Civil Aviation Safety Authority
of Papua New Guinea

Advisory Circular

AC173-3

Instrument Flight Procedure Design Process

Initial Issue

06 February 2025

GENERAL

Civil Aviation Authority Advisory Circulars (AC) contain information about standards, practices and procedures that the Director has found to be an Acceptable Means of Compliance (AMC) with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices or procedures are found to be acceptable, they will be added to the appropriate Advisory Circular.

PURPOSE

This Advisory Circular provides specific guidance acceptable to the Director, for showing compliance with Civil Aviation Rule 173 Instrument Flight Procedure Design process requirements and explanatory material to assist in showing compliance.

RELATED CAR

This AC relates to Civil Aviation Rule Part 173, specifically rules:

- 173.55(b) Design of instrument flight procedures
- Rule 173.201(b) Design

CHANGE NOTICE

There was no previous issue of this AC, consequently no change is in effect.

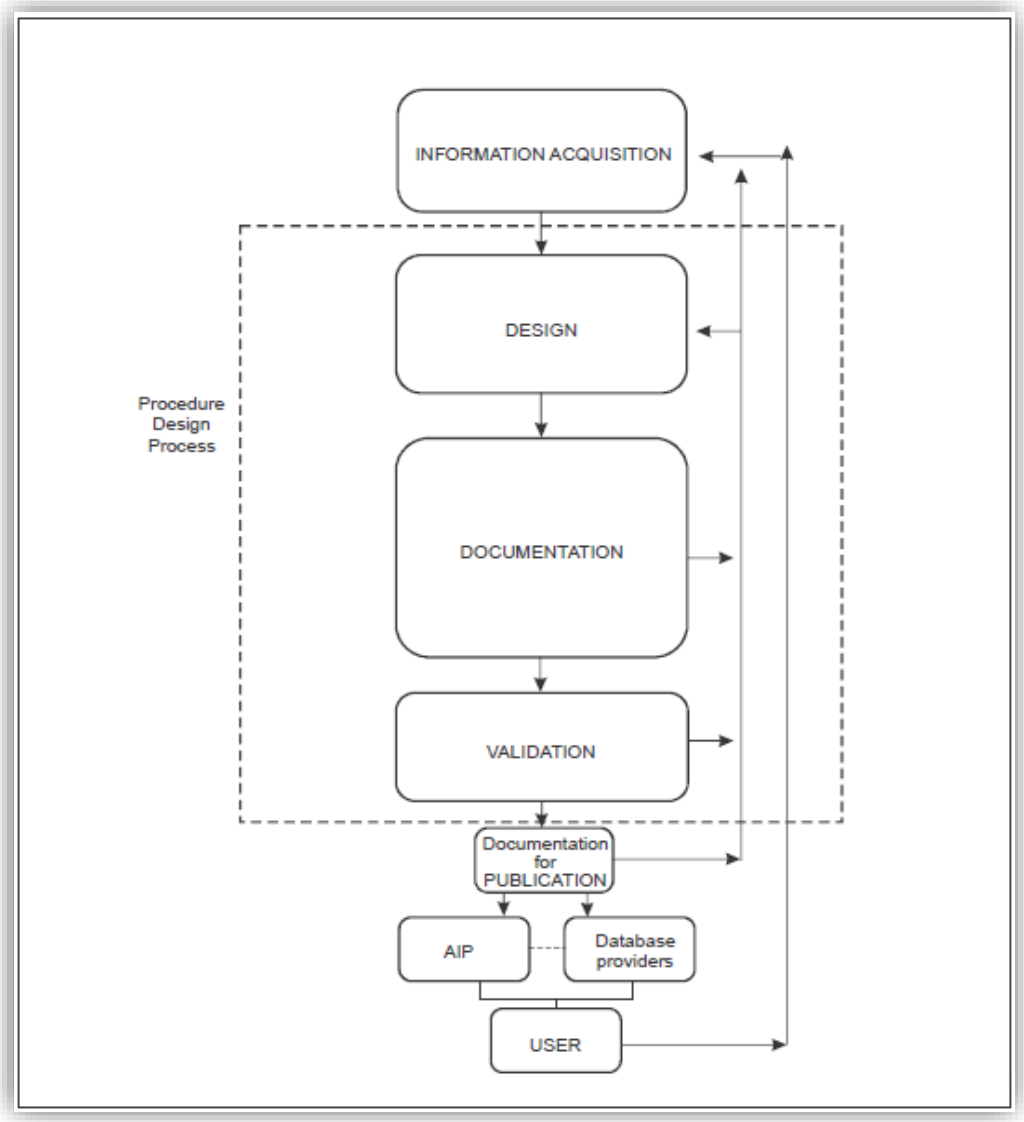
APPROVAL

This AC has been approved for publication by the Director of Civil Aviation

Table of Content

1. The Instrument Flight Procedure Process

The Instrument Flight Procedure (IFP) process (Figure I-2-4-1 of DOC 8168 Vol-II) encompasses the acquisition of data, design and promulgation of procedures. It starts with compilation and verification of the many inputs and ends with ground and/or flight validation of the finished product, and documentation for publication. The elements of the process encompass enablers, constraints, output, and post-publication feedback for the procedure under consideration.



1.1. Information Acquisition

This step is critical as it forms the foundation for the entire IFP design process.

- **Terrain Data**: Detailed topographical maps and digital elevation models (DEMs) are used to understand the terrain features. This data helps in identifying potential obstacles and ensuring that the flight path maintains safe altitudes.
- **Obstacle Data**: Information about man-made structures (e.g., buildings, towers) and natural obstacles (e.g., mountains, trees) is collected. This data is crucial for obstacle clearance analysis.

- **Airspace Structure**: Understanding the layout of controlled and uncontrolled airspace, including restricted, prohibited, and danger areas. This helps in designing procedures that avoid conflicts with other air traffic.
- **Meteorological Data**: Historical and real-time weather data, including wind patterns, temperature, and visibility, are considered. This data helps in designing procedures that are safe under various weather conditions.
- **Navigation Aids**: Locations and characteristics of navigation aids (e.g., VOR, NDB, ILS) are identified. This information is used to ensure that the procedure provides adequate navigational guidance.
- **Airport Data**: Detailed information about the airport, including runway dimensions, taxiways, aprons, and lighting systems. This data is essential for designing approach and departure procedures.

1.2. Design

The design phase involves creating the IFP based on the acquired data.

- **Procedure Layout**: Designing the flight path, including waypoints, altitudes, and headings. This involves creating initial, intermediate, final, and missed approach segments for approach procedures, and departure and arrival routes for SID and STAR procedures.
- **Safety Margins**: Ensuring that the procedure maintains safe distances from obstacles and terrain. This involves calculating obstacle clearance altitudes (OCAs) and minimum descent altitudes (MDAs).
- **Compliance**: Ensuring that the design adheres to ICAO standards and any local regulations. This includes following criteria for obstacle clearance, airspace structure, and navigation aid coverage.
- **Optimization**: Balancing safety, efficiency, and operational feasibility. This involves considering factors such as fuel consumption, flight time, and air traffic flow.

1.3. Documentation

Thorough documentation is essential for the validation and publication of the IFP.

- **Charts**: Creating visual representations of the flight procedure, such as approach plates, departure charts, and en-route charts. These charts provide pilots with a graphical depiction of the procedure.
- **Textual Descriptions**: Detailed written descriptions of the procedure, including step-by-step instructions for pilots. This includes information on altitudes, headings, waypoints, and any special instructions.
- **Supporting Data**: Any additional data that supports the design, such as calculations, rationale for design choices, and safety assessments. This documentation is used for validation and regulatory approval.

1.4. Validation

The validation phase ensures that the designed IFP is safe and effective.

- **Simulation**: Using flight simulators to test the procedure under various conditions. This helps in identifying any potential issues and making necessary adjustments.
- **Flight Testing**: Conducting real-world test flights to verify the procedure's safety and accuracy. This involves flying the procedure in an actual aircraft and assessing its performance.

- **Review and Feedback**: Gathering feedback from pilots, air traffic controllers, and other stakeholders. This feedback is used to identify any issues and make improvements.
- **Adjustments**: Making any necessary changes based on the validation results. This may involve modifying the flight path, altitudes, or other aspects of the procedure.

1.5. Documentation for Publication

After validation, the procedure is prepared for publication.

- **Final Documentation**: Creating the final version of the charts and textual descriptions. This documentation is reviewed and approved by regulatory authorities.
- **Aeronautical Information Publication (AIP)**: Ensuring the procedure is included in the AIP, which is the official source of aeronautical information. The AIP is updated regularly to include new and revised procedures.
- **Distribution**: Providing the procedure to users and database providers who will incorporate it into their systems. This includes updating electronic flight bags (EFBs), navigation databases, and other systems used by pilots and air traffic controllers.

1.6. User

The final step involves the end-users who will use the published IFP in their operations.

- **Pilots**: Using the procedure during flight operations to ensure safe and efficient navigation. Pilots are trained on the new procedures and provided with the necessary charts and documentation.
- **Air Traffic Controllers**: Providing guidance and instructions to pilots based on the procedure. Controllers are trained on the new procedures and provided with the necessary information to manage air traffic effectively.
- **Airlines and Operators**: Incorporating the procedure into their operational manuals and training programs. This ensures that all personnel are familiar with the new procedures and can use them safely and effectively.

This comprehensive process ensures that all Instrument Flight Procedures are designed, validated, and documented in a systematic and thorough manner, maintaining high standards of safety and efficiency.

2. Procedure Design Administration

2.1. Classification of Procedures

2.1.1 Instrument Flight Procedure Design Package Types:

1. **Non-precision Approach (Ground-based)**: Uses non-precision aids like VOR, NDB, or LOC without vertical guidance.
2. **Non-precision Approach (RNP APCH)**: Utilizes Required Navigation Performance standards without precision landing aids.
3. **Precision Approach (Ground-based)**: Employs precision aids like ILS for both lateral and vertical guidance.
4. **Precision Approach (GBAS)**: Uses Ground-Based Augmentation System for enhanced accuracy.
5. **Approach with Vertical Guidance (APV)**: Provides vertical guidance but does not meet precision approach standards.

6. **RNP AR APCH**: Complex approaches requiring specific authorization due to stringent performance requirements.
7. **Departure**: Procedures designed for aircraft departures.
8. **Helicopter (Off-shore) — Airborne Radar**: Helicopter approaches using airborne radar systems.
9. **Helicopter (Off-shore) — NDB**: Helicopter approaches using non-directional beacons.
10. **Standard Instrument Departure (SID)**: Standardized routes for aircraft after takeoff.
11. **Standard Terminal Arrival Route (STAR)**: Standardized routes for aircraft arriving at an airport.
12. **Visual Flight Procedures (VFP)**: Allows for visual navigation under certain conditions.
13. **Circling Approach**: Maneuver to align with the runway for landing.
14. **Missed Approach Procedure**: Actions to be taken if an approach cannot be completed.
15. **Holding Procedures**: Patterns for aircraft to follow while waiting for further clearance.
16. **Special Instrument Flight Procedures**: Custom procedures for specific operational needs.

2.2. Instrument Flight Procedure Design Package (IFPDP)

2.2.1 Submission for Approval

All IFPDP must be submitted to the Civil Aviation Safety Authority (CASA) for approval. This submission must include:

- A Ground Validation conducted by a Part 173 Authorized person.
- An application for CA 95/01, which is the application for registration of an Instrument Flight Procedure under CAR Part 95.

To efficiently share your Procedure Design Documentation (PDP), The follow steps may be recommended:

1. **Compress the Files**:
    - Use file compression software like WinRAR, 7-Zip, or the built-in compression tool on your operating system to compress the PDP files into a single folder.
2. **Email the Compressed Folder**:
    - Attach the compressed folder to an email and send it to the relevant recipients.
3. **Upload to Cloud Storage**:
    - Upload the compressed folder to a cloud storage service such as Google Drive, Dropbox, or OneDrive.
    - Once uploaded, generate a shareable link.
4. **Share the Link**:
    - Share or email the link to the relevant recipients, allowing them to access and download the PDP files.

2.3. Components of the Design Package

2.3.1. Letter of Intent / CAR Part 95 Application

Prepare a formal letter outlining the intent to design a new IFP, including the purpose, scope, and expected outcomes. Ensure the application complies with CAR Part 95 requirements.

- Designer: Approved Part 173 Holder or has delegation from the Director.
    - **New Flight Procedure Design Work**: Initiate new flight procedure design projects.
    - **Periodic Review**: Conduct periodic reviews of existing flight procedures to ensure they remain current and effective.
    - **Maintenance**: Perform maintenance on existing flight procedures to address any issues or updates.

2.3.2. Collection & Validation of Data

- **Required Data:** Gather all necessary data for the task at hand.
- **Source Data Verification:** Verify the accuracy and reliability of the source data.

2.3.3. Creation of Conceptual Design & Review by Stakeholder

- **Conceptual Design Creation**: Develop the initial conceptual design of the flight procedure.
- **Stakeholder Input**: Obtain and evaluate input from stakeholders on the conceptual design.
- **Incorporate Input**: Incorporate stakeholder input into the conceptual design. If not feasible, discuss and agree on the final design with stakeholders.

2.3.4. Apply Criteria

- **Apply PANS-OPS Criteria**: Apply the criteria from PANS-OPS DOC-8168 to the agreed conceptual design to create the final draft.
- **Document & Store (Retention)**
- **Documentation and Storage**: Document the Instrument Flight Procedure (IFP) design work and store it for future reference.

2.3.5. Safety Assessment

- **Safety Assessment**: Complete and document the safety assessment required for the IFP.
- **Ground Validation & Criteria Verification**
- **Ground Validation**: Complete and document ground validation and criteria verification.
- **Flight Validation & Data Verification**
- **Flight Validation**: Conduct flight validation based on ground validation results.
- **Flight Validation Report**: Receive the flight validation report and recommend unrestricted use if applicable.
- **Evaluate Input**: If the procedure is restricted, evaluate the input and incorporate it into the IFP design.

2.3.6. Consult with Stakeholders

- **Final Draft Consultation**: Forward final draft charts to stakeholders for consultation.

- **Incorporate Input**: Receive and consider stakeholder input, amending the draft charts accordingly.

2.4. Publication

2.4.1. Public Procedures:

- **Certificate of Design**: This is a formal document that certifies the completion of the design process. It must be signed by the Senior Person (Chief Designer), ensuring that the design adheres to the regulations specified in Part 173 and PANS-DOC 8168 Vol II.
- **Submission to AIS**: The certified designer is responsible for forwarding this certificate to the Aeronautical Information Service (AIS), which handles the publication of IFPs in the AIP. The AIP is a critical document that provides essential information for the safe operation of aircraft.

2.4.2. Other Procedures:

- **Non-AIP Procedures**: These are procedures that are not intended for publication in the AIP. They might be internal procedures or those used for specific purposes that do not require public dissemination.
- **Submission to CASA**: For these procedures, the certified or authorised designer must send the relevant documents to the Director/CEO of the Civil Aviation Safety Authority (CASA) in Papua New Guinea. This ensures that all procedures, whether published or not, are reviewed and approved by the authority.