



Civil Aviation Authority

CAR-173

Civil Aviation Regulation

INSTRUMENT FLIGHT

PROCEDURE DESIGN

REQUIREMENTS

Effective: 25 July 2023

Approved by HE Eng. Naif Ali Hamed Al-Abri
President of CAA

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Table of Contents – CAR-173 – Instrument Flight Procedure Design Requirements.....	1
Corrigendum of Amendments.....	3
Glossary of Terms or Abbreviations	8
SUBPART A - GENERAL	11
CAR 173.001 Scope	11
CAR 173.005 Definitions	11
CAR 173.010 Roles and Responsibilities	13
CAR 173.015 Requirement for Certificate	13
CAR 173.020 Application for Certificate	13
CAR 173.025 Issue of Certificate.....	13
CAR 173.030 Privileges of Certificate.....	14
CAR 173.035 Duration of Certificate.....	14
CAR 173.040 Renewal of Certificate	14
CAR 173.045 Audits and Inspections	14
CAR 173.050 Resolution of Non-Compliances	14
CAR 173.055 Transferability	15
CAR 173.060 Non-Compliance.....	15
Subpart B — Certification Requirements.....	16
CAR 173.100 Personnel requirements.....	16
CAR 173.105 Training.....	16
CAR 173.110 Facility Requirements.....	17
CAR 173.115 Documentation.....	17
CAR 173.116 Criteria for the Approval of IFP Designers	18
CAR 173.120 Authorisation of Persons to Certify Instrument Flight Procedures.....	20
CAR 173.125 Certification of Instrument Flight Procedures.....	20
CAR 173.130 Errors in published instrument flight procedures	20
CAR 173.135 Management of IFP Records	20
CAR 173.140 Quality Management System (QMS) Requirements	21
CAR 173.145 Safety Management System (SMS) Requirements	21
CAR 173.150 Operations Manual.....	22
CAR 173.155 Flight Procedure Design Software Validation.....	22
Subpart C — Operating Requirements.....	23
CAR 173.200 Continued Compliance	23
CAR 173.205 Changes to Certificate Holder's Organisation	23
Subpart D — Design Criteria—Instrument Flight Procedure	25
CAR 173.250 Design Criteria	25

CAR 173.255	Aerodrome Operating Minima to be Published in Instrument Approach Charts.....	25
Subpart E — Instrument Flight Procedure Process.....		27
CAR 173.300	FPD Initiation	27
CAR 173.305	Collection and Validation of the Data	27
CAR 173.310	Flight Procedure Design (FPD).....	27
CAR 173.315	FPD Documentation	28
CAR 173.320	Validation of IFP	28
CAR 173.325	Ground Validation	28
CAR 173.330	Flight Validation.....	28
CAR 173.335	Flight Inspection	29
CAR 173.340	Submission of IFP Designs for Approval	29
CAR 173.345	IFP dissemination	30
CAR 173.350	Continuous Maintenance and Periodic Review of IFP	30
Appendix A — Qualifications and Experience for Chief Designer and Qualified Flight Procedure Designer.....		31
Appendix B — Instrument Flight Procedure Process Flowchart.		33
Appendix C — Overview of the Necessary Steps in the Validation Process.		35

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Glossary of Terms or Abbreviations

The following terms or acronyms may be used in any manual or document published by the CAA. Reproduction in part or whole is allowed without prior approval. The Document Control Office reserves the rights to include such a listing in any CAA manual or document prior to publishing.

ASMAC	ATC Surveillance Minimum Altitude Chart
ATS	Air Traffic Service
CAA	Civil Aviation Authority
CAD	Computer-Aided Design
CAR	Civil Aviation Regulation
DOC	Document
FPD	Flight Procedure Design or Flight Procedure Designer
GIS	Geographic Information Systems
GM	Guidance Material
ICAO	International Civil Aviation Organisation
IAP	Instrument Approach Procedure
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules
IFPDS	Instrument Flight Procedure Design Service
IFPDSP	Instrument Flight Procedure Design Service Provider
ISA	International Standard Atmosphere
MOCA	Minimum Obstacle Clearance Altitude
MSA	Minimum Sector Altitude
OCA/H	Obstacle Clearance Altitude/Height
PinS	Point-in-Space
QMS	Quality Management System
RNAV	Area Navigation
RNP	Required Navigation Performance
SID	Standard Instrument Departure
SMS	Safety Management System
STAR	Standard Instrument Arrival
TAA	Terminal Arrival Altitude
UTC	Universal Time Coordinated
Vol	Volume
VPT	Visual Manoeuvre with Prescribed Track
WGS-84	World Geodetic System — 1984

FOREWORD

- (a) The Civil Aviation Requirements for Civil Aviation Regulation Enforcement Procedures have been issued by the Civil Aviation Authority of Oman – DGCA (hereinafter referred to as “the AUTHORITY”) under the provisions of the Civil Aviation Law of the Sultanate of Oman.
- (b) This CAR has been modelled on the requirements contained in ICAO Annex 11 (Air Traffic Services), ICAO DOC 8168 (Procedures for Air Navigation Services – Aircraft Operations) Vol I-III, ICAO DOC 9906 (Quality Assurance Manual for Flight Procedure Design) Vol 1-3, 5-6 and ICAO DOC 10068 (Manual on the Development of a Regulatory Framework for Instrument Flight Procedure Design Service).
- (c) CAR-173 prescribes the requirements for:
 - (1) The rules governing the certification and operation of organisations that provide an Instrument Flight Procedure Design Service (IFPDS) and the technical standards for the design of Instrument and Visual Flight Procedures.
 - (2) Punitive actions can and will be enforced by the Authority against recognised actions of non-compliance.
- (d) This CAR does not apply to the design of aircraft performance operating limitations or flight paths for critical engine inoperative emergency procedures.
- (e) Amendments to the text in CAR-173 in revised editions are issued as a complete amendment of pages contained within.
- (f) The editing practices used in this document are as follows:
 - (1) ‘Shall’ is used to indicate a mandatory requirement and may appear in CARs.
 - (2) ‘Should’ is used to indicate a recommendation
 - (3) ‘May’ is used to indicate discretion by the Authority, or the industry as appropriate.
 - (4) ‘Will’ indicates a mandatory requirement and is used to advise of action incumbent on the Authority.

Note: The use of the male gender implies the female gender and vice versa.

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SUBPART A - GENERAL

CAR 173.001 Scope

- (a) CAR-173 contains the Regulations governing: -
- (1) The certification of an organisation who wants to become an Instrument Flight Procedure Design Service Provider (IFPDSP);
 - (2) Instrument Flight Procedure (IFP) process, submission and approval;
 - (3) Validation of IFPs;
 - (4) Maintenance of IFPs, and
 - (5) Training requirements for Flight Procedures Design (FPD) staff.
- (b) The aim of this CAR is: -
- (1) To describe the responsibilities and accountabilities of the Authority, Sponsor and the IFPDSP.
 - (2) To ensure that IFPs:
 - i Are designed in accordance with the required standards as defined in this CAR;
 - ii Are safe and flyable;
 - iii Meet stakeholder requirements; and
 - iv Are operationally and environmentally acceptable.
- (c) For the purpose of this CAR, an IFPDSP is an organisation employing one or more suitably qualified FPD for the provision of an Instrument Flight Procedure Design Service (IFPDS).
- (d) For the purpose of this CAR, an IFP is: —
- (1) A Standard Instrument Arrival (STAR),
 - (2) A Standard Instrument Departure (SID),
 - (3) An Instrument Approach Procedure (IAP),
 - (4) An MSA or TAA,
 - (5) Holding procedure,
 - (6) A Visual Flight Procedure, including RNP (VPT) Procedure,
 - (7) An Airway,
 - (8) An ATC Surveillance Minimum Altitude Chart (ASMAC).

CAR 173.005 Definitions

Existing definitions in ICAO Documents shall form part of this Regulation, supplemented by the definitions contained in CAR-1. Where there are differences between the definitions in the two sources, CAR-1 has precedence.

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

Audit. A systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which requirements and audit criteria are fulfilled.

Authority. The competent body responsible for the safety regulation of Civil Aviation.

Flight Inspection. The operation of a suitably equipped aircraft for the purpose of calibrating ground-based NAVAIDS or monitoring/evaluating the performance of the Global Navigation Satellite System (GNSS).

Flight Procedure Design. The complete package that includes all the considerations that went into the development of an Instrument Flight Procedure.

Flight Procedure Designer. A person responsible for Flight Procedure Design who meets the competency requirements as laid down by the Authority.

Ground Validation. A review of the entire Instrument Flight Procedure Package by a person(s) 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 a Flight Validation.

Inspection. An examination of specific activities, products or services of an aviation license, certificate, approval or authorisation holder (or applicant) performed by civil aviation inspectors to confirm compliance with requirements for the license, certificate, approval or authorization already issued (or being issued) by the State.

Instrument Flight Procedure. A description of a series of predetermined flight manoeuvres by reference to flight instruments, published by electronic and/or printed means.

Instrument Flight Procedure Design Service. A service established for the design, documentation, validation, continuous maintenance and periodic review of instrument flight procedures necessary for the safety, regularity and efficiency of air navigation.

Instrument Flight Procedure Design Service Provider (IFPDSP). A body that provides an IFPDS.

Operator. The person, organisation or enterprise engaged in or offering to engage in an aircraft operation.

Procedure Altitude/Height. A published altitude/height used in defining the vertical profile of a flight procedure, at or above the minimum Obstacle Clearance Altitude/Height where established.

Proponent. An ANSP, Aerodrome Operator or Operator, or a representative there-of, who proposes a new IFP, or a change to, or withdrawal of an IFP.

RNP (VPT) Procedure. An IFR procedure including an RNP instrument path followed by a visual path defined by waypoints to promote stabilised approach and prescribed visual maneuvering to a designated runway.

Sponsor. An ANSP, or a representative acting on the ANSP's behalf, who proposes a new design, changes to, or withdrawal of an Instrument Flight Procedure. The Aerodrome Operator shall act as the sponsor where no ANSP is appointed at the aerodrome under its responsibility.

Validation (of IFPs). The necessary final quality assurance step in the procedure design process, prior to publication. The purpose of validation is the verification of all obstacle and navigation data, and assessment of flyability of the procedure. Validation normally consists of ground validation and flight validation.

Verification (of IFPs). Checking by a qualified procedure designer other than the one who designed the Instrument Flight Procedure to ensure compliance with applicable criteria.

CAR 173.010 Roles and Responsibilities

- (a) The Authority is responsible for overall regulatory oversight of Instrument Flight Procedure Design Service Providers (IFPDSPs) including approval of all Instrument Flight Procedures (IFPs) for aerodromes, heliports and airspace within the Muscat FIR.
- (b) Provided that the requirements laid down in this CAR are met, the Sponsor shall:
 - (1) provide an Instrument Flight Procedure Design Service (IFPDS); and/or
 - (2) agree with one or more ICAO Member State(s) to provide an Instrument Flight Procedure Design Service (IFPDS) or a joint service; and/or
 - (3) delegate the provision of the Instrument Flight Procedure Design Service (IFPDS) or a part of the service to an external agency(ies) certified under this CAR.
 - (4) In all cases, the Sponsor remains responsible for all Instrument Flight Procedures for aerodromes, heliports and airspace under its responsibility, including maintenance and periodic review of IFPs.
- (c) The Instrument Flight Procedure Design Service Provider (IFPDSP) shall:
 - (1) Comply with the requirements and standards defined in this CAR.
 - (2) Ensure continuous compliance with this CAR.

CAR 173.015 Requirement for Certificate

- (a) An IFPDSP shall not provide an IFPDS for aerodromes, heliports and airspace within the Muscat FIR except under the authority of an IFPDS certificate issued in terms of this CAR.

CAR 173.020 Application for Certificate

- (a) An applicant for an IFPDS certificate issued under this CAR shall submit to the Authority:
 -
 - (1) Completed application form;
 - (2) An acceptable Operations Manual in accordance with CAR 173.150;
 - (3) An acceptable Quality Management System (QMS) in accordance with CAR 173.140 and in compliance with ICAO DOC 8168 Vol II, Chapter 4 (Quality Assurance) and ICAO DOC 9906 Vol 1 (Quality Assurance Manual for Flight Procedure Design);
 - (4) An acceptable Safety Management System (SMS) in accordance with CAR 173.145
 - (5) A payment of the appropriate fee prescribed by regulations made under the Civil Aviation Law.
- (b) The Authority may request additional documents as deemed necessary to verify the compliance of the applicant with this CAR.

CAR 173.025 Issue of Certificate

- (a) The Authority may issue an IFPDS certificate issued under this CAR if:
 - (1) The Authority is satisfied that the applicant meets the requirements of this CAR; and
 - (2) The applicant and persons listed in CAR-173.100 paragraphs (a)(2) to (5) are acceptable to the Authority; and
 - (3) The documentation required under this CAR is acceptable to the Authority; and
 - (4) The Authority is satisfied that the granting of the certificate is not contrary to the interests of aviation safety.

CAR 173.030 Privileges of Certificate

- (a) The IFPDS certificate shall specify the IFPDS that the certificate holder is authorised to provide.
- (b) The IFPDSP shall not provide an IFPDS that is not specified on the IFPDS certificate.

CAR 173.035 Duration of Certificate

- (a) An IFPDS certificate issued under this CAR is granted or renewed for a maximum period of 2 years.
- (b) An IFPDS certificate remains in force until it expires, is surrendered by the certificate holder or is suspended or revoked by the Authority.
- (c) The validity of the IFPDS certificate is subject to the continued compliance of the IFPDS certificate holder with this CAR.
- (d) The IFPDS certificate shall remain valid subject to periodic surveillance audits and inspections conducted at the discretion of the Authority confirming continued compliance with this CAR.

CAR 173.040 Renewal of Certificate

- (a) For the renewal of an IFPDS certificate issued under this CAR the application shall submit a renewal application to the Authority in accordance with CAR 173.020.
- (b) The application shall be submitted to the Authority not less than thirty (30) days before the expiry date indicated on the certificate.
- (c) The expiry date of the certificate may be extended at the discretion of the Authority. The extension interval shall not exceed 3 months at a time. The total extension period shall not exceed 6 months from the expiry date indicated on the certificate.

CAR 173.045 Audits and Inspections

- (a) The Authority shall conduct an initial certification audit and thereafter audits at intervals not exceeding 2 years (24 months) to verify and ensure compliance of the IFPDS certificate holder.
- (b) The Authority may conduct inspections to verify effective implementation and ensure continued compliance of the IFPDS certificate holder.
- (c) The Authority may require the IFPDS certificate holder to provide such information as the Authority considers relevant to the inspection or audit.
- (d) The Authority shall be granted unrestricted access to the IFPDS certificate holder or applicant's facilities and shall be permitted to carry its own equipment (e.g. computers, cameras and recording devices) under all conditions while carrying out its oversight functions.

CAR 173.050 Resolution of Non-Compliances

- (a) When objective evidence is found showing non-compliance of the IFPDS certificate holder with the requirements, the finding shall be set out as follows: —
 - (1) A Level 1 Finding is any non-compliance with these regulations which could affect the safety of aircraft.
 - (2) A Level 2 Finding is any non-compliance with these regulations with no immediate safety concern.
 - (3) A Level 3 Finding is a deficiency that could lead to a non-compliance. These are considered as observations only and would not impact an approval, certificate or license.
- (b) After a receipt of notification of findings: —
 - (1) A Level 1 Finding must be rectified immediately or within maximum 7 days depending on the safety implications of the non-compliance;

- (2) A Level 2 Findings must be rectified within 7 to 90 days depending on the nature and circumstance of the non-compliance.
- (3) The certificate holders shall: —
 - i. Conduct a Root Cause Analysis to identify the root cause of the non-compliance(s);
 - ii. Define a Corrective Action Plan (CAP), including Estimate Completion Dates (ECD), acceptable to the Authority; and
 - iii. Demonstrate corrective action implementation to the satisfaction of the Authority within the period agreed with the Authority.
- (c) In the case of Level 1 or Level 2 findings, the IFPDS certificate may be subject to restriction, a partial or full suspension or revocation. The IFPDS certificate holder shall provide confirmation of receipt of the notice of suspension or revocation of the certificate within 3 days.
- (d) Upon restriction, suspension, revocation or surrender of the certificate, the IFPDS certificate holder shall return the certificate to the Authority within 10 working days.
- (e) From the date of suspension, revocation or surrender the IFPDSP shall not claim or purport that the IFPDSP is the holder of a valid certificate issued under this CAR and shall inform all affected parties within 5 working days that the certificate was suspended, revoked or surrendered.
- (f) The IFPDSP shall inform all affected parties within 5 working days if any restriction is placed upon its IFPDS certificate by the Authority.

CAR 173.055 Transferability

- (a) An IFPDS certificate granted under this CAR is not transferable.

CAR 173.060 Non-Compliance

- (a) Non-compliance with this Regulation or instructions issued by the Authority may require the Authority to restrict, suspend or revoke the IFPDS certificate.
- (b) If deemed necessary, the Authority may take additional enforcement action in terms of CAR-12.

Subpart B — Certification Requirements

CAR 173.100 Personnel requirements

- (a) An applicant for an IFPDS certificate must employ, contract, or otherwise engage:
- (1) A senior person identified as the Chief Executive who:
 - i. has the authority within the organisation to ensure that every activity undertaken by the organisation under the authority of this certificate can be financed and carried out in accordance with this CAR; and
 - ii. is responsible for ensuring that the organisation complies with this CAR;
 - (2) A “Chief Designer” who is responsible for ensuring that the organisation complies with the design criteria requirements of this CAR as well as the certification of every IFP developed by the applicant’s organisation and made available for publication and operational use;
 - (3) Sufficient number of suitably qualified FPDs to plan, design, verify, validate and maintain the IFPs developed by the applicant’s organisation.
 - (4) A Safety Manager post holder responsible for the implementation and management of a Safety Management System according to the requirements of CAR-173.145;
 - (5) A Quality Management post holder responsible for the provision of a Quality Management System according to the requirements of CAR-173.140; and

NOTE: Some of the positions may be combined subject to acceptance by the Authority.

- (b) Qualifications and experience details for the persons nominated by the applicant for the positions listed in (a) above shall be forwarded to the Authority for acceptance. The Authority retains the right to reject any person appointed and who has been found unsuitable for the position.
- (c) The minimum qualifications and experience requirements for the Chief Designer and the Qualified Flight Procedure Designers are specified in Appendix A.
- (d) An applicant for an IFPDS certificate shall:
- (1) Provide those authorised personnel with written evidence of the scope of their authorisation.
 - (2) Develop Job Descriptions for its FPD personnel, which must contain safety responsibilities.
- (e) The Chief Designer responsible for the certification of IFPs must be authorised in accordance with CAR-173.120 to certify IFPs.

CAR 173.105 Training

The applicant for an IFPDS certificate shall:

- (a) Develop an overall training policy, acceptable to the Authority, for its staff. The training policy and programme shall lay down the training necessary for staff to perform their duties;

NOTE: The Training Policy must commit to provide all necessary training to all technical personnel including Initial Training (e.g. Induction and Basic Training), On-the-Job Training (OJT), Recurrent Training, Specialised/Advanced Training and Refresher Training. The Training Policy should require the establishment of a Training Programme for each technical staff position as well as Training Plans for each technical staff member. The Training Policy should be documented and signed at the management level of the organisation.

- (b) Develop training programmes, acceptable to the Authority, for all technical Flight

Procedure Designer position. The training programme shall include:

- (1) Initial training;
- (2) Advanced training;
- (3) On-the Job training;
- (4) Recurrent training; and
- (5) Refresher training.

NOTE: The Training Programme must include all the training required for the incumbent of the position to acquire and maintain the necessary competencies for the position as well as to effectively perform the related post functions and activities. It should include the minimum content for each type of training, as applicable, as well as the interval for recurrent training.

- (c) Develop individual periodic training plans for each Flight Procedure Designer staff member, acceptable to the Authority, based on the respective training programmes.

NOTE: The Training Plan must be developed based on the Training Programme established for the staff member's position and must detail the type of training to be provided during a specified time period as well as the training priorities.

- (d) Ensure that the training programmes are appropriately implemented in accordance with periodic training plans detailing and prioritising the type of training needed over a specified time frame;
- (e) Establish a procedure for initially assessing and for maintaining the competence of:
 - (1) Those personnel involved in the planning, design, verification, validation and maintenance of Instrument Flight Procedures; and
 - (2) Those senior persons who are authorised to certify Instrument Flight Procedures.
- (f) Establish procedures acceptable to the Authority for keeping training record for all technical staff and to be maintained up to date.

NOTE: ICAO Doc 9906 Vol 2 (Flight Procedure Designer Training (Development of a Flight Procedure Designer Training Programme)) provides guidelines for the development of competency-based FPD training courses/programmes.

CAR 173.110 Facility Requirements

- (a) The applicant for an IFPDS certificate shall establish offices and facilities; including access to up-to-date reference documents, manuals, data and IFP Design Software; that are appropriate for the IFPDS listed in its Operations Manual.

CAR 173.115 Documentation

- (b) The applicant for an IFPDS certificate shall ensure that FPD staff have access to relevant and up-to-date reference material (such as documents and user guides), standards, practices and procedures, instructions, and any other documentation that is necessary for the execution of IFP service listed in their Operations Manual.
- (c) These documents shall include, but not be limited to:
 - (1) ICAO Annex 2,
 - (2) ICAO Annex 4,
 - (3) ICAO Annex 5,
 - (4) ICAO Annex 6,
 - (5) ICAO Annex 10,
 - (6) ICAO Annex 11,
 - (7) ICAO Annex 14,

- (8) ICAO Annex 15,
 - (9) ICAO DOC 4444,
 - (10) ICAO DOC 7030,
 - (11) ICAO DOC 8071,
 - (12) ICAO DOC 8126,
 - (13) ICAO DOC 8168 Vol I, II and III,
 - (14) ICAO DOC 8697,
 - (15) ICAO DOC 9274,
 - (16) ICAO DOC 9365
 - (17) ICAO DOC 9368,
 - (18) ICAO DOC 9371,
 - (19) ICAO DOC 9501,
 - (20) ICAO DOC 9613,
 - (21) ICAO DOC 9643,
 - (22) ICAO DOC 9674,
 - (23) ICAO DOC 9708,
 - (24) ICAO DOC 9826,
 - (25) ICAO DOC 9849,
 - (26) ICAO DOC 9905,
 - (27) ICAO DOC 9906 Vol 1, 2, 3, 5 and 6,
 - (28) ICAO DOC 9931,
 - (29) ICAO DOC 10031,
 - (30) ICAO DOC 10068,
 - (31) CAR 1,
 - (32) CAR 100,
 - (33) CAR 171,
 - (34) CAR 172,
 - (35) CAR 173,
 - (36) CAR 175,
 - (37) CAR 177,
 - (38) CAR OPS 1,
 - (39) National and Regional Airspace and Navigation Plans.
 - (40) Software user manuals.
- (d) The applicant for an IFPDS certificate must establish a procedure for controlling all documentation required by paragraph (a) to ensure that: —
- (1) the documentation is reviewed and authorised by an appropriate person before issue and use; and
 - (2) current issues of relevant documentation are available to personnel at every location if they need access to the documentation; and
 - (3) every obsolete document is promptly removed from every point of issue and use; and
 - (4) a change to documentation is reviewed and authorised by an appropriate person before issue and use; and
 - (5) the current version of every item of documentation can be identified to prevent the use of superseded material.

CAR 173.116 Criteria for the Approval of IFP Designers

- (a) The applicant for an IFPDS certificate shall provide evidence of the following:
- (1) Specialist procedure design training in accordance with a competency-based approach. (One such an approach is described in *ICAO Doc 9906 Vol 2 (Flight Procedure Designer Training (Development of a Flight Procedure Designer Training Programme))*);

- (2) Proof of successful completion of a PANS-OPS training course based on ICAO DOC 8168 Vol 2 presented by an organisation acceptable to the Authority.
- (3) Evidence of recent (within last 12 months) IFP design work which should include evidence of specific designs which have been approved for use;
- (4) Aviation experience, including a working knowledge of:
 - a. Air Traffic Management,
 - b. Air Traffic Control,
 - c. Air Traffic Flow Management, and
 - d. Airspace Management.

NOTE: Flight Procedure Designers should also have a working knowledge of navigation, navigation systems, aircraft operations, aircraft performance, aeronautical information services, aerodrome safeguarding, geography, and geodesy.

CAR 173.120 Authorisation of Persons to Certify Instrument Flight Procedures

- (a) Subject to paragraphs (b), (c), and (d), an applicant for an IFPDS certificate must establish a procedure for authorising a Chief Designer to certify IFPs in accordance with CAR 173.125.
- (b) An authorisation must not be issued to a person unless the person meets the applicable training and experience requirements specified in Appendix A.1.
- (c) Every authorisation that is issued to a person must be in writing and must specify the types of IFPs that the person is authorised to certify.
- (d) An IFP type that is specified on an authorisation must not be inconsistent with the types of IFPs specified on the IFPDS certificate.

CAR 173.125 Certification of Instrument Flight Procedures

- (a) Subject to paragraphs (b), (c) and (d) an applicant for an IFPDS certificate must establish a procedure for the certification of every IFP that the an IFPDSP proposes to design, make available for operational use, and publish in the Oman AIP.
- (b) The procedure required by paragraph (a) must include details of the checks to be carried out by the Chief Designer, who is authorised to certify the particular type of IFP, to ensure that the IFP meets the applicable requirements and standards prescribed by this CAR;
- (c) The authorised Chief Designer must certify that the IFP has been designed in accordance with, and meets, the applicable standard and requirement prescribed by Subpart D, and
- (d) A person who is authorised in accordance with CAR-173.120 to certify an IFP must not certify an IFP that the person has designed.

CAR 173.130 Errors in published instrument flight procedures

- (a) The holder of an IFPDS certificate must establish a procedure for recording, investigating, correcting, and reporting any identified error, and any identified non-conformance with the standards and requirements of this CAR, in an IFP that is certified or maintained under the authority of the IFPDS certificate.
- (b) The procedure required by paragraph (a) must require that: —
 - (1) An IFP is immediately withdrawn from operational use if the error or non-conformance affects, or may affect, the safety of an aircraft operation; and
 - (2) The error or non-conformance is corrected, and certified by the Chief Designer who is appropriately authorised in accordance with CAR-173.120; and
 - (3) The correction required by paragraph (2) is clearly identified and promulgated by the most appropriate means relative to the operational significance of the error or non-conformance; and
 - (4) The source of the error or non-conformance is identified, and: -
 - i. if possible, eliminated to prevent a recurrence; and
 - ii. preventive action is taken to ensure that the source of the error or non-conformance has not affected the integrity of any other IFP; and
 - (5) The Authority is notified, of a promulgated information incident relating to an error or non- conformance referred to in paragraph (a).

CAR 173.135 Management of IFP Records

- (a) An applicant for an IFPDS certificate must establish a procedure for the management of records that are required for the applicant organisation's functions relating to the design, verification, validation, certification and maintenance of IFP.
- (b) The management of records includes the identification, collection, indexing, storage, safekeeping, accessibility, maintenance and disposal of records.
- (c) The procedure required by paragraph (a) must provide for the following to be recorded for every IFP Package: —

- (1) A statement of compliance with Subpart D from the authorised Chief designer;
 - (2) A complete record of the design process including copies of all source data (Aerodrome survey report, electronic terrain and obstacle data, airport infrastructure information, ...etc.), information, calculations and drawings used in the project;
 - (3) An IFP summary;
 - (4) All parameters used (speeds, bank angles, wind velocity, temperature, ISA value, descent gradient, climb gradient, timings, height loss margins, Obstacle Assessment Surface (OAS) coefficients, etc.);
 - (5) Proposed IFP chart/depiction of sufficient detail to safely navigate and identify significant terrain, obstacles and obstructions;
 - (6) Proposed ARINC 424 Path Terminators (for PBN procedures only);
 - (7) List of relevant obstacles, identification and description of controlling obstacles and obstacles otherwise influencing the design of the procedure, waypoint fix latitude/longitude, procedural tracks/course, distances and altitudes;
 - (8) OCA/H, MOCA and/or Procedure Altitude/Height, as applicable.
 - (9) Any special local operational procedure (e.g. noise abatement, non-standard traffic patterns, lighting activation);
 - (10) Detailed listing of deviations from design criteria and proposed mitigation;
 - (11) Safety assessments;
 - (12) Relevant signed Design, Verification and Validation Reports, including stakeholder endorsement;
 - (13) Electronic design files in industry standard GIS (Geodatabase or Shapefiles) or CAD (.dwg or .dgn) file format.
 - (14) Draft AIP submission.
 - (15) IFP data sets containing the digital representation of the IFP should be provided in accordance with AMC CAR 175.
- (d) The documentation in (c) above becomes the property and hence the responsibility of the Sponsor once the IFPDSP has officially signed over the IFP Package to the Sponsor. Thereafter the IFPDSP is responsible to only store a record of the official handover form signed by both parties.
- (e) The IFP Package shall be retained for a minimum period of one year from the date at which the IFP is replaced or withdrawn from use.

CAR 173.140 Quality Management System (QMS) Requirements

- (a) An applicant for an IFPDS certificate shall establish and implement an acceptable Quality Management System (QMS) for FPD in accordance with ICAO DOC 8168 Vol II Chapter 4 (Quality Assurance) and ICAO DOC 9906 Vol 1 (Quality Assurance Manual for Flight Procedure Design).

CAR 173.145 Safety Management System (SMS) Requirements

- (a) An applicant for an IFPDS certificate must establish, implement, and maintain a Safety Management System (SMS) in accordance with CAR 100 appropriate to the size and complexity of the organisation.

CAR 173.150 Operations Manual

- (a) An applicant for an IFPDS certificate shall provide and keep up to date its Operations Manual or system of manuals relating to the provision of the IFPDS listed in its Operations Manual for the use and guidance of operations personnel.
- (b) The applicant for an IFPDS certificate shall ensure that the Operations Manual contains:
 - (1) A statement signed by the by the Chief Executive on behalf of the applicant's organisation confirming that:
 - i. the Operations Manual and any included manuals define the organisation and demonstrate its means and methods for ensuring ongoing compliance with this CAR; and
 - ii. the organisation has sufficient financial strength to provide the services contained within the organisation's Operations Manual; and
 - (2) Details of the applicant's staffing structure, including an organisation chart showing lines of responsibility of the persons specified in CAR-173.100 (a)
 - (3) The titles and names of the person or persons required by CAR-173.100 (a); and
 - (4) The duties and responsibilities of the person or persons specified in CAR-173.100(a), including matters for which they have responsibility to deal directly with the Authority on behalf of the organisation;
 - (5) List of the types of instrument flight procedure to be designed and certified by the applicant's organisation;
 - (6) Contain the procedures, instructions and information required by the operations personnel to perform their duties;
 - (7) The format and standards for the IFP designed under the authority of their IFPDS certificate;
 - (8) The relevant parts of the Operations Manual are accessible to the personnel concerned;
 - (9) Procedures to control, amend and distribute the Operations Manual.
 - (10) Operations personnel are informed of amendments to the Operations Manual.

Note— ICAO Doc 10068 (Manual on the Development of a Regulatory Framework for Instrument Flight Procedure Design Service) Table 3-1 provides a sample framework and contents of an Operations Manual.

CAR 173.155 Flight Procedure Design Software Validation

Each applicant for an IFPDS certificate shall:

- (a) Validate IFP Design Software in compliance with ICAO DOC 9906 Vol III;
- (b) Document any non-compliances and differences identified;
- (c) Include in the Operations Manual the risks identified in these non-compliances/differences and how it will be mitigated; and
- (d) Training of FPD staff on these non-compliances/differences and mitigation techniques must be incorporated in the Training Programme required under CAR 173.105.

Subpart C — Operating Requirements

CAR 173.200 Continued Compliance

The holder of an IFPDS certificate must: —

- (a) Hold at least one complete and current copy of the certificate holder's Operations Manual required by CAR-173.150 at the certificate holder's principal location; and
- (b) Comply with every procedure and standard detailed in the Operations Manual, QMS and SMS; and
- (c) Make each applicable part of the Operations Manual available to personnel who require the applicable part to carry out their duties; and
- (d) Continue to meet the standards and comply with the requirements of Subpart B prescribed for certification under this CAR; and

CAR 173.205 Changes to Certificate Holder's Organisation

- (a) A holder of an IFPDS certificate must: —
 - (1) Subject to paragraph (b), ensure that the holder's organisation's Operations Manual is amended so that it remains a current description of the holder's organisation;
 - (2) Ensure that any amendment made to its Operations Manual meets the applicable requirements of this CAR;
 - (3) Comply with the amendment procedures contained in its Operations Manual;
 - (4) Forward to the Authority for retention a copy of each amendment that the certificate holder makes to its Operations Manual as soon as practicable after the amendment is incorporated into its Operations Manual;
 - (5) Amend its Operations Manual as the Authority considers necessary in the interests of aviation safety.
 - (6) Notify the Authority of any change of the certificate holder's postal address, address for service, telephone number, or facsimile number within 14 days of the change.
- (b) Before a holder of an IFPDS certificate changes any of the following, prior acceptance by the Authority is required:
 - (1) The organisational structure.
 - (2) The person identified as the Chief Executive,
 - (3) The title or name of any person specified in the Operations Manual required by rule CAR-173.100 (a)(2) to (5),
 - (4) The types of Instrument Flight Procedure specified on the holder's certificate, or
 - (5) The Operations Manual, QMS and SMS, if the change is a material change.
- (c) The Authority may impose conditions under which the holder of the IFPDS certificate must operate during or following any of the changes specified in paragraph (b).
- (d) The holder of an IFPDS certificate must comply with any condition imposed by the Authority under paragraph (c).
- (e) If any of the changes under paragraph (b) requires an amendment to the IFPDS certificate, the holder of the certificate must forward the certificate to the Authority for endorsement of the change within 14 days.

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Subpart D — Design Criteria—Instrument Flight Procedure

CAR 173.250 Design Criteria

- (a) IFPs for aerodromes, heliports and airspace within Muscat FIR shall be designed in accordance with the guidance contained within ICAO DOC 8168 Vol II and ICAO DOC 9905, as appropriate, ensuring in particular that required obstacle clearances are achieved.
- (b) When the IFP being developed is an RNAV based procedure, then the additional requirements from ICAO Doc 9613 (Performance Based Navigation (PBN) Manual) Vol 1 and 2 shall apply.
- (c) As applicable, the provisions from ICAO Doc 9906 (The Quality Assurance Manual for Flight Procedure Design) in the construction of all IFPs shall apply.
- (d) The design of an IFP must: —
 - (1) Be coordinated with all appropriate Air Traffic Service Providers and other interested and affected parties;
 - (2) Be compatible with any air traffic service and associated procedure that is provided within the area or areas of airspace where the IFP is intended to be implemented; and
 - (3) Take into account: —
 - i. Any prescribed noise abatement procedure; and
 - ii. Any legislation restricting aircraft operations; and
 - iii. The classification and any associated designation of the airspace in which the IFP is to be established and any adjacent airspace that may be affected by the procedure; and
 - iv. The effect that the proposed IFP may have on any other IFPs established in the airspace.
- (e) An IFP must not be designed on or use a ground based aeronautical facility unless—
 - (1) The holder of the aeronautical telecommunication service certificate agrees in writing that the aeronautical facility can be used for the intended IFP, and
 - (2) The aeronautical facility is operated under the authority of an aeronautical telecommunication service certificate issued in accordance with CAR-171.
- (f) Consideration shall be given in the design of IFPs to the effect of the design on the environment, and also to the Omani environmental regulations as well as international standards and best practices.
- (g) All terminal IFP shall be, to the extent possible, designed to consider Continuous Climb Operations (CCO) and Continuous Descent Operations (CDO).

Note— ICAO Doc 9829 (Guidance on the Balanced Approach to Aircraft Noise Management) and ICAO Doc 10031 (Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes) provide guidance on reducing the noise and environmental impact.

CAR 173.255 Aerodrome Operating Minima to be Published in Instrument Approach Charts

- (a) The holder of an IFPDS certificate must establish Aerodrome Operating Minima to be published in the Oman AIP for each Instrument Approach Procedure (IAP) and Visual Manoeuvring/Circling Procedure designed and/or maintained under the authority of their certificate for aerodromes and heliports in accordance with the design criteria referred to in CAR-173.250 and CAR–OPS 1.430 Aerodrome Operating Minima.

NOTE: *Guidance Material GM – CAR-173 (Determination of Aerodrome Operating Minima (AOM)) provides a guideline for development and determination of AOM.*

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Subpart E — Instrument Flight Procedure Process

NOTE: The Instrument Flight Procedure process (See flowchart at Appendix B) are detailed in ICAO DOC 8168 Vol II and ICAO DOC 9906. It encompasses: the initiation and collection of requirements and constraints, the acquisition of data, the FPD, verification, ground validation, flight validation and flight inspection (when required), approval and publication.

CAR 173.300 FPD Initiation

- (a) The design process for a new, review or change to an existing IFP shall be initiated by the Sponsor.
- (b) The Sponsor shall notify the Authority of his intention to establish or amend any IFP.
- (c) The request shall be submitted to the Authority for a formal review and acceptance.
- (d) IFP process shall be carried out in accordance with ICAO DOC 8168 Vol II, ICAO DOC 9906 and Subpart E.

CAR 173.305 Collection and Validation of the Data

- (a) The holder of an IFPDS certificate must collect the following data from recognized sources, validate for accuracy, resolution, integrity, reference geodetic datum and effective dates, and incorporate them into the design documentation:
 - (1) Airport, navigation aid, obstacle and terrain data based on verified WGS-84 surveys and complying with ICAO Annex 11, 14 and 15 requirements;
 - (2) Airspace requirements;
 - (3) User requirements: needs of Air Traffic Service provider and operators who will use this procedure;
 - (4) Airport infrastructure such as runway classification, lighting, communications, runway markings, and availability of local altimeter setting;
 - (5) Environmental considerations; and
 - (6) Any other potential issue associated with the procedure.
- (b) The acquisition of data for the FPD process must ensure that the acquired data's quality characteristics are known and adequate, or that, in the case where the data's quality characteristics are unknown or inadequate (invalid), that appropriate data verification occurs prior to use.

- NOTE:*
1. *WGS-84 surveys must be conducted at regular intervals to validate obstacle information so that the minimum obstacle clearance is assured and the integrity of IFPs are safeguarded. Yearly WGS-84 surveys are deemed to meet the requirement for "regular intervals".*
 2. *Where the data's quality characteristics are unknown or inadequate, an appropriate horizontal tolerance must be added to the perimeter of the object (terrain feature or obstacle) and a vertical tolerance added to the height or elevation of the object. When the application of these tolerances creates an unacceptable operational penalty, additional survey information should be used to refine the object's location and height data.*

CAR 173.310 Flight Procedure Design (FPD)

The holder of an IFPDS certificate must establish procedures for ensuring that every IFP certified under its authority is:

- (a) Designed or amended using methods ensuring that the procedure meets the applicable requirements and standards prescribed in Subpart D; and
- (b) Independently verified, before certification, by a qualified procedure designer who is independent of the person directly responsible for the design to ensure compliance with applicable criteria; and
- (c) Certified by the Chief designer in accordance with CAR-173.125.

CAR 173.315 FPD Documentation

- (a) The FPD shall prepare an IFP Validation Package to enable an Independent Procedure Designer to carry out a Ground Validation of the IFP.
- (b) The package shall include:
 - (1) A plan view of each segment and obstacle evaluation area,
 - (2) Complete documentation identifying obstacles, obstructions and terrain relevant to the IFP, including identifying the controlling obstacle/terrain, OCA/H, MOCA and/or Procedure Altitude/Height, as applicable.
 - (3) Narrative description of the IFP, segment by segment.
 - (4) Plan and profile views of the IFP.
 - (5) Data relating to each fix and/or holding pattern involved in the IFP,
 - (6) ARINC424 compliant coding for PBN procedures,
 - (7) Confirmation that Navigation Aid coverage, if applicable, is satisfactory,
 - (8) Draft chart of the procedure suitable for use by the Flight Validation crew.
 - (9) Safety assessments.
- (c) All documentation shall undergo a final verification for accuracy and completeness prior to validation, approval and publication.

CAR 173.320 Validation of IFP

- (a) The IFP validation process must be carried out as part of the initial IFP design as well as for any amendment to an existing IFP. An overview of the necessary steps in the validation process can be found in Appendix C.
- (b) The validation of IFPs is required under:
 - (1) ICAO DOC 8168 Vol II,
 - (2) ICAO DOC 9906 Vol 1 and 5.
- (c) The IFP design process starts with the collection of relevant data, proceeds through the design phase, verification, then Ground and/or Flight Validation prior to publication.
- (d) Therefore, Validation shall occur at the collection of data phase, the Ground and/or Flight Validation stage and, in the case of PBN IFP, the validation of the navigation database ARINC 424 coding instructions.

CAR 173.325 Ground Validation

- (a) The holder of an IFPDS certificate must establish procedures to ensure:
 - (1) That Ground Validation is undertaken for all IFPs. Ground Validation consists of an independent IFP design review and Preflight Validation
 - (2) That Ground Validation is conducted by an Independent Procedure Designer who did not design or verify the IFP.
 - (3) That any concerns or changes required by the Independent Procedure Designer is communicated to the FPD who shall determine whether or not the IFP should be revised. Such concerns or changes shall be documented and included in the IFP package.
 - (4) That any issues identified in the Ground Validation is addressed prior to any Flight Validation.
 - (5) That justification is provided where it is recommended that Flight Validation be dispensed with.

CAR 173.330 Flight Validation

- (a) Flight Validation is the responsibility of the Sponsor.
- (b) The objective of Flight Validation is to —

- (1) Verify the obstacle that is determined as the controlling obstacle for each segment and to check that no new obstacles have been erected since the IFP was designed or that no obstacle information are grossly inaccurate to the extent that it may affect the IFP.
 - (2) Prove the fly-ability of an IFP whose Ground Validation caused some concern about track adherence or crew workload.
- (c) A Flight Validation shall be carried out during the initial approval, amendment or review of an IFP or when determined necessary by the Authority.
 - (d) Subject to approval by the Authority, Flight Validation may be dispensed with if the accuracy and completeness of all obstacle and navigation data considered in the procedure design, and any other factors normally considered in the Flight Validation can be verified during the Ground Validation.
 - (e) A Flight Validation shall however be carried out when:
 - (1) The flyability of a procedure cannot be determined by other means;
 - (2) The procedure requires mitigation for deviations from design criteria;
 - (3) The accuracy and/or integrity of obstacle and terrain data cannot be determined by other means;
 - (4) New procedures differ significantly from existing procedures; and
 - (5) For helicopter PinS procedures.
 - (f) Flight Validation shall only be conducted after the Ground Validation Package was reviewed and accepted by the Authority.
 - (g) The Flight Validation shall be conducted by a Flight Validation Pilot or Organisation who meets the requirements of ICAO DOC 9906 Vol 6 and are accepted by the Authority.
 - (h) The Flight Validation shall be conducted, recorded and documented in accordance with ICAO DOC 9906 Vol V.
 - (i) The Flight Validation may be conducted during the Flight Inspection of the associated Navigation Aid if it is conducted during daylight and when Visual Meteorological Conditions (VMC) prevail throughout each segment.

NOTE: ICAO DOC 8071 Vol 2 (Manual on Testing of Radio Navigation Aids) Chapter 5 provides additional guidance for the Flight Validation of IFPs.

CAR 173.335 Flight Inspection

- (a) Flight Inspection is the responsibility of the Sponsor.
- (b) Flight Inspection shall be conducted by an organisation certified in accordance with CAR-171.
- (c) Flight Inspection of IFPs is required to assure that the appropriate Radio Navigation Aids adequately support the IFP, in accordance with ICAO Annex 10 and ICAO DOC 8071.
- (d) Flight inspection of IFPs is required when introducing new ground-based navigation facilities to be incorporated in an IFP.
- (e) For GNSS-based RNAV procedures, a Flight Inspection aiming at verifying the absence of permanent interference shall be performed before commissioning of the procedure:
 - (1) Along the Intermediate Segment, Final Approach segment, and the Missed Approach;
 - (2) On SIDs, in an area of 15 NM from the Aerodrome Reference Point (ARP).
- (f) In the case of RNAV procedures based on DME, if the DME infrastructure study using a simulation tool concluded it a necessity, a Flight Inspection along the flight path shall be performed prior to the commissioning of the procedure to verify the appropriate reception of the DME beacons.

CAR 173.340 Submission of IFP Designs for Approval

- (a) Submission of IFP Designs for approval by the Authority is the responsibility of the Sponsor.
- (b) The Authority will only accept IFPs designed by a IFPDSP certified under this CAR and for the type of IFP shown in the scope of their IFPDS certificate.

- (c) IFP designs submitted for evaluation and approval by the Authority shall include:
- (1) A complete record of the design process including copies of all source data, information, calculations and drawings used in the IFP;
 - (2) A statement of compliance with Sub-part D and E from the authorised Chief designer;
 - (3) A report demonstrating how the original requirement has been satisfied;
 - (4) A narrative, which unambiguously describes the procedure in textual format and table showing all tracks in degrees True to 1/100th degree;
 - (5) A graphical representation which accurately reflects the content of the narrative provided;
 - (6) Safety assessments conducted;
 - (7) Relevant signed Design, Verification and Validation Reports;
 - (8) A comprehensive design rationale in text format, including references to ICAO DOC 8168 VOL II.
- (d) Proposals for new airspace or airways or amendments to existing airspace or airways shall be developed and submitted to the Authority in accordance with the Airspace Change Proposal process.

CAR 173.345 IFP dissemination

- (a) The Authority shall be responsible for dissemination of the IFP and associated documentation to the Aeronautical Information Service (AIS) for publication following approval of the IFP by the Authority.
- (b) The Sponsor shall ensure that:
- (1) The design and format of the IFP charts are in a standardized format in accordance with the requirements of CAR-177; and
 - (2) Where the IFP is a PBN procedure, it is described in a clear and unambiguous fashion as detailed in ICAO DOC 8168 (Procedures for Air Navigation Services – Aircraft Operations) Vol 2 and ICAO Annex 15 (Aeronautical Information Services); and
 - (3) Where the IFP is a PBN procedure, prior to publication, it is validated to ensure that the dataset is complete, coherent and correct; and
 - (4) The IFPDSP performs a final check of the draft AIP/chart amendment before publication to ensure that no errors have been introduced during the data transfer process.

CAR 173.350 Continuous Maintenance and Periodic Review of IFP

- (a) Published IFP shall be subjected to a continuous maintenance and periodic review to ensure that they continue to comply with changing criteria and meet user requirements.
- (b) The Sponsor must establish a procedure to ensure that each IFP under its responsibility is reviewed whenever:
- (1) There is a change to the obstacle environment which may affect the IFP,
 - (2) Procedures based on newly installed or relocated Radio Navigational Aids (excluding visual aids), or airport runway addition/change, Magnetic Variation,
 - (3) There is a change in airspace structure that may affect the IFP,
 - (4) There is a change to user requirements that may affect the IFP,
 - (5) There are changes in design criteria which have safety impact, or
 - (6) A maximum period of 5 years has lapsed since the IFP was designed or last reviewed.
- (c) Failure by the Sponsor to ensure continuous maintenance and periodic review of IFPs may require the Authority to impose operational restrictions, suspend or withdraw the IFP and/or take enforcement action in terms of CAR 12.

NOTE: The existing IFP can be maintained even upon the amendment of design criteria and/or depiction standards if it is determined that these amendments are not safety-related issues.

Appendix A — Qualifications and Experience for Chief Designer and Qualified Flight Procedure Designer

This Appendix specifies the qualifications and experience for the persons referred to in CAR-173.100 paragraphs (a) (2) and (3).

A1. Chief Designer:

- (a) Training — have successfully completed an ICAO PANS-OPS training course, or a training course accepted by the Authority. Where no formal training course has been completed, the Authority may accept evidence of a comprehensive “in-house” training and development program under the supervision of a suitably qualified and experienced FPD whose qualifications are accepted by the Authority.
- (b) Experience in application of IFPs — have at least 10 years’ experience in the application of IFPs through experience gained in Air Traffic Control, as a flight crew member on IFR operations, in operational control of IFR operations, or other experience accepted by the Authority as equivalent.
- (c) Experience in design of IFPs — at least 5 years’ experience designing IFPs which must include —
 - (1) Under supervision by a FPD whose qualifications are accepted by the Authority, the design of at least 3 IFPs of the type that the person is to be authorised to certify; or
 - (2) For a new IFP type, experience accepted by the Authority in designing or certifying similar IFP types.

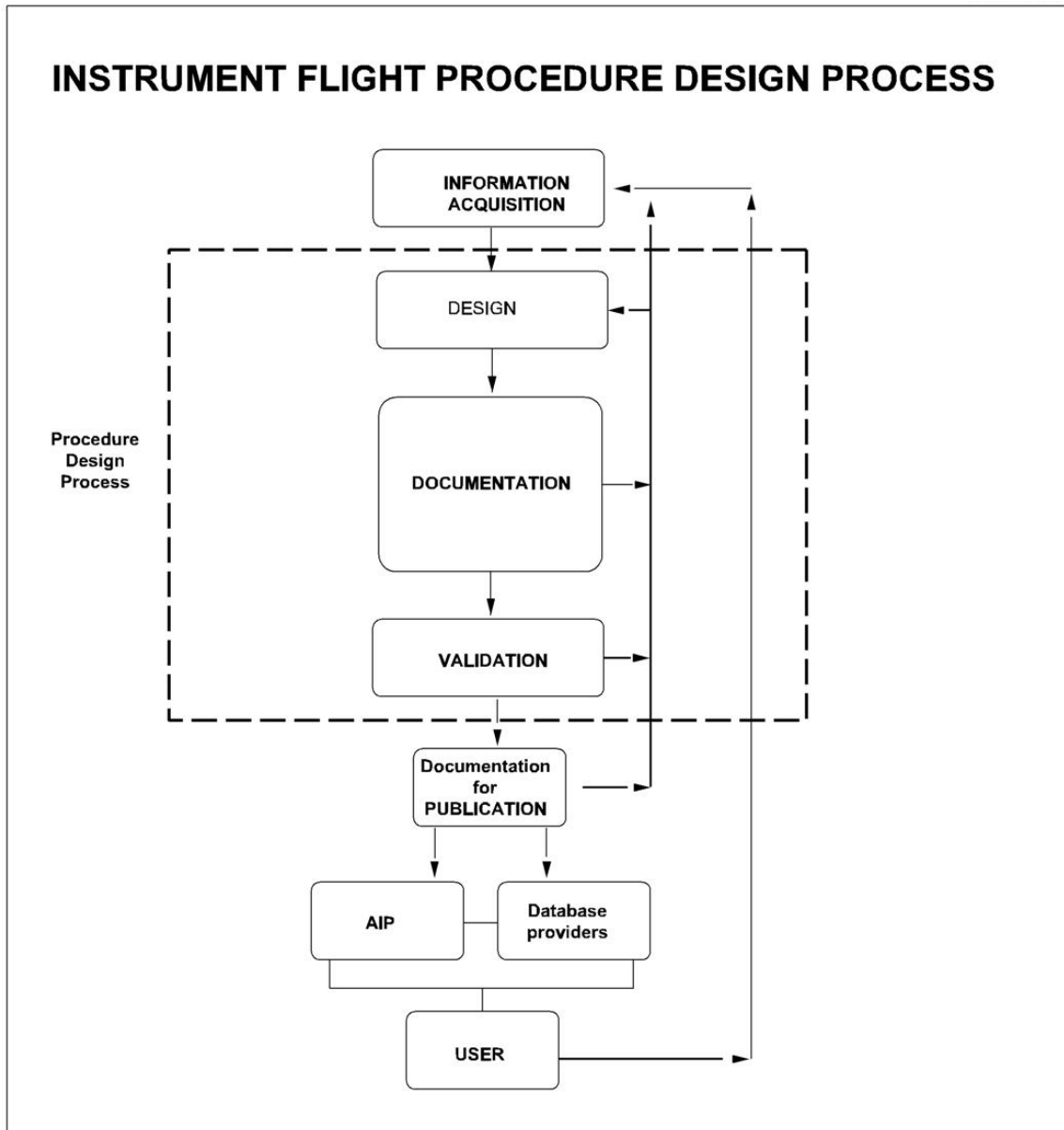
A.2 Qualified Flight Procedure Designer

- (a) Training — have successfully completed an ICAO PANS-OPS training course, or a training course accepted by the Authority. Where no formal training course has been completed, the Authority may accept evidence of a comprehensive “in-house” training and development program under the supervision of a suitably qualified and experienced FPD whose qualifications are accepted by the Authority.
- (b) Experience in application of IFPs — have at least 5 years’ experience in the application of IFPs through experience gained in Air Traffic Control, as a flight crew member on IFR operations, in operational control of IFR operations, or other experience accepted by the Authority as equivalent.
- (c) Experience in design of IFPs — at least 2 years’ experience designing IFPs which must include —
 - (1) Under supervision by a procedure designer whose qualifications are accepted by the Authority, the design of at least 3 IFPs of the type that the person is to be authorised to design; or
 - (2) For a new IFPs type, experience accepted by the Authority in designing similar IFP types.

NOTE: *The IFPDSP should ensure that personnel selected to attend initial Flight Procedure Designer training meets the knowledge, skill and experience requirements defined in ICAO Doc 9906 Volume 2 (Flight Procedure Designer Training (Development of a Flight Procedure Designer Training Programme)) Chapter 3.3.*

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Appendix B — Instrument Flight Procedure Process Flowchart.



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Appendix C — Overview of the Necessary Steps in the Validation Process.

