NAMIBIAN CIVIL AVIATION AUTHORITY

Advisory Pamphlet (AP)

ANSSO-FPD-AP173/06

02/2024

INSTRUMENT PROCEDURE DESIGN PROCESS

1. Explanation of Advisory Pamphlets (AP) system. The Namibian Civil Aviation Authority (NCAA) issues advisory pamphlets to inform the aviation public in a systematic way of non-regulatory material. Unless incorporated into a regulation by reference, the contents of an advisory circular are not binding on the public. Advisory pamphlets are issued in a numbered-subject system corresponding to the subject areas of the Namibian Civil Aviation Regulations (NAMCARs).

   Advisory Pamphlets are intended to provide information and guidance to illustrate a means but not necessarily the only means of complying with the Regulations, or to explain certain Regulatory requirements by providing interpretative and explanatory material. Where an AP is referred to in a 'Note' below the regulation, the AP remains as guidance material.
   APs should always be read in conjunction with the referenced regulations.

2. Reproduction of Advisory Pamphlets. Advisory pamphlets may be reproduced in their entirety or in part without permission from the Civil Aviation Authority.

3. Effective date: _____

NAMIBIA CIVIL AVIATION AUTHORITY NCAA 2024 -01- 13 Private Bag 12003 Ausspannplatz Windhoek Office of the Executive Director

_____
Ms. Toska Sem
Executive Director of Civil Aviation

INSTRUMENT PROCEDURE DESIGN PROCESS

1. PURPOSE

This Advisory Pamphlet (AP) provides guidance to Flight Procedure Design (FPD) organization on the sixteen steps of the instrument procedure design process to meet the requirements of NAMCAR Part 173 and the associated technical standards.

2. BACKGROUND

(a) NAM-CARs Part 173 requires a flight procedure design organisation to ensure that the procedures are designed in accordance with prescribed requirements.

(b) NAM-CAR Parts 173 also requires a flight procedure design organisation to ensure that the designed instrument flight procedures follow the sixteen steps of instrument procedure process as applicable in accordance with prescribed standards.

(c) NAM-CAR Part 173 also requires a flight procedure design organisation to establish a procedure for verifying every instrument flight procedure that it publishes in the Aeronautical Information Publication

3. EXTRACTS FROM NAM-CARS, PART 173 – FLIGHT PROCEDURE DESIGN SERVICES

173.04.2 Standards for design of flight procedures

(1) A flight procedure design organisation designing an instrument flight procedure under the organisation's procedure design approval must ensure that the procedure is designed in accordance with.

c) The quality assurance, training, and validation and associated requirements set out in the current version of the ICAO Quality Assurance Manual for Flight Procedure Design (Doc 9906) – Volume 1 to Volume 6; and

173.04.3 Design criteria for flight procedures

1) A flight procedure design organisation must design, validate and publish every flight procedure in accordance with the requirements of this Part and in accordance with the appropriate design processes, standards, guidelines, and aeronautical data quality requirements contained in the following materials:

(viii) Quality Assurance Manual for Flight Procedure Design (Doc 9906 - AN/472);

4. EXTRACTS FROM NAM-CARS, PART 173 – FLIGHT PROCEDURE DESIGN SERVICES

173.04.4 Standards for design of flight procedures

2. Design of Instrument Flight Procedures

2.1 A flight procedure design organisation must establish detailed procedures for ensuring that every IFP developed is:

(a) designed or amended using the applicable design criteria;

(b) independently verified by a qualified person who is independent of the person directly responsible for the design; and

(c) validated as required by this Part 173.

GUIDANCE TO THE SIXTEN STEPS OF INSTRUMENT FLIGHT PROCEDURE PROCESS

1. OVERVIEW

1.1 Flight procedure design should not be seen as a stand-alone process. It should be coordinated with all relevant stakeholders and integrated into a State's airspace design process, taking into account air traffic flows, separation issues, airspace user requirements, etc.

1.2 The instrument flight procedure process encompasses: the initiation and collection of requirements and constraints, the acquisition of data, the FPD, ground validation, flight validation and flight inspection (when required), approval and publication.

1.3 This process includes review, verification, and validation processes which are necessary to minimize the possibility of errors. It considers the safety analysis necessary prior to implementation. The process also incorporates the periodic review of data, criteria, and feedback from operational implementation.

1.4 The process covers the entire lifespan of an IFP, from the initial development up to the withdrawal, recognizing that some of the process steps, such as AIP publication and procedure regulation, might belong to other organizations.

1.5 It is recommended this process be periodically reviewed to ensure continuous improvement, particularly after the release of updates to the reference material.

1.6 This process, supported by the other volumes of the Quality Assurance Manual for Flight Procedure Design, and properly applied, should provide consistent results with an appropriate level of quality.

2. *OUTPUT OF THE QUALITY PROCESS*

2.1 Although the process covers the entire life cycle of an IFP, from the original requirement to final withdrawal, the aim of the process is not the decommissioning of IFPs.

2.2 The decommissioning of the IFP is the termination of the quality process (except for the archiving requirements).Throughout the life cycle of the procedure, several outputs are generated and evolve to a next level in the "production line".

2.3 Listed below from the beginning of the process, the main outputs are:

a) conceptual design, including planned implementation dates, and resources needed to achieve the task;

b) the FPD, including the procedure layout, the relevant calculation outputs, coordinates and a textual description of the intended procedure;

c) validation and verification reports for the IFP;

d) approval of the procedure by the regulatory authority;

e) documentation throughout the various stages from the input through the publication process; and

f) finally, the released AIP publication (charts, texts, coordinates, path terminators and any other pertinent information relevant to the procedure)

APPENDIX 1 PROCESS DESCRIPTION

Step	Description	Input	Output	Parties Involved	Quality records	reference
1	**INITIATION** At the starting point a "pre-design" request is made for a new FPD or a "modification" request to an existing FPD resulting from feedback, continuous maintenance or periodic review (see Steps 11 to 13). Justification for the FPD must be clearly stated and must be in accordance with the airspace concept and the State navigation strategy. It is a managerial responsibility to make a decision at this point to "go" or "no go"	• Request from a stakeholder for a new or a modified procedure. • Review of an existing procedure. • Navigation strategy considerations. • Resource planning. • Feedback on existing procedure	• Managerial decision to set up the procedure design process or to discontinue the activity	Stakeholders		• SO 9001:2000: section 7.2.1 "Determination of requirements related to the product"; section 7.2.2 "Review of requirements related to the product"; section 7.3.1 "Design and development planning"; and section 7.3.2 "Design and development inputs" • NAMCAR/NAMCATS 173
2	**COLLECT AND VALIDATE ALL DATA** • Specific ATS stakeholders'	• All stakeholder requirements.	• Preliminary work file containing	• Designer • ATM, AIS		• Safety Management Manual (SMM) (Doc 9859).

	requirements: local traffic patterns (altitude, direction, airspeed), feeder/transitions, arrival/departures, preferred routes, ATS routes, communication facilities, time, restrictions and any ATS needs, restrictions or problems. • The designer is to collect from recognized sources, validate for resolution, integrity, reference geodetic datum and effective dates, and incorporate the following data into a design file: – Terrain data: electronic raster and/or vector data or paper cartographic maps. – Obstacle data: man-made and	• Previous designs. • Data from State-recognized sources. • All other data	summary of stakeholder requirements, summary of all data	•Stakeholders • Data sources (e.g. surveyors, charting agencies, MET offices, etc.)		• Quality Assurance Manual for Flight Procedure Design (Doc 9906). • ISO 9001:2000. • Annexes 11, 14, 15. • World Geodetic System-1984 (WGS-84) Manual (Doc 9674). • ED 76/RTCA DO 200. • ED 77/RTCA DO 201. • ED 98/RTCA DO 276. • Eurocontrol Doc P357/DO 002-2. • ISO 9001:2000. • Guidelines for electronic terrain, obstacle and aerodrome mapping information (Doc 9881)

	natural (tower/tree/vegetation height). – Aerodrome/heliport data: ARP/HRP, runway, lighting, magnetic variation and rate of change, weather statistics, altimetry source – Aeronautical data: airspace structure, classifications (controlled, uncontrolled, Class A, B, C, D, E, F, G, name of controlling agency), airways/air routes, altimeter transition altitudes/flight levels, other instrument procedure assessed airspace, area of magnetic unreliability. – Navaid data: coordinates, elevation, service volume,					

	frequency, identifier, magnetic variation. • Existent waypoints significant to the planned navigation.					
3	**CREATE CONCEPTUAL DESIGN** A conceptual design is drafted with the key elements considering the overall strategy.	• Preliminary work file	• Conceptual design.	• Designer.		• Doc 8168 (or applicable criteria). • Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual (Doc 9905) (or applicable criteria). • ISO 9001:2000: section 7.3.1 "Design and development planning".
4	**REVIEW BY STAKEHOLDERS** Formal agreement and approval of the conceptual design is sought at this stage. If agreement and approval are not possible then either the designer	• Work programme to serve as basis for decision, including the scope of the activity to be performed. • Conceptual design	• Formally approved conceptual design or formal decision to discontinue, updated with any consequential changes, if	• All concerned stakeholders. • Designer and management	• Formally approved conceptual design or formal decision to discontinue, updated with any consequential	• ISO 9001:2000: section 7.3.1 "Design and development planning"; and section 7.3.4 "Design and development review".

	must redesign the conceptual design or the stakeholders must reconsider their requirements.		applicable. • Planned implementation AIRAC date, based on available resources and any other technical/ operational/ training constraints		changes, if applicable	
5	**APPLY CRITERIA** Using the stakeholder-approved conceptual design, apply criteria	• Preliminary work file. • Formally approved conceptual design. • Planned implementation AIRAC date. • Resource allocation for the design and planning for publication.	• FPD. • Draft procedure layout. • Report. • Calculation outputs • Coordinates. • Textual description of the procedure.	• Designer.		• Doc 8168 (or applicable criteria). • Doc 9905 (or applicable criteria). • ISO 9001:2000: section 7.3 "Design and development
6	**DOCUMENT AND STORE** • For traceability, complete	• FPD. • Draft procedure layout. • Report.	• Data store FPD containing:	• Designer		• Doc 8168 (or applicable criteria). • Doc 9905 (or applicable criteria).

	necessary submission / calculation forms in paper and / or electronic formats. • Create a draft instrument procedure graphical depiction. • Provide a summary of the logic and decisions used in the step-by-step design of the procedure. • Gather all information used and created in the design of the procedure and assemble into a submission package. • Obtain traceability of consensus from stakeholders via signatures. • Store submission package in a secure format and area, easily accessible for future considerations	• Calculation outputs. • Coordinates. • Textual description of the procedure.	all calculations; all forms and reports, including consensus from stakeholders; all charts/maps AIRAC textual description; path terminators (if applicable); and procedure plate (draft graphical depiction).			• Annexes 4 and 15. • Doc 9906. • State depiction standards. • State forms

7	**CONDUCT SAFETY ACTIVITIES** Determine Level Of Safety Impact Perform an assessment of the magnitude of change to determine the amplitude needed for the safety case. **Develop Safety Documentation** Safety documentation to be provided for the implementation of a new procedure should be agreed at this stage. Normally the Safety Management System to be used is defined for the ANSP affected by the change or by the regulator responsible for the area where the procedure will be implemented	• FPD containing draft procedure layout, report, calculation outputs, coordinates, textual description of the procedure	• Formal statement on the significance of change, allowing to determine the amplitude of the safety case that needs to be performed	• Quality and safety officer, affected stakeholders, supported by designers		• EUROCONTROL Safety Regulatory Requirement (ESARR 4, Section 5). • Doc 9859. • ISO 9001:2000. • European Air Traffic Control Harmonisation and Integration Programme (EATCHIP) Safety Assessment Method. • State Safety Management System documentation (e.g. UK CAA Doc 675)
8	**CONDUCT VALIDATION**	• FPD package.	• Validation report	• Validation	• Results of	• Doc 8168 (or applicable criteria).

	AND CRITERIA VERIFICATION See Doc 9906, Volume 5, "Validation of Instrument Flight Procedures" for detailed guidance	• Safety case.		personnel as per Doc 8168 (PANS-OPS), Volume 2, Part 1, Section 2, Chapter 4, 4.	validation	• Doc 9905 (or applicable criteria). • Annexes 4 and 15. • Doc 9905, Volume 5. • Doc 9613.
9	**CONSULT WITH STAKEHOLDERS** • Submit all pertinent information to all relevant stakeholders for consultation	• Validated IFP	• Designer. • Relevant stakeholders.	• Stakeholder endorsement		NAMCARS/NAMCAT 173
10	**APPROVE IFP** • Provide IFP documentation to the designated authority for approva	• Validated IFP. • Stakeholder endorsement.	• Approved IFP.	• Designer. • Designated authority	Formal approval of the FPD for new procedures (or for relevant changes on existing procedures)	NAMCARS/NAMCAT 173
11	**CREATE DRAFT PUBLICATION** • Provide FPD package, including a graphical depiction, to the AIS to	• Approved IFP	• Draft publication.	• Designer. • AIS		• Annexes 4 and 15. • ISO 9001:2000 section 4.2 "Documentation requirements" section 7.3.5 "Design and

	create a draft publication					development verification".
12	**VERIFY DRAFT PUBLICATION** • Verify the draft publication for completeness and consistency.	• Draft publication. • Validated FPD	• Cross-checked draft publication. • Decision for publication release	• Designer. • AIS / aviation authority		• Regional / national regulation. • Doc 8168, Volumes I and II (or applicable criteria) • All applicable Annexes and Documents. • ISO 9001:2000 section 7.3.5 "Design and development verification"; and section 7.3.6 "Design and development validation".
13	**PUBLISH IFP** • AIS initiates the AIRAC process	• Cross-checked draft publication. • Decision for publication release	• AIP chart, documentation	• AIS.		• Annexes 4 and 15.
14	**OBTAIN FEEDBACK FROM STAKEHOLDERS** • Request and analyse feedback from stakeholders on the accept-ability of the work performed.	• AIP chart, documentation. • Reports from stakeholders.	• Decision for ongoing activities	• Manager of the design office. • Stakeholders.		• Standards for processing aeronautical data (EUROCAE ED-76 / RTCA DO-200)

	• Cross-check the AIP chart, documentation					
15	**CONDUCT CONTINUOUS MAINTENANCE** • On a continuous basis ensure that: – significant changes to obstacles, aerodrome, aeronautical and navaid data are assessed. – significant changes to criteria and design specification that affect procedure design are assessed to determine if action is required prior to the periodic review. • If action is required, return to Step 1 to reinitiate process.	• Significant changes in the FPD environment or design criteria changes that are safety related	• Revision as required.	• Designer. • Regulator. • Procedure owner. • Pilots (when applicable and possible)	• If modifications or amendments, the reason(s) for the change(s)	• Doc 8168 (or applicable criteria). • Doc 9905 (or applicable criteria). • Annexes 4 and 15. • Doc 9859. • Doc 9906
16	**CONDUCT PERIODIC REVIEW** • On a periodic basis (periodicity	• All changes in the FPD environment,	• Revisions as required	• Designer. • AIS/Aviation Authority	• Results of the periodic review.	• Doc 8168 (or applicable criteria). • Doc 9905 (or applicable criteria).

	determined by State, but no greater than five years) ensure: – that all changes to obstacles, aerodrome, aeronautical and navaid data are assessed; and – that all changes to criteria, user requirements and depiction standards are assessed. • If action is required, return to Step 1 to reinitiate process.	design criteria or depiction standards.			• If modifications or amendments, the reason(s) for the change(s).	• Annexes 4 and 15. • Doc 9859. • Doc 9906

APPENDIX 2 REPORT TEMPLATE FOR THE PROCEDURE DESIGN PROCESS

1. INTRODUCTION

<insert introduction here>

2. STEP-BY-STEP DESCRIPTION OF ACTIVITIES WITHIN THE PROCESS

<This section detail all the steps of the process described in appendix 1 and provide additional comments and explanations as follow.

2.1 INITIATION (STEP 1)

This subsection should state the main reasons for the request, e.g., safety enhancement, efficiency of operations, and environmental considerations. The request may be tied to a change in the aerodrome infrastructure or airspace structure.

2.2 COLLECT AND VALIDATE ALL DATA (STEP 2)

This subsection should state the method used for collection, validation and verification of all the data used in the design of the instrument flight procedure. These may be addressed under the following:

a) Terrain data: electronic raster and/or vector data or paper cartographic maps; Obstacle data: man-made and natural with their coordinates and elevation;
b) Aerodrome/heliport data, e.g. ARP/HRP and runway(s) with their coordinates and elevation, lighting, magnetic variation and rate of change, weather statistics, altimeter source;
c) Aeronautical data: airspace structure, classifications (controlled, uncontrolled, Class A, B, C, D, E, F, G, name of controlling agency), airways/air routes, altimeter transition altitudes/flight levels, neighboring instrument procedures, area(s) of magnetic unreliability.
d) Navaid data: coordinates, elevation, service volume, frequency, identifier, magnetic variation; and
e) Existing significant points to local navigation.

2.3 CREATE CONCEPTUAL DESIGN (STEP 3)

In this subsection, the procedure designer should provide, as an input for this activity, the drawing of the earlier designs if available and use the outputs of the previous steps such as presentation notes containing design objectives and indicators as well as the requirements and constraints and the verified data collated in the previous steps.

2.4 REVIEW BY STAKEHOLDERS (STEP 4)

This subsection provides the outcomes of the stakeholder's review of the conceptual design.

2.5 APPLY CRITERIA (STEP 5)

In this subsection provide the procedure design report as an attachment. (from the design organization)

2.6 DOCUMENT AND STORE (STEP 6)

In this subsection, state how all supporting documentation, such as spreadsheets, drawing files and other relevant files used in the design process should be stored.
Note: The documents should remain in a common location, and for the lifetime of the procedures and should be in line with the approved manual (Manual reference*).*

2.7 CONDUCT SAFETY ACTIVITIES (STEP 7)

In this subsection attach a safety assessment detailing the hazards identified and mitigation for each hazard.
Note: As per TGM Volume 2 Part 2 Chapter 5

2.8 CONDUCT VALIDATION (STEP 8)

In this subsection provide a report of ground and flight validation

2.9 CONSULT WITH STAKEHOLDERS (STEP 9)

This subsection provides evidence of the stakeholder's consultation as attachment.

2.10 APPROVE IFP (STEP 10)

This step in for the regulator

2.11 CREATE DRAFT PUBLICATION (STEP 11)

In this subsection provide chart going for publication

2.12 VERIFY DRAFT PUBLICATION (STEP 12)

This step in for the regulator

2.13 PUBLISH IFP (STEP 13

In this subsection provide evidence of the publication request sent to the AIS office and if it confirms to the AIRAC cycle.

2.14 OBTAIN FEEDBACK FROM STAKEHOLDERS (STEP 14)

This subsection should provide evidence of the implementation of a system to get feedback from stakeholders about the operational implementation of the procedure. The advice of datahouses, ATC and pilots actually using the procedure is particularly relevant. The system may be comprised of regular meetings with stakeholders or based on results (reports) from a consultation (questionnaire).

2.15 CONDUCT CONTINUOUS MAINTENANCE (STEP 15)

2.16 CONDUCT PERIODIC REVIEW (STEP 16)