prescribed requirements .

2.2. Duties & Responsibilities

2.2.1. Eswatini Civil Aviation Authority

2.2.1.1. The Authority is responsible for advising the Minister on the regulatory and guidance material applicable to Air Navigation Services in Eswatini, as well as its implementation.

2.2.1.2. The Authority has established an Aerodromes & Air Navigation Services (AANS) Department with a mandate, amongst others, to implement the requirements for the provision of visual and instrument flight procedures prescribed in this Directive.

2.2.1.3. The Authority delegates the provision of the instrument flight procedures to a service provider that takes over the responsibility for the production, publication and distribution of the visual and instrument flight procedures.

2.2.1.4. The AANS has the responsibility to oversee the activities of all ANSP including the one in charge of visual and instrument flight procedures.

2.2.2. IFP services Provider

2.2.2.1. The IFP services Provider shall hold a certificate issued under Civil Aviation (Air Navigation Services) Regulation 2013.

2.2.2.2. The IFP services Provider is responsible for the preparation, storage, publication, and distribution of the visual and instrument flight procedures.

2.2.2.3. The IFP services Provider shall maintain an appropriate instrument design office to enable the IFP designer to carry on design work in instrument flight procedures in accordance

with the requirements set out in the Civil Aviation (Air Navigation Services) Regulation, and associated advisory circulars,directives, and orders.

2.2.2.4. The IFP design services provider shall ensure that the designs of instrument flight procedure are in accordance with:

a)applicable standards set out or referred to in ICAO Doc 8168; and

b) applicable standards as set out in the Civil Aviation (Air Navigation Services) Regulation, and associated advisory circulars, directives, and orders.

2.2.2.5. The IFP design services provider shall make provisions for a person(s) trained in IFP design to check and verify independently the plans of each instrument flight procedure designed.

2.3. Instrument Flight Procedure Design Manual

2.3.1. Requirements for MANSOPS

2.3.1.1. The IFP design service providers shall develop and maintain an operations manual.

2.3.1.2. The operations manual shall serve to demonstrate how the service provider will comply with the requirements set out in the Civil Aviation (Air Navigation Services) Regulation, and associated advisory circulars,directives, and orders.

2.3.1.3. The contents of the operations manual shall include but not limited to the requirements of MANSOPS as set out in the Civil Aviation (Air Navigation Services) Regulation, and associated advisory circulars, directives, and orders.

2.3.2. Resource Requirements

2.3.2.1. The IFP design service provider shall provide and maintain facilities for the design work on instrument flight procedures. This would include:

(a) having available equipment appropriate for the design, design verification, flight validation, and maintenance of the types of instrument flight procedures;

(b) access to relevant and current data including, but not limited to, aeronautical data, land contour data, and obstacle data for the design, design verification, flight verification, and maintenance of the instrument flight procedures; and

(c) ready access to copies of relevant documentation comprising technical standards, practices, and instructions, and any other documentation that may be necessary for the design, design verification, flight validation, and maintenance of the types of instrument flight procedure.

2.3.2.2. If an aeronautical database and aeronautical data is required for designing an instrument flight procedure, the IFP design services provider shall ensure the integrity of the database and the data. The data used shall be current, traceable, and meets the required level of verifiable accuracy for the design.

3. Preparation for procedure design

3.1. Equipment

3.1.1. The following equipment shall be available:

a) rulers (various scales), protractors, compasses, flexible curves, etc.;
b) maps of appropriate scales;
c) a calculator with scientific functions and one or more memory function. Where a number of repetitive calculations are to be performed, a programmable calculator can be helpful; and
d) precalculated templates and tables of dimensions for the procedures to be designed

3.2. Preparatory calculations

3.2.1. The PANS-OPS caters to a wide variety of conditions in each segment of instrument procedures — departure as well as approach and missed approach. The services provider shall simplify procedure design by precalculating certain critical dimensions, area parameters and templates. These can then be used directly in most procedures, eliminating tedious and repetitive calculations.

Precalculated tables of dimensions and tolerances

3.2.2. The use of precalculated tables of dimensions/ tolerances is made possible because most of the departure, final approach and missed approach area dimensions (MAPt, distance to SOC turn area dimensions, etc.) depend only on aerodrome elevation (IAS and wind speed are already defined and fixed). Fortunately, the variation of these dimensions with aerodrome elevation is relatively small. Thus, if the dimensions are calculated to cover a range of aerodrome elevations from, say, 0 to 3 000 ft, any "penalty" introduced is negligible. If the actual range ofaerodrome elevations exceeds this, the aerodromes may be divided into two groups and separate sets of dimensions calculated; alternatively, one set (with slightly larger values) can be prepared to cover the extended range ofaerodrome elevations.

Pre-calculated area transparencies

3.2.3. The following precalculated areas drawn on transparencies to map scale may be useful:

a) intermediate approach within a reversal/racetrack area;
b) final approach for off-aerodrome VOR or NDB;
c) final approach/missed approach for on-aerodrome VOR or NDB;
d) basic ILS surfaces; and
e) departure.

Holding/racetrack/reversal procedure templates

3.2.4. Patterns for the areas required are published in the Template Manual for Holding, Reversal and Racetrack Procedures (Doc 9371). It should be noted that they are not templates for the whole area — this is obtained by locating such a template over the vertices of the associated fix tolerance area and tracing a composite boundary. In addition, the entry area (for

racetracks and holdings) requires further re-orientation of the TTT template and tracing to complete the entry areas.

3.3. Maps

3.3.1. It is necessary to select maps with scales appropriate to the procedure segment being designed. Suitable scales are:

a) 1:1 000 000 and 1:500 000 for initial location of facilities in relation to airways and calculation of minimum sector altitudes;
b) 1:250 000 for confirmation of minimum sector altitudes, plotting of standard arrival routes, racetrack and reversal areas, initial/intermediate areas and missed approach;
c) 1:100 000 and 1:50 000 for detail checks within racetrack and reversal areas or intermediate areas ,final approach area, detail checks in missed approach area; and
d) 1:25 000 and 1:10 000 for check of the ILS precision segment and preparation of obstacle datafor collision risk model (CRM).

3.4. Obstacle survey

3.4.1. all obstacles should be accounted for. This is relevant when using data from existing maps, since maps are frequently out of date by the time they are printed and many items (i.e. trees, heights of tall buildings) are not portrayed. Such items must be accounted for either by physical examination of the site or by the addition of a suitable margin above the terrain contours.

3.4.2. the accuracy of the vertical and horizontal data obtained (and hence the cost of the survey) may be adjusted by adding an amount equal to the specified survey error to the height of all measured obstructions and by making a corresponding adjustment for specified horizontal error.

3.5. REFERENCES

3.5.1. **Applicable Standards and Guidance Material**

3.5.1.1. The standards and guidance material for development of flight procedures in compliance with the provisions of the latest editions of the following ICAO documents:

a. The Civil Aviation (Air Navigation services) Regulations 2013.
b. ICAO Doc 8168 – OPS/611 Aircraft Operations
c. ICAO Doc 9274 – AN/904 Manual on the Use of the Collision Risk Model (CRM) for ILS operations
d. ICAO Doc 9368 – AN/911 Instrument Flight Procedure Construction Manual
e. ICAO Doc 9674 – AN/946 World Geodetic System 1984 (WGS-84) Manual
f. ICAO Doc 9906 – AN/472 Quality Assurance Manual for Flight Procedure Design
g. ICAO Doc 8697
h. ICAO Annex 4

3.5.1.2. Appropriate action must be taken to ensure that latest editions of the applicable reference documents are used.

3.5.2. **Criteria**

3.5.2.1. The PANS OPS Criteria contained in ICAO Doc 8168 shall be applied in developing instrument approach procedures.

3.5.2.2. The design and format for IAP charts shall be in accordance with ICAO Annex 4 and ICAO Doc 8697.

3.5.2.3. In addition to the primary consideration of obstacle clearance, principles which should be applied to the design of flight procedures are that they should be safe, simple and economic in terms of time and airspace. Different procedures to the same runway should be harmonized as far as possible, e.g. platform altitudes and FAFs.

4. Requirement for flight procedures

4.1. New Procedures

4.1.1. Where an operational requirement exists for a new flight procedure, the Air Navigation Services Provider shall ensure that such procedure is designed in accordance with the standards outlined at section 3.5 above and submitted to Authority for approval. The supporting documentation outlined at section 5 below should be included.

4.1.2. The ANSP may consult with Authority, in advance or during the design process, to clarify regulatory requirements.

4.2. Revision of Flight Procedures

4.2.1. Each flight procedure published in the AIP should be revised as follows:

a) when a significant change to the obstacle environment occurs, requiring an amendment of procedural minimum altitudes;
b) when a published bearing, track or radial would fall into error by 1^0, consequent on a change to magnetic variation or station declination;
c) to improve safety or operational efficiency, as identified by an interested party;
d) to accommodate changes to aircraft category or characteristics;
e) to accommodate route connectivity or airspace organisation change;
f) necessitated by changes to the supporting navigation facility;
g) to comply with amendments to applicable ICAO provisions and other international and national standards and recommended practices;
h) where a change in procedural attitude is required;
i) when a significant change occurs to aerodrome physical characteristics such as runways;
j) when any other significant change occurs to aeronautical, cultural or topographical data

4.2.2. Each procedure should be reassessed at least yearly and a revision proposed if necessary.

4.3. Data acquisition

4.3.1. **Information and data required.**

4.3.1.1. The information and data required for procedure design shall consist of:

a. Airport, NAVAID, obstacle, terrain coordinates and elevation data based on verified surveys and compliant with ICAO Annex 11, 14 and 15 requirements;
b. Airspace requirements;
c. Airport infrastructure: runway classification, lighting, communications, runway markings and local altimeter setting;
d. Environmental considerations;
e. Any other potential issue associated with the procedure.

4.4. Review of design and approval

4.4.1. New or revised procedure

4.4.1.1. Each new or revised procedure shall be verified by a qualified procedure designer other than the one who designed the procedure, to ensure compliance with applicable criteria, before submission to the Authority for approval.

4.4.1.2. The credentials and the comments of the procedure designer reviewing the procedure must be attached to the documentation submitted for approval.

4.5. Proficiency of Procedure Designer

4.5.1. Proficiency

4.5.1.1. In order to ensure that flight procedures, submitted to the Authority for approval for publication in AIP, meet the required standard of quality assurance the proficiency of the designers is specified as follows:

(1) successful completion of an ICAO PANS-OPS course for the relevant flight procedure types;
(2) a minimum of five years aviation experience as a pilot, air traffic controller, procedure designer under supervisor, or equivalent experience; and,
(3) completion of a minimum of two approved flight procedures designs under the supervision of a competent procedure designer

4.5.1.2. Flight procedures submitted for approval should be accompanied by details of competence of the designer(s).

4.5.2. Categories of personnel to be trained

4.5.2.1. The following categories of personnel are required to be trained:

(a) Flight procedure designers ,

(b) Cartographers, and

(c) Flight Procedures inspectors

4.5.3. Approved training organizations

4.5.3.1. A number of organizations provide training in flight procedure design. An IFP design services provider shall request the Authority to approve training organizations intended for the provision of training.

4.5.4. Requirements for training

4.5.4.1. Basic flight procedure design training : Basic flight procedure design shall be provided to all personnel to be involved in the design, development, drawing and flight inspection. The training should provide participants with basic skills to develop non-precision approach and departure procedures using the ICAO PANS-OPS Doc 8168 criteria. The training will form a foundation for progression in the areas of specialization for each individual.

4.5.4.2. Specialized training Flight procedure design is a wide discipline and it is not practicable for an individual to cover all aspects of the subject. The ANSP needs to identify individual talents and provide specialized training as follows:

(a) Precision approach procedures

(b) RNAV and RNP procedures

(c) Quality control in flight procedure design

(d) Flight procedures inspection

4.5.4.3. On-the-Job Training : The IFP design service provider shall ensure that performance based OJT programmes involving designing, developing, drawing and flight inspection of procedures are conducted before any individual can be authorized to carry out specified duties. The ANSP shall engage qualified OJT instructors to carry out specialized training in the field.

4.5.4.4. Refresher training. The technology employed in developing procedures as well as the airborne and space based system used in navigation are in a constant state of evolution. To cope with changing technology and operating procedures, it is necessary that the IFP design organisation provide personnel with courses of instruction designed to bring knowledge and skills up to date. Refresher courses may range from in-house to full-fledged training in specialized training organizations.

4.5.5. Training records

4.5.5.1. The IFP design services provider shall ensure that training records, including OJT are properly kept for inspection by the Authority as may be required.

4.5.5.2. The training records shall include certificates, OJT tasks performed and any other documents related to training and approval of jobs performed.

4.5.6. Requirement for approved curriculum

4.5.6.1. The IFP design organisation shall develop training curricula for all types of training as required by this circular.

4.5.6.2. The curricula shall be approved by the Authority.

4.6. Airspace Organization

4.6.1. Instrument flight paths should be contained within controlled airspace, where established.

4.6.2. Where instrument flight paths are contained within controlled airspace which lies above uncontrolled airspace, the minimum procedural altitude should be at least 500ft above the base of controlled airspace.

4.6.3. Any proposal to establish a terminal instrument flight path in uncontrolled airspace will require a safety assessment including consideration of types and density of air traffic, risk analysis and acceptable mitigation.

4.7. Flight Procedure Construction Principle

In addition to the primary consideration of obstacle clearance, principles which should be applied to the design of flight procedures are that they should be safe, simple and economic in terms of time and airspace. Consistency between different procedures to the same runway should be applied to the extent feasible e.g. harmonization of platform altitudes and FAFs.

5. Supporting Documentation

5.1. Documentation to be included

5.1.1. The documentation to be included with flight procedures submitted for approval should include, as appropriate:

a) obstacle survey data including dates of last full and update surveys;
b) airfield and navigation facility data;
c) diagram of each segment and holding areas showing dominant obstacles;
d) procedural and minimum altitudes for each segment;
e) track guidance;
f) chart depicting the procedure;
g) textual or abbreviated description and path terminators where applicable;
h) associated positional data e.g. co-ordinates, bearings, distances;
i) description of methodology and options considered;
j) sufficient detail of significant calculation and design data to enable the proposal to be validated;
k) other information considered relevant in support of the request for approval

5.2. Documents and Records Control System

5.2.1. The IFP design services provider shall establish and put into effect, a system for controlling documents and records relating to the instrument flight procedures on which the designer carries on design work, including the policies and procedures for making, amending, preserving and disposing of those documents and records.

5.2.2. The IFP design services provider shall, at the Authority's request, make the documents ans make the documents and records, or copies of them or extracts from them, available for inspection by the Authority.

5.2.3. The IFP design services provider shall ensure that all documents produced from the time the need for the design or amendment of a procedure is determined to the actual request for approval are retained.

6. Quality Assurance

6.1. Quality requirements

6.1.1. The quality requirements for the procedures shall conform to the requirements prescribed by the Authority. This includes the establishment, maintenance and documentation of a quality management system.

6.2. Working Practices

6.2.1. Use of software

6.2.1.1. Where practicable calculation and drawing of flight paths and protected areas should be done using accredited software.

6.2.2. Data Processing

6.2.2.1. Data processing and transfer techniques shall, where practicable, be based on electronic rather than manual methods. Techniques for deriving positional data shall ensure that accuracy, resolution and integrity of such data complies with the requirements prescribed by the Authority.

6.2.3. Survey and Charting Accuracies

6.2.3.1. Account must be taken of survey and charting accuracies by adding vertical and horizontal tolerances, as determined appropriate.

6.2.4. Obstacle clearance altitude / height OCA / OCH

6.2.4.1. The entity responsible for developing flight procedures shall publish obstacle clearance altitude OCA and obstacle clearance height OCH for an aerodrome as described in ICAO Doc 8168 vol II.

6.2.5. Minimum Descent Altitude MDA and Minimum Descent Height MDH

6.2.5.1. The entity responsible for developing flight procedures shall establish and publish minimum descent altitude MDA and Minimum descent height MDH for an aerodrome as described in ICAO Annex 4 and Doc 8168 vol II.

6.2.6. Decision Altitude DA and Decision Height DH

6.2.6.1. The entity responsible for developing flight procedures shall establish and publish Decision Altitude DA and Decision Height DH for an aerodrome as described in ICAO Annex 4 and Doc 8168 vol II.

6.2.7. Validation of flight procedures

6.2.7.1. Validation is the necessary final quality assurance step in the procedures design process prior to publication. The purpose of validation is the verification of all obstacles and navigation data, and assessment of applicability of the procedure.

6.2.7.2. Ground validation shall always be undertaken. When the Authority can verify, by ground validation, the accuracy and completeness of all obstacles and navigation data, then the Authority may decide to dispense with the flight validation requirement.

6.2.8. Ground validation

6.2.8.1. Ground validation is a review of the entire instrument flight procedure by a person trained in procedure design and with appropriate knowledge of flight validation issues. It is meant to catch errors in criteria and documentation, and evaluate on the ground, to the extent possible, those elements that will be evaluated in flight. Issues identified in the ground validation should be addressed prior to any flight validation. The ground validation will also determine if flight validation is needed for modifications and amendments to previously published procedures.

6.2.9. Flight validation

6.2.9.1. Flight validation of instrument flight procedures shall be carried out as part of the initial certification and shall be included as part of the periodic quality insurance program. It shall be performed by a flight crew approved by the Authority. The objectives of flight validation are:

(a) Provide assurance that adequate obstacle clearance has been provided;
(b) Verify that the navigation data used are correct;
(c) Verify that all required infrastructures, such as runway marking, lighting, communication and navigational aids are in place and operative;
(d) Verify that the procedure can be safely flown;
(e) Evaluate the charting, required infrastructures, visibility and other operational factors.

6.2.9.2. A briefing to the flight crew shall be performed before the flight test by the designer of the procedure or by a qualified procedure designer having reviewed the procedure.

6.2.9.3. To perform flight validation of procedures, pilots must carry a Commercial Pilot License and a valid Instrument Rating with appropriate experience and be approved by the Authority.

6.2.10. Flight inspection

6.2.10.1. Flight inspection of instrument flight procedures shall not be confused with flight validation, and is required to assure that the appropriate radio navigation aids adequately support the procedure. This is carried out as a part of a formal flight inspection program and is performed by a qualified and certified flight inspector using an appropriately equipped and certified aircraft.

6.2.11. Periodical review of flight procedures

6.2.11.1. The entity responsible for flight procedures design shall establish, submit to the Autority and conduct a program of periodical review of the procedures to ensure that they continue to comply with changing criteria an meet the users requirements.

6.2.12. Exceptions from PANS-OPS Criteria.

6.2.12.1. Any exceptions from PANS-OPS criteria applied in the procedure construction should be identified. Such exceptions will require to be considered in conjunction with operators before approval for publication is issued. Only where an identifiable operational

advantage can be gained, without compromising safety taking account of the local environment will exceptions to the PANS-OPS criteria be accepted.

6.2.13. **Consultation with User Representatives.**

6.2.13.1. The ANSP is advised to consult with user representatives, where feasible, before submission of new procedures, particularly where there are complexities in the design. Such consultation may be informal but a note of the outcome may be included with the supporting documentation. During the evaluation process a determination will be made as to whether formal consultation with user representatives is required.

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