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CIVIL AVIATION AUTHORITY OF THE PHILIPPINES
Old MIA Road, Pasay City, Philippines

Manual of Standards For Instrument Flight Procedure Design Services

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FOREWORD

The Civil Aviation Authority of the Philippines (CAAP) is responsible under the Civil Aviation Authority Act of 2008 (Republic Act No. 9497) of the Republic of the Philippines, as amended, for the regulation of civil aviation in the Philippines. CAAP exercises safety regulatory oversight by developing and promulgating appropriate, clear and enforceable aviation safety standards.

This Manual of Standards for Instrument Flight Procedure Design Services (MOS-IFPDS) is one mechanism that CAAP uses to ensure that safety regulations in the development and maintenance of visual and instrument flight procedures are met pursuant to Republic Act 9497. This Manual of Standards is a component of the State Safety Program (SSP) and prescribes the detailed safety standards, technical requirements and procedures which have been determined to be necessary for promoting and supporting global standardization and aviation safety in civil air navigation.

The standards, requirements and procedures in this Manual are based mainly on the recommendations stipulated in ICAO Document 10068 (Manual on the Development of a Regulatory Framework for Instrument Flight Procedure Design Service) and ICAO Document 9906 Volumes 1-6 (Quality Assurance Manual for Flight Procedure Design), with appropriate modifications as have been determined by CAAP to be applicable in the Philippines, remaining cognizant of the three (3) main principles applied to the design of all instrument flight procedures, namely; they should be safe; they should be simple; they should be economical of both time and airspace. Safety is based on common sense and sound operational judgement. Simple procedures are essential at a time when pilot workload is high and the consequence of error can be fatal. Economic procedures are increasingly necessary — flight time is money and airspace are often in short supply.

Amendments to this Manual of Standards for Instrument Flight Procedure Design Services are the responsibility of the Head of the Aerodrome and Air Navigation Safety Oversight Office (AANSOO), CAAP. Readers should forward advice of errors, inconsistencies or suggestions for improvement to this Manual to the Head of AANSOO at the following address AANSOO Office, CAAP, Old MIA Road, Pasay City, Philippines or thru email at aanso.caap@gmail.com.

CAPTAIN JIM C. SYDIONGCO
Director General

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Corrigenda			
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DEFINITIONS

When the following terms are used in this manual, they have the following meanings:

Acceptance. The act of accepting with formal approval (favorable reception).

***Accuracy*.** The degree of conformance between the estimated or measured value and its true value.

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

***Aerodrome data**.* Data relating to an aerodrome including the dimensions, coordinates, elevations and other pertinent details of runways, taxiways, buildings, installations, equipment, facilities and local procedures.

***Aeronautical data**.* Data relating to aeronautical facts, such as, inter alia, airspace structure, airspace classifications (controlled, uncontrolled, Class A, B, C... F, G), name of controlling agency, communication frequencies, airways/air routes, altimeter transition altitudes/flight levels, collocated instrument procedure (and its airspace as assessed by design criteria), area of magnetic unreliability, magnetic variation.

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

Air traffic management (ATM). The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.

Air traffic services (ATS). A generic term meaning, variously, flight information service, alerting service, air traffic advisory service and air traffic control service (area control service, approach control service or aerodrome control service).

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

Authorized designer. A recognized procedure design service provider authority under CAAP or a 3rd-party procedure design service provider who is a holder of a procedure design certificate of authorization that is in force.

Automation. The automatic operation or control of equipment, a process, or a system.

Basic element. The lowest level object identified within a specific function.

Basic parameter. Reference parameter or constant defined in the applicable criteria for procedure design calculations.

Cartographic map. A representation of a portion of the Earth, its culture and relief, with properly referenced terrain, hydrographic, hypsometric and cultural data depicted on a sheet of paper.

Circling approach. An extension of an instrument approach procedure which provides for visual circling of the aerodrome prior to landing.

Civil Aviation Authority of the Philippines (CAAP). Unless specifically stated otherwise, when used in this document shall refer to the government entity responsible for regulating civil aviation activities of the Philippines.

Competency. A combination of skills, knowledge and attitudes required to perform a task to the prescribed standard.

Competency-based training and assessment. Training and assessment that are characterized by a performance orientation, emphasis on standards of performance and their measurement, and the development of training to the specified performance standards.

Competency element. An action that constitutes a task that has a triggering event and a terminating event that clearly defines its limits, and has an observable outcome.

Competency framework. A competency framework consists of competency units, competency elements, performance criteria, evidence and assessment guide and range of variables. Competency units, competency elements and performance criteria are derived from job and tasks analyses of procedure designers and describe observable outcomes.

Competency unit. A discrete function consisting of a number of competency elements.

Conceptual design. High-level graphical and/or textual description of the designer's interpretation of the stakeholders' requirements.

Consultation. A conference between two or more people to consider a particular question.

Data owner. refers to the organization (Airport Authorities, Surveyors, Charting Agencies, ATS, CNS, MET, AIS, etc.) providing the document reference (Survey reports, Weather Logs, Equipment Specifications, Aeronautical Charts, AIP, etc.) as source of a data used in procedure design.

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

Decision altitude or decision height (DA/H). A specified altitude or height in a 3D instrument approach operation at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Note 1. - Decision altitude (DA) is referenced to mean sea level and decision height (DH) is referenced to the threshold elevation.

Note 2. - The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In Category III operations with a decision height the required visual reference is that specified for the particular procedure and operation.

Note 3. - For convenience where both expressions are used, they may be written in the form "decision altitude/height" and abbreviated "DA/H".

Designer. A person adequately trained who performs the design of an instrument flight procedure.

Digital elevation model (DEM). The representation of a portion of the Earth's surface by continuous elevation values at all intersections of a defined grid, referenced to common datum.

Note. - Digital terrain model (DTM) is sometimes referred to as DEM.

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

Enabling objective. A training objective derived from performance criteria in the competency framework. In order to achieve enabling objectives, a trainee requires skills, knowledge and attitudes.

Error. An action or inaction by an individual that leads to deviations from organizational or operational intention or expectation.

Error management. The process of detecting and responding to errors with countermeasures that reduce or eliminate the errors or the consequence of errors.

Evidence and assessment guide. A guide that provides detailed information (e.g. tolerances) in the form of evidence that an instructor or an evaluator can use to determine if a candidate meets the requirements of the competency standard.

Flight inspection. The operation of a suitable 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 (FPD). 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 CAAP.

Note. – Flight procedure designer is sometimes simply referred to as "designer".

Flight procedure design process. The process which is specific to the design of instrument flight procedures leading to the creation or modification of an instrument flight procedure.

Flight procedure inspectorate (FPI). Refers to the PANS-OPS Safety Inspectorate unit under the Aerodromes and Air Navigation Safety Oversight Office (AANSOO) designated to carry out the safety oversight activities in the area of development and maintenance of visual and instrument flight procedures.

Flight procedure inspectorate staff. A person or persons assigned at the PANS-OPS Safety Inspectorate unit responsible for the establishment of regulations governing Instrument Flight Procedure Design Services, oversight of the process of development and maintenance of visual and instrument flight procedures, evaluation of 3rd Party Procedure Design Service Providers' applications for authorizations, and performance of safety regulatory surveillance of Procedure Design Service Providers' activities.

Flight validation pilot (FVP). A person performing flight validation who meets the competency requirements as laid down by CAAP.

Flight validation service provider (FVSP). A body that provides flight validation services.

Flyability. The ability to keep an aircraft within predefined tolerances of designed lateral and vertical flight track.

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

Instrument approach operations. An approach and landing using instruments for navigation guidance based on an instrument approach procedure. There are two methods for executing instrument approach operations:

a) a two-dimensional (2D) instrument approach operation, using lateral navigation guidance only; and

b) a three-dimensional (3D) instrument approach operation, using both lateral and vertical navigation guidance.

Note. — *Lateral and vertical navigation guidance refers to the guidance provided either by:*

a) *a ground-based radio navigation aid; or*

b) *computer-generated navigation data from ground-based, space-based, self-contained navigation aids or a combination of these.*

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

Non-precision approach (NPA) procedure. An instrument approach procedure designed for 2D instrument approach operations Type A.

Note. — Non-precision approach procedures may be flown using a continuous descent final approach (CDFA) technique. CDFAs with advisory VNAV guidance calculated by on-board equipment are considered 3D instrument approach operations. CDFAs with manual calculation of the required rate of descent are considered 2D instrument approach operations.

Approach procedure with vertical guidance (APV). A performance-based navigation (PBN) instrument approach procedure designed for 3D instrument approach operations Type A.

Precision approach (PA) procedure. An instrument approach procedure based on navigation systems (ILS, MLS, GLS and SBAS Cat I) designed for 3D instrument approach operations Type A or B.

Note. — Refer to CAR-ANS Part 6 for instrument approach operation types.

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

Instrument flight procedure design service (IFPDS). 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. A body that provides an IFPDS. Also referred to as Procedure Design Service Provider (PDSP).

Instrument flight procedure process. The overarching process from data origination to the publication of an instrument flight procedure.

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost or altered since the data origination or authorized amendment.

Maintenance (continuous). The continuous maintenance of an instrument procedure is an ongoing process triggered by the Aeronautical Information Services (AIS) through notification of any critical changes to the instrument procedure environment that would necessitate timely revision of the instrument procedure design. Examples of critical changes would be the erection of an obstacle within a determined radius of an Aerodrome Reference Point (ARP); the planned decommissioning of an associated secondary navigation aid; or the planned extension/ reduction of a runway. It is assumed that the AIS would respond by NOTAM to any unplanned critical change to the instrument procedure environment. The AIS would notify the procedure designer of the NOTAM action and would then expect the procedure designer to take maintenance/corrective action as required.

Maintenance (cyclical/periodic). The cyclical maintenance of an instrument procedure is a planned systemic review at a predetermined interval of the procedure design.

Mastery test. A test that evaluates a trainee's ability to perform a terminal objective. A mastery test should match as closely as possible the conditions, behaviors and standards of terminal objectives.

Material-dependent training. A well-documented and repeatable training package that has been tested and proven to be effective.

Minimum descent altitude or minimum descent height (MDA/H). A specified altitude or height in a 2D instrument approach operation or circling approach operation below which descent must not be made without the required visual reference.

Note 1. — Minimum descent altitude (MDA) is referenced to mean sea level and minimum descent height (MDH) is referenced to the aerodrome elevation or to the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. A minimum descent height for a circling approach is referenced to the aerodrome elevation.

Note 2. — The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In the case of a circling approach the required visual reference is the runway environment.

Note 3. — For convenience when both expressions are used, they may be written in the form "minimum descent altitude/height" and abbreviated "MDA/H".

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

Modelling of criteria. A schematic description of criteria that accounts for its properties and may be used for further study or application of its characteristics.

Navaid data. Data relating to both ground-based and space-based navigational aids including service volume, frequency, identification, transmission power and limitations of operation

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

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

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

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

Note 3.— See Part I, Section 4, Chapter 5, 5.4 for specific applications of this definition.

Obstacle data. Any man-made fixed or temporary object which has vertical significance in relation to adjacent and surrounding features and which is considered as a potential hazard to the safe passage of aircraft, or man-made fixed or temporary objects that extend above a defined surface intended to protect aircraft in flight.

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

Performance criteria. A simple, evaluative statement on a required outcome of the competency element and a description of the criteria used to judge if the required level of performance has been achieved. Several performance criteria can be associated to a competency element.

Procedure design function. An element of a procedure design software executing a predefined task and providing output to the procedure designer.

Note. - The description of a procedure design function needs to include all required input (values, format, etc.) and a comprehensive description of the expected outputs. For example, outputs may include:

a) result of checks for consistency of input with the applicable regulation;

b) results of various calculations (area width, MOCA, etc.); and

c) protection area drawing.

Procedure Design Service Provider (PDSP). a person or organization who engages in the design, development, changes to, or modification of instrument flight procedures.

Note. – See also "Instrument flight procedure design service provider."

Procedure design tool. Automation system that provides calculations and/or designs and layouts in the field of procedure design.

Procedure owner. refers to the organization (airport authority, ATS, air operator, etc.) indorsing procedure design work to a PDSP.

Process. A set of interrelated or interacting activities which transforms inputs into outputs; hence "flight procedure design (FPD) process" or "instrument flight procedure process".

Procedure. A specified way to carry out an activity or a process (see ISO 9000:2000 Quality management systems – Fundamentals and vocabulary, section 3.4.5).

Progress test. A test that measures a trainee's ability to meet key enabling objectives.

Quality record. Objective evidence which shows how well a quality requirement is being met, or how well a quality process is performing. Quality records normally are audited in the quality evaluation process.

Range of variables (conditions). The conditions under which the competency units must be performed.

Raster map. An electronic representation of a cartographic map with properly referenced terrain, hydrographic, hypsometric and cultural data.

Recognized source. A source of data that is either recognized by CAAP or a source that has professional credentials to provide a specific type of data.

Reference geodetic datum. The numerical or geometrical quantity or set of such quantities (mathematical model) which serves as a reference for computing other quantities in a specific geographic region such as the latitude and longitude of a point. A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Required navigation performance (RNP). A statement of the navigation performance necessary for operation within a defined airspace.

Note. — Navigation performance and requirements are defined for a particular RNP type and/or application.

Resolution. The number of units or digits to which a measured or calculated value is expressed and used. The smallest difference between two adjacent values that can be represented in a data storage, display or transfer system.

Review. An activity undertaken to determine the suitability, adequacy and effectiveness of the subject matter to achieve established objectives (see ISO 9000:2000 Quality management systems – Fundamentals and vocabulary, section 3.8.7).

Significant obstacle. Any natural terrain feature or man-made fixed object, permanent or temporary, which has vertical significance in relation to adjacent and surrounding features and which is considered a potential hazard to the safe passage of aircraft in the type of operation for which the individual procedure is designed.

Note. — The term "significant obstacle" is used in this document solely for the purpose of specifying the objects considered in calculations of relevant elements of the procedure and intended to be presented on an appropriate chart series.

Skills, knowledge, attitudes (SKA). The skills/knowledge/attitudes are what an individual requires to perform an enabling objective derived from performance criteria. A skill is the ability to perform an activity that contributes to the effective completion of a task. Knowledge is specific information required for the trainee to develop the skills and attitudes for the effective accomplishment of tasks. Attitude is the mental state of a person that influences behavior, choices and expressed opinions.

Software environment. Software used to support an automation tool, such as an operating system, or database management system.

Software validation. Acknowledgement, derived from a series of tests, of the compliance of an automation system with the applicable standards. It may be one or a combination of the following:

a) *Functional validation* **-** Confirmation of the correct implementation of automation functions and of the compliance of the human machine interface with the user requirements

b) *Validation with reference to criteria* - Confirmation through a series of tests of the compliance of the results with reference to applicable criteria.

Stakeholder. An individual or party with vested interests in an instrument flight procedure design.

Standard instrument departure (SID). A designated instrument flight rule (IFR) departure route linking the aerodrome or a specified runway of the aerodrome with a specified significant point, normally on a designated ATS route, at which the en-route phase of a flight commences.

Standard terminal arrival (STAR). A designated instrument flight rule (IFR) arrival route linking a significant point, normally on an ATS route, with a point from which a published instrument approach procedure can be commenced.

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

Terminal objective. A training objective derived from a competency element in the competency framework which a trainee will achieve when successfully completing instruction.

Terminating event. A cue or indicator that a task has been completed.

Terrain data. Data pertaining to the natural surface of the Earth excluding man-made obstacles, and can be represented as a cartographic map, an electronic raster map, an electronic vector data map or an electronic Digital Elevation Model (DEM).

Test. A basis for critical evaluation.

Traceability. The degree that a system or a data product can provide a record of the changes made to that product and thereby enable an audit trail to be followed from the end-user to the data originator.

Training objective. A clear statement that is comprised of three parts, i.e. the desired performance or what the trainee is expected to be able to do at the end of particular stages of training, the performance standard that must be attained to confirm the trainee’s level of competence and the conditions under which the trainee will demonstrate competence.

Training provider. In the context of this MOS, a body that provides procedure designer training.

Triggering event. A cue or indicator that a task should be initiated.

Validation. Confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled. The activity whereby the current value of a data element is checked as having a value that is fully applicable to the identity given to the data element, or a set of data elements that is checked as being acceptable for their purpose.

Verification. Confirmation, through the provision of objective evidence, that specified requirements have been fulfilled. The activity whereby the current value of a data element is checked against the value originally supplied.

Vector data. The digitized version of graphic or rasterized data, usually having three-dimensional attributes.

Visual maneuvering (circling) area. The area in which obstacle clearance should be taken into consideration for aircraft carrying out a circling approach.

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

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

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

ABBREVIATIONS

AANSOO	Aerodrome and Air Navigation Safety Oversight Office
AC	Advisory Circular
ADMS	Aerodrome Development and Management Service
AFPDD	Airspace and Flight Procedure Design Division
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation and Control
AIS	Aeronautical Information Service
ALS	Approach Lighting System
ANS	Air Navigation Services
ANSP	Air Navigation Service Provider
APV	Approach Procedures with Vertical Guidance
ARINC	Aeronautical Radio, Incorporated
ARP	Aerodrome Reference point
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATM	Air Traffic Management
ATMO	Air Traffic Management Officer
ATMSID	Air Traffic Management Safety Inspectorate Division
ATS	Air Traffic Services
Baro-VNAV	Barometric Vertical Navigation
CAAP	Civil Aviation Authority of the Philippines
CAD	Computer Aided Design
CAR-ANS	Civil Air Regulations for Air Navigation Services
CAR-SM	Civil Air Regulations for Safety Management
CAT	Category
CAT I/II/III	Category of Approach
CDA	Continuous Descent Approach
CDFA	Continuous Descent Final Approach
CE	Critical Element
CF	Course to a Fix
CNS	Communications, Navigation and Surveillance
COTS	Commercial Off the Shelf
CRC	Cyclic Redundancy Check
DA/H	Decision Altitude/ Height
DEM	Digital Elevation Model
DG	Director General

DME	Distance Measuring Equipment
Doc	Document
DTM	Digital Terrain Model
eTOD	Electronic Terrain and Obstacle Data
EUROCAE	European Organization for Civil Aviation Equipment
FAA	Federal Aviation Administration
FAF	Final Approach Fix
FAS	Final Approach Segment
FICG	Flight Inspection and Calibration Group
FIR	Flight Information Region
FMS	Flight Management System
FPA	Flight Path Angle
FPAP	Flight Path Alignment Point
FPD	Flight Procedure Design
FPI	Flight Procedure Inspectorate
FPIS	Flight Procedure Inspectorate Staff
FRT	Flight Readiness Test
FTP	Fictitious Threshold Point
FV	Flight Validation
FVP	Flight Validation Pilot
FVSP	Flight Validation Service Provider
GBAS	Ground-Based Augmentation System
GIS	Geographic Information System
GLS	GLS GBAS Landing System
GNSS	Global Navigation Satellite System
GP	Glide Path
GPS	Global Positioning System
GV	Ground Validation
HA	Holding/racetrack to an Altitude
HDOP	Horizontal Position Dilution of Precision
HF	Holding/racetrack to a Fix
HM	Holding/racetrack to a Manual Termination
HMI	Human Machine Interface
HPL	Horizontal Protection Level
HRP	Heliport Reference Point
IAC	Instrument Approach Chart
IAP	Instrument Approach Procedure

IAS	Indicated Air Speed
ICA	Initial Climb Area
ICARD	International Codes and Route Designators
ICAO	International Civil Aviation Organization
IEEE	Institute of Electrical and Electronic Engineers
IELTS	International English Language Testing System
IAF	Initial Approach Fix
IF	Intermediate Fix
IFP	Instrument Flight Procedure
IFPDS	Instrument Flight Procedure Design Service
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IR	Instrument Rating
ISO	International Standards Organization
LNAV	Lateral Navigation
LOA	Letter of Agreement
LOI	Local Operation Instruction
LOC	Localizer
LPV	Localizer Performance with Vertical Guidance
LTP	Landing Threshold Point
MC	Memorandum Circular
MDA/H	Minimum Descent Altitude/ Height
MET	Aviation Meteorology
MLS	Microwave Landing System
MOC	Minimum Obstacle Clearance
MOCA	Minimum Obstacle Clearance Altitude
MOS	Manual of Standards
MSA	Minimum Sector Altitude
NAVAID	Navigational Aid
NDB	Non-directional Radio Beacon
NM	Nautical Mile
NOTAM	Notice to Airmen
NPA	Non-precision Approach
OAS	Obstacle Assessment Surface
OCA/H	Obstacle Clearance Altitude/Height
OJT	On-the-Job Training
OLS	Obstacle Limitation Surface

PA	Precision Approach
PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations
PBN	Performance-Based Navigation
PCAR	Philippine Civil Air Regulations
PDF	Portable Document Format
PDG	Procedure Design Gradient
PDOP	Position Dilution of Precision
PDSP	Procedure Design Service Provider
PinS	Point-in-Space
PV	Pre-flight Validation
QM	Quality Manual
QMS	Quality Management System
RNAV	Area Navigation
RNP	Required Navigation Performance
RNP AR	Required Navigation Performance Authorization Required
RPAS	Remotely Piloted Aircraft System
RT	Radiotelephony
RTCA	RTCA (formerly Radio Technical Commission for Aeronautics)
RVSM	Reduced Vertical Separation Minimum
SAR	Search and Rescue
SARPS	Standards and Recommended Practices
SBAS	Satellite-Based Augmentation System
SI	International System of Units (Système International)
SID	Standard Instrument Departure
SKA	Skills, Knowledge and Attitude
SMS	Safety Management System
SOP	Standard Operating Procedure
STAR	Standard Instrument Arrival
TAA	Terminal Arrival Altitude
TAWS	Terrain Awareness Warning System
TLS	Target Level of Safety
TMA	Terminal Area
TOEFL	Test of English as a Foreign Language
TR	Training Record
UTC	Universal Time Constant
UTM	Universal Transverse Mercator
VASIS	Visual Approach Slope Indicator System

VDOP	Vertical Position Dilution of Precision
VMC	Visual Meteorological Condition
VNAV	Vertical Navigation
VOR	Very High Frequency Omnidirectional Radio Range
VPL	Vertical Protection Level
VSS	Visual Segment Surface
WGS-84	World Geodetic System 1984
WP	Waypoint

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CHAPTER 1

INTRODUCTION

1.1 GENERAL

1.1.1 This Manual of Standards (MOS) is supplementary to CAR-ANS Part 16 – "Procedure Design Services" and discusses more in detail the safety regulatory and oversight framework of CAAP for the provision of an Instrument Flight Procedure Design Service (IFPDS).

Note. – Although not directly stated, the provisions herein, when referring to design work, includes applicable provisions for both "visual and instrument flight procedure design".

1.1.2 This MOS also lays down the requirements and guidelines for the Procedure Design Service Providers (PDSPs) in the following aspects of IFPDS:

a) developing their work procedures and operations manual;

b) qualifications, training and competency for designers and flight validation pilots;

c) process flow for the design, maintenance and implementation of instrument flight procedures;

d) quality assurance in the elements of procedure design, such as procedure design documentation, verification and validation methods to ensure safety, flyability and design accuracy, including strategies on the acquisition/processing of source information/data;

e) authorization of PDSP organizations engaged or intending to engage in design works within Manila FIR;

f) approval of IFP design;

g) validation process of IFP design; and

h) FPD software validation.

1.1.3 It should be noted that CAAP oversight and the procedure design service provision are two separate components which should work in collaboration to ensure the safe development and maintenance of IFPs.

1.2 NATIONAL REGULATIONS FOR IFPDS

1.2.1 CAR-ANS Part 11 — Air Traffic Services, Chapter 11.2, 11.2.34, and Appendix 11.7 contains the provisions concerning CAAP's safety oversight function in the area of IFPDS.

1.2.2 Appendix 11.7 of CAR-ANS Part 11 stipulates that CAAP may choose to implement IFPDS in the following manner:

a) provide an instrument flight procedure design service; and/or

b) agree with one or more other Contracting State(s) to provide a joint service; and/or

c) delegate the provision of the service to external agency(ies) or 3rd Party PDSPs.

1.2.3 CAR-ANS Part 16 – provides for the general rules and regulations that apply to person or organization who wants to become, or are, authorized designers of instrument flight procedures. It also sets out certain rules that apply to CAAP in administering procedure design certificate of authorizations.

1.2.4 The manner in which the IFPDS is implemented is described in this Manual of Standards (MOS).

1.3 APPROVAL AND RESPONSIBILITY FOR IFPs

1.3.1 In all cases in paragraph 1.2.2 above, CAAP approves and remains responsible for all instrument flight procedures for aerodromes and airspace under the responsibility of CAAP. It should be noted that cases 1.2.2 b) and c) are not about the delegation of responsibility, but the delegation of the IFPDS function.

1.3.2 CAAP remains responsible for all IFPs to be implemented within the Manila FIR. The process by which CAAP meets its obligation to approve IFPs is also introduced in this MOS and described more in details in Chapter 4.

1.3.3 There may be IFPs that are only available to operators or are airline specific. The concerned operator should first request for special authorization from CAAP prior to use of such IFPs.

1.3.4 CAAP remains responsible for all IFPs (including those mentioned in 1.3.3) and reserves the right to approve, disapprove, suspend or recommend modifications to such procedures and publish such procedures as necessary in the interest of safety of all the users of the aerodromes and airspace concerned.

1.4 DESIGN CRITERIA

1.4.1 For global standardization, visual and instrument flight procedures must be designed in accordance with the design criteria stipulated in PANS-OPS, ICAO Doc 8168, Volume II (Procedures for Air Navigation Services — Aircraft Operations, — Construction of Visual and Instrument Flight Procedures) and any applicable standards set out or referred to in ICAO approved documents and materials (e.g. ICAO Doc 9905 – RNP AR Procedure Design Manual) applying the latest amendments thereto.

1.4.2 Any deviations from the criteria stipulated in the above-mentioned documents may be established by CAAP only for the purpose of enhancing safety. These deviations, if any, shall be promulgated in CAAP regulations and published in the Aeronautical Information Publication (AIP) Philippines in accordance with CAR-ANS Part 15 — Aeronautical Information Services.

1.5 CAAP SAFETY OVERSIGHT

1.5.1 The PANS-OPS Safety Inspectorate unit under AANSOO is delegated to ensure that PDSPs providing IFPDS as in 1.2.2 (or part of the service as described in 3.2) intending to design instrument flight procedures for aerodromes or airspace under the responsibility of CAAP meet(s) the requirements in accordance with CAAP regulatory framework.

1.5.2 The functions of the PANS-OPS Safety Inspectorate unit enumerated in 2.1.3.2 are distinct from the functions of the Airspace and Flight Procedure Design Division (AFPDD) which is the PDSP established under the ATS to provide IFPDS under CAAP, in accordance to 1.2.2, (a).

1.6 SAFETY RISK ASSESSMENT

1.6.1 A safety risk assessment of an IFP is considered completed when the flight procedure design is in compliance with CAAP regulatory framework.

1.6.2 A safety risk assessment must be conducted and submitted to AANSOO when there is a deviation from CAAP regulatory framework.

1.7 QUALITY MANAGEMENT SYSTEM

1.7.1 The PANS-OPS Safety Inspectorate under AANSOO shall review pertinent quality records (e.g. IFP Package) to ensure that PDSPs providing IFPDS as in 1.2.2 (or part of the service) implement(s) a quality management system at relevant stages of the instrument flight procedure design process.

Note. — This requirement can be met by means of a quality assurance methodology, such as that described in Chapters 4 and 5.

1.8 CONTINUOUS MAINTENANCE AND PERIODIC REVIEW

1.8.1 The PANS-OPS Safety Inspectorate unit ensures that continuous maintenance and periodic review of instrument flight procedures for aerodromes and airspace under the responsibility of CAAP are conducted. A review of all instrument procedures implemented within the aerodromes or airspace under the responsibility of CAAP must be conducted periodically within intervals not exceeding every five (5) years from date of publication.

1.8.2 Provided that a safety assessment acceptable to AANSOO was submitted together with the IFP technical package, CAAP may approve implementation of an IFP without publication in the AIP Philippines. Such case occurs when the procedure is airline specific or owned by privately operated aerodromes. As such, the review of the IFP must be conducted periodically within intervals not exceeding every five (5) years from date of approval. The safety assessment must demonstrate that the procedure, not published or unknown to other users of airspace, can be implemented within acceptable levels of safety.

Note. — Guidelines on continuous maintenance and periodic review is contained in 3.4.2 and in Chapter 4.

1.9 TARGET AUDIENCE OF THE MOS FOR IFPDS

1.9.1 This MOS is intended but not limited to be used by:

a) The PANS-OPS Safety Inspectorate unit responsible for the safety oversight of an IFPDS;
b) PDSPs engaged or are intending to engage in design works to be implemented within aerodromes or airspace under the responsibility of CAAP;
c) Flight validation service providers and flight validation pilots engaged in validation of flight procedure design;
d) Training organizations intending to provide flight procedure and flight validation trainings;
e) FPD software developer intending to develop flight procedure design tools;
f) FPD software validator intending to validate a flight procedure design tool; and
g) Organizations or stakeholders, whose involvement in the development and maintenance of IFPs, as referred to in this MOS, are indispensable.

Note. - A PDSP can utilize this MOS as a parameter in establishing its organization, procedures and operations manual. Chapter 3 of this manual provides information intended to be used by PDSPs. In addition, Chapter 2 can be utilized by the service provider for preparation of an application for authorization from CAAP or an audit by AANSOO. Practices and procedures are to be developed in accordance with the established regulatory framework contained herein. For this reason, it is essential that CAAP has knowledge of the practices and procedures used by service providers.

1.10 STRUCTURE OF THE MANUAL

1.10.1 The following drafting conventions are used in this manual:

a) “must” and “shall” - indicates a statement of specification, the compliance with which is required to achieve the implementation of the specification;
b) “should” - indicates a recommendation or best practice; and
c) “may” - indicates an optional element.

1.10.2 This manual consists of the chapters and appendices described in succeeding paragraphs:

1.10.2.1 Chapter 1, Introduction – provides the purpose of the MOS, the manner in which to read the MOS and the description of the contents of the MOS.

1.10.2.2 Chapter 2, CAAP Safety Oversight Function - provides the standards and processes for CAAP to conduct safety oversight of PDSPs. It provides an overview of CAAP’s responsibilities pertaining to IFPDS as provided in CAR-ANS Parts 11 and 16, and a description of the regulatory framework established by CAAP to meet the requirements of CAR-ANS Parts 11 and 16.

1.10.2.3 Chapter 3, Procedure Design Service Provider Function – provides the standard requirements and recommendatory practices for an instrument flight procedure design service provider. This chapter describes the process and procedures to be developed by a service provider, including guidance on the expected contents and structure of a PDSP's operations manual. This chapter also includes a basic description of the work items of service providers. More detailed information on the work processes involved in FPD is contained in Chapters 4 and 5.

1.10.2.4 Chapter 4, Flight Procedure Design Quality Assurance System - prescribes the guidelines for the quality assurance in the elements of procedure design, such as procedure design documentation, verification and validation methods to ensure safety, flyability and design accuracy, including strategies on the acquisition/processing of source information/data. It also provides a generic process flow diagram for the design and implementation of flight procedures.

1.10.3 Chapter 5, Validation of Instrument Flight Procedures – complements Chapter 4 as it provides more detailed guidance on the implementation of validation process of IFPs.

1.10.4 Chapter 6, Flight Procedure Design Software Validation – places the requirements of CAAP for the validation (not certification) of procedure design tools, notably with regard to application of design criteria. It also provides guidance for PDSPs regarding implementation of an FPD software validation program.

1.10.5 Appendix 1 — "3rd Party PDSP Authorization Process", specifies the requirements and process for the issuance of 3rd Party PDSP Certificate of Authorization in accordance to the requirements contained in CAR-ANS Part 16. It also includes the checklist employed by the PANS-OPS Inspectorate as basis for recommending approval.

1.10.6 Appendix 2 – "IFP Quality Assurance Checklist", specifies the form employed by the PANS-OPS Safety Inspectorate for procedural approval of IFPs.

1.10.7 Appendix 3 – "Sample PDSP Audit Protocol Questionnaire", provides an idea of the scope of an audit and a guide to the requirements to be met by a PDSP. Only a sample is provided, the actual protocol questions may vary during the actual audit. AANSOO normally provides the auditee with a copy of the checklists together with the audit notification at least one (1) month prior the scheduled audit activity. Any modification to the checklist therefrom shall be forwarded to the auditee at least two weeks before the first day of audit or during the entry meeting and takes measures to protect any working documents that involve confidential or proprietary information.

1.10.8 Appendix 4 – "Sample Pre-Implementation Checklists for Preparation of IFP Implementation Safety Assessment", provides a tool for IFP validators (a designer not involved in the particular design to be validated) to conduct internal quality assurance of the FPD and determine whether a safety risk assessment is required to be conducted prior to submission to AANSOO.

1.10.9 Appendix 5 – “Flight Validation Pilot Training and Evaluation”, contains recommended minimum qualifications and training, as well as guidance concerning the skills, knowledge and attitudes (SKA) to be addressed in training and evaluation of flight validation pilots.

1.10.10 Appendix 6 – “Validation Templates for Fixed Wing Aircraft” provides a sample template for generating a detailed written report of the results of the pre-flight validation for fixed-wing aircraft.

1.10.11 Appendix 7 - “Validation Templates for Helicopters” provides a sample template for generating a detailed written report of the results of the pre-flight validation for helicopters.

1.10.12 Appendix 8 – “Human Factors” provides insight on human factors consideration in validating IFPs, for the purpose of flight validation is to determine whether a flight procedure is operationally safe, practical and flyable for the target end user.

1.10.13 Appendix 9 – “Obstacle Assessment” provides detailed guidance regarding obstacle assessment during validation of an IFP.

1.10.14 Appendix 10 – “Sample Validation Documentation” provides a template for FPD software validation report.

CHAPTER 2

CAAP SAFETY OVERSIGHT FUNCTION

2.1 STATE SAFETY OVERSIGHT SYSTEM

A State Safety Oversight System consists of eight critical elements (CE) as described in the *Safety Oversight Manual (ICAO Doc 9734), Part A — The Establishment and Management of a State Safety Oversight System, Chapter 3*. The following sections describe CAAP's implementation of each of the critical elements with regards to IFPDS.

2.1.1 CE-1: Primary aviation legislation

2.1.1.1 Republic Act 9497 – "An Act Creating the Civil Aviation Authority of the Philippines", Chapter VII, Section 35 under the Powers and Functions of the Director General, establishes the responsibility of CAAP for the safety of instrument flight procedures, referred thereto as "airways" or "air routes", to be inspected, and to determine suitability in the interest of safety for the aerodromes and airspace under its authority.

2.1.2 CE-2: Specific operating regulations

2.1.2.1 CAAP's specific operating regulations for IFPDS are contained in the following publications;

a) CAR-ANS Part 16, governing Procedure Design Services (PANS-OPS), contains the general requirements for PDSPs intending to engage in design works within Manila FIR,

b) CAAP Citizens Charter issued pursuant to Republic Act 11032 – "Anti-Red Tape Act of the Philippines", referring to the "Issuance of Authorization for Third (3rd) Party Procedure Design Organizations"

c) This MOS for:

   i) 3rd-Party authorization process (Appendix 1);

   ii) design criteria as specified in 1.4.;

   iii) qualification and competencies of PDSPs' technical personnel in 3.6;

   iv) Visual and IFP approvals (4.4.11 and Appendix 2);

   v) Visual and IFP design process in Chapters 4 and 5;

   vi) quality assurance of IFPs in Chapters 4 and 5;

   vii) requirements and guidelines for periodic reviews and continuous maintenance of IFPs in 3.4.2 and Chapter 4;

   viii) requirements and guidelines for ground and flight validations of IFPs in 4.4.8, 4.4.9 and Chapter 5;

d) general regulatory criteria to develop procedures for the establishment of aerodrome operating minima, if applicable;

e) ATMSID Inspectors Handbook for qualification and competencies of PANS-OPS safety inspectors; and

f) other relevant CAAP Memorandum Circulars (MC 49-13).

Note 1. - CAAP surveillance processes (planning inspections, audits, and monitoring activities) of PDSPs are also contained in the Air Traffic Management Safety Inspectorate Division (ATMSID) Handbook.

Note 2. - The term "regulations" is used in a generic sense and includes, but is not limited to, instructions, rules, edicts, directives, sets of laws, requirements, policies and orders.

Note 3. - CAAP is not required to establish State minima. However, once CAAP minima are established, the minima must be published in the AIP Philippines in accordance with CAR-ANS Part 15, 15.6.2.1 and MOS-AIS Appendix 2.

2.1.3 CE-3: State system and functions

2.1.3.1 *Compliance to General Requirements*

2.1.3.1.1 The Air Traffic Service under CAAP has established as one of its units, the Airspace and Flight Procedure Design Division (AFPDD). 3rd-Party PDSPs may also provide IFPDS to CAAP provided they hold the proper authorization issued by CAAP or belonging to categories (b) and (c) as stated in 16.4.1 of CAR-ANS Part 16. Further, CAAP may agree with one or more other ICAO Contracting State(s) to provide a joint service in accordance to established agreements. These authorities, organizations or agencies, as appropriate, must be supported by sufficient and qualified personnel and provided with adequate financial resources for the management of safety in flight operations. CAAP ensures these through the conduct of oversight activities over these PDSPs.

2.1.3.1.2 Consistent with the provisions of Sec. 31 Chapter V of Republic Act 9497, the discharge of the oversight functions of the Director General was delegated to AANSOO by virtue of CAAP MC 15-09 – "Establishment and Institution of the Aerodrome and Air Navigation Safety Oversight Office (AANSOO)". Further, CAAP Authority Order 307-2019 – "Establishment of the Ad Hoc PANS-OPS Safety Inspectorate Section under the ATMSIDAANSOO", created the FPI for CAAP.

2.1.3.1.3 It should be noted that CAAP oversight and the procedure design service provision are two separate components with different specific functions and should work in collaboration to ensure the safe development and maintenance of IFPs.

2.1.3.2 *Functions and responsibilities of the PANS-OPS Safety Inspectorate*

2.1.3.2.1 The PANS-OPS Safety Inspectorate shall have the following functions and responsibilities;

a) develop and amend national regulations governing the development and maintenance of visual and instrument flight procedures subject to approval of the DG;

b) oversee the process of development and maintenance of visual and instrument flight procedures;

c) verify the validity of application made by 3rd Party PDSPs in accordance with regulations embodied in CAR-ANS Part 16, and make appropriate recommendations for the approval/ disapproval, amendment, suspension or revocation of Certificates of Authorization of 3rd Party PDSPs;

d) carry out safety inspections and audits to determine compliance with the requirements prescribed in applicable national regulations;

e) ensure continuous maintenance of the procedure are performed by concerned stakeholders concerned such as ADMS, ATS, CNS, AIS, Aerodrome Operators, etc., to ensure that significant changes to obstacles, aerodrome, aeronautical and navigational aid data are assessed for their impact on the IFP;

f) conduct ground validation of IFP to verify validation reports submitted by the PDSP as part of the approval process of IFPs,

g) ensure establishment and implementation of a quality system for the entire flight procedure process. AANSOO shall collect all pertinent documents and evidences of each stage in the IFP process prior to endorsement for approval by the Director General of CAAP,

h) may participate in different activities involved in the process such as ground and flight validation, safety assessment and pertinent reviews of the procedures, as appropriate or as necessary,

i) perform such other tasks as may be assigned by the Director General or the Chief of the AANSOO and ATMSID.

2.1.3.2.2 The PANS-OPS Safety Inspectorate should be provided with the necessary resources, both human and financial, to be able to effectively carry out oversight obligations on behalf of CAAP.

2.1.3.2.3 *Job description of PANS-OPS Safety Inspectors*

2.1.3.2.3.1 The PANS-OPS Safety Inspector is responsible for performing safety oversight functions of PDSPs. The inspector ensures compliance of rules, regulations, standards, directives related to PANS-OPS provision. The primary functions include:

a) Developing and amending PANS-OPS regulations, standards, directives and guidance materials required for aviation safety related to IFPDS provision;

b) Ensuring that the process of development and maintenance of visual and instrument flight procedures are properly implemented thru the established quality assurance system of CAAP;

c) Conducting audits and regularly inspecting the adequacy of PDSPs in terms of operational procedures, practices, manpower numbers, equipment/facilities, and personnel training/development/licensing to ensure the proper implementation of safe procedures;

d) Process application for authorization of 3rd-Party PDSPs in accordance with applicable regulations, standards, written procedures and other relevant directives issued by CAAP;

2.1.3.2.3.2 Inspectors assigned at the PANS-OPS Safety Inspectorate Section may also be delegated to perform other regulatory tasks of the civil aviation system (e.g. the ATS, AIS/ Charting Safety Inspectorate, MET, SAR).

2.1.3.3 *Resources for the PANS-OPS Safety Inspectorate*

2.1.3.3.1 CAAP shall ensure that funds, in the amount as may be justified by AANSOO, must be readily available to enable the PANS-OPS Inspectorate to effectively fulfill its functions and responsibilities including, trainings to ensure competencies of the PANS-OPS inspectors as well as for obligations imposed by other legislation such as those that may involve industry visits.

Note. - In some States, the cost for the activities of the FPI is compensated from fees paid by the service providers for certifications, surveillance activities, etc.

2.1.4 CE-4: Qualified technical personnel

2.1.4.1 The established minimum qualification requirements, trainings and competencies for the ATM Safety Inspectors (ATS, PANS-OPS, MET, AIS/Charting and SAR inspectors) performing oversight and safety-related functions are described in general under Parts 3 and 4 of the ATMSID Inspectors Training Manual.

Note. - minimum qualification requirements, trainings and competencies as prescribed by CAAP for designers and flight validation pilots is specified in 3.6 of this MOS.

2.1.4.2 CAAP ensures that the established qualifications and experience requirements are met by all PANS-OPS Safety Inspectors.

2.1.4.3 The ATMSID Inspectors Training Manual contains the training program and training plan for PANS-OPS Safety Inspectors within an established period (usually 5 years). The training includes initial (introduction, basic specialization), on-the-job training (OJT), continuation (recurrent, refresher, advance specialized courses), requalification and advanced training for senior inspectors.

2.1.4.4 The training program must be appropriately implemented in accordance with the periodic training plan detailing and prioritizing the type of training needed over a specified time frame.

2.1.4.5 The system to maintain training records of all PANS-OPS Safety Inspectors is also included in the ATMSID Inspectors Training Manual.

2.1.4.6 PANS-OPS Safety Inspectors competency, as described in the ATMSID Inspectors Training Manual and ATMSID Inspectors Handbook, generally follows:

a) technical expertise as a civil aviation safety inspector which requires the capability to apply and improve technical knowledge and skills to perform safety oversight duties for PDSPs;

b) expertise in instrument flight procedure design to optimize the quality of the safety oversight duties for PDSPs; and

c) safety inspectors' attributes or behavior.

2.1.5 CE-5: Technical guidance, tools and provision of safety-critical information

2.1.5.1 CAAP provides appropriate facilities, comprehensive and up-to-date technical guidance material and procedures, safety-critical information, tools and equipment, and transportation means, as applicable, to the PANS-OPS safety inspectors to enable them to perform their safety oversight functions effectively and in accordance with established procedures in a standardized manner described in this MOS and the ATMSID Inspectors Handbook.

2.1.5.2 CAAP also provides technical guidance to the aviation industry on the implementation of relevant regulations thru forums or symposiums and thru the issuance of guidance materials that may be in the form of Advisory Circulars (ACs).

2.1.5.3 Such material includes information on how to process an application for initial compliance of a PDSP (Appendix 1), including detailed procedures and checklists, which takes the form of an "authorization". Procedures and checklists for ongoing surveillance activities, e.g. inspections and audits (ATMSID Inspectors Handbook and Appendix 3). A third component would be the procedures and checklists to be used by the FPI in the process of approving IFPs (Appendix 2 and Chapter 4).

Note. –This MOS in itself contains certain stipulations providing technical guidance for both the PANS-OPS Safety Inspectorate and the PDSPs as some provisions herein recommends or prescribes practices for them to implement applicable regulations.

2.1.5.4 The PANS-OPS Safety Inspectorate should be provided with adequate tools to enable the effective accomplishment of its tasks, such as transportation as applicable, adequate offices, relevant software and office equipment, telephones and other communication facilities. Access to the Internet to supplement a technical library has become a necessity in today's world of information and communication technology.

2.1.6 CE-6: Authorization and approval obligations

2.1.6.1 CAAP issues Certificates of Authorization to qualified PDSPs in pursuant to the requirements of CAR-ANS Part 16 and in accordance to the process stipulated in Appendix 1.

2.1.6.2 CAAP, prior to allowing a PDSP to engage in design works ensures that the service provider complies with the regulatory requirements in force. The PDSP organization is then subject to continuing surveillance to ensure that the requirements continue to be met.

2.1.6.3 Unsatisfactory conditions noted by the PANS-OPS Safety Inspectorate should be brought to the attention of the applicant or holder of the authorization. In the case of deficiencies or weaknesses, an opportunity is provided for the applicant to correct the problem, and the applicant is given an opportunity to reapply or implement corrective actions to address the deficiencies. The processes involved in audit/inspection including the elimination of findings are detailed in the ATMSID Inspectors Handbook.

2.1.6.4 As part of this process, CAAP established standards for the required competency level for technical personnel in charge of flight procedure design, flight validation, and others (see 3.6).

2.1.6.5 CAAP ensures that PDSPs develop a job description, training program, training plan, and a system of maintaining training records for their designers and flight validation pilots.

Note. - See ICAO Doc 9906, Volume 2 for guidance on flight procedure designer training, and Volume 6 for guidance on flight validation pilot training.

2.1.7 CE-7: Surveillance obligations

2.1.7.1 In the interest of safety, and to promote a reasonable degree of standardization, it is the intention of CAAP, to the greatest degree possible, to implement the provisions in PANS-OPS in a consistent manner, using processes that will minimize the possibility of errors, identify errors that do occur before they impact safety, and provide for continuous improvement of the procedure design process in order to eliminate or reduce future errors. This is especially important in the modern aviation environment, where increasing reliance is placed on computers and the data they process, for navigation and obstacle awareness.

2.1.7.2 CAAP ensures that all published instrument flight procedures to be implemented within the Manila FIR can be flown safely by the relevant aircraft and can safely be integrated into the ATM environment. Safety is not only accomplished by application of the technical criteria in PANS-OPS, associated ICAO provisions, and national regulations but also requires measures that control the quality of the process used to apply that criteria, which may include air traffic monitoring, ground validation and flight validation. These measures shall ensure the quality and safety of the procedure design product through review, verification, coordination, and validation at appropriate points in the process, so that corrections can be made at the earliest opportunity in the process.

2.1.7.3 CAAP implements documented audit/inspection processes, as detailed in the ATMSID Inspectors Handbook, to proactively assure that authorization and/or approval holders continue to meet the established requirements. The said handbook also contains the mechanism to ensure competency of the PANS-OPS safety inspectors and effectiveness of the audit/ inspection process employed by AANSOO to perform safety oversight functions on behalf of CAAP.

2.1.7.4 As part of the surveillance activities for PDSPs, the PANS-OPS Safety Inspectorate develops periodic surveillance plans as described in the ATMSID Inspectors Handbook.

2.1.7.5 The surveillance activities are carried out using standardized procedures and checklists (Appendix 3). Among other items, the procedures and checklists pay particular attention to the following:

a) Design criteria: CAAP ensures that PDSPs develop IFPs in accordance with the design criteria promulgated by CAAP, (in this case the criteria as adopted from ICAO Doc. 8168 Vol 2 and ICAO Doc. 9905 as appropriate).

i) CAAP ensures that the service provider responsible for developing flight procedures establishes obstacle clearance altitudes/heights (OCA/H) in accordance with CAAP approved design criteria.

Note. - This requirement is normally accomplished through the verification of design documents and related evidences ("Oversight by Process"). However, CAAP also checks the output itself by other means such as flight validation ("Oversight by Output").

ii) CAAP is yet to require aerodromes to determine their aerodrome operating minima. However, where aerodrome operating minima have been established by the aerodrome, CAAP must ensure that the PDSP responsible for developing flight procedures has established specific operating minima (e.g. visibility, minimum descent altitude/height (MDA/H), decision altitude/height (DA/H)) for the IFPs developed at aerodromes.

b) Quality Management System (QMS): CAAP ensures that the QMS used by the PDSP is effective. To be effective, a systemic quality assurance process should be part of this system. Data quality management, personnel training, and validation of software are all integral elements of a quality assurance program. CAAP ensures that PDSPs retain all procedure design documentation for which it is responsible, so as to allow any data anomalies or errors found during the production, maintenance or operational use of the procedure to be corrected in accordance with CAAP's regulatory framework.

c) Continuous maintenance and periodic review: Oversight functions are applied even after the initial promulgation of flight procedures. CAAP ensures that published IFPs are maintained continuously and reviewed periodically to ensure they continue to comply with current criteria and assessed user requirements.

d) Oversight of the validation process: As part of the quality assurance process, CAAP ensures that a validation process is conducted by the PDSPs. The validation process is subdivided into ground validation and flight validation.

Note. — Procedures for validation is contained in Chapters 4 and 5.

2.1.8 CE-8: Resolution of safety issues

2.1.8.1 ATMSID Inspectors Handbook documents the process to take appropriate actions, up to and including enforcement measures, to resolve identified safety issues. CAAP ensures that identified safety issues are resolved in a timely manner through a system which monitors and records progress, including actions taken by the PDSPs in resolving such issues.

2.1.8.2 The ATMSID Inspectors Handbook includes a mechanism/system with a time frame for elimination of any deficiency identified by the PANS-OPS Safety Inspectorate. While CAR-ANS Part 16 grants CAAP the exclusive authority and responsibility to suspend or revoke the PDSPs' design privileges, if a deficiency is not corrected within the established time frame.

CHAPTER 3

PROCEDURE DESIGN SERVICE PROVIDER FUNCTION

3.1 GENERAL

3.1.1 This chapter provides guidelines for service providers, conducting IFPDS or a part of it, in developing their processes, procedures and organizations, in accordance with SARPs, PANS and CAAP regulations. This MOS emphasizes that PDSPs and the PANS-OPS Safety Inspectorate are partners and that in collaboration, ensure the safety and quality of IFPDS.

3.1.2 PDSPs need to clearly understand the roles of PANS-OPS Safety Inspectorate and their expectations for PDSPs. This would allow PDSPs to better prepare their processes and documentation to be able to demonstrate to CAAP that the established requirements are met on an initial and continuous basis.

3.2 SERVICES TO BE PROVIDED BY A PDSP

3.2.1 *General Services*

3.2.1.1 A PDSP may provide any or all of the following services;

a) (Initial) design,

b) continuous maintenance,

c) periodic review,

d) documentation process,

e) FPD validation process,

f) FPD software validation, and

g) IFPD training.

3.2.2 *Design Services*

3.2.2.1 A PDSP may offer to design any or all of the following type of visual and instrument procedure, whether conventional or Performance-Based Navigation;

a) En-route,

b) Standard Terminal Arrival Route,

c) Standard Instrument Departure,

d) Instrument Approach Procedures (see definition for further classification),

e) Visual Approach Procedures including Visual with Prescribed Track, and

f) Helicopter Point-in-Space (PinS).

Note: Holding, Circling and Missed Approach procedures are incorporated in the above procedures.

3.2.3 *Validation Services*

3.2.3.1 A PDSP may offer any or all of the following services for the purpose of FPD validation:

a) validation of newly designed flight procedures;

b) periodic validation (with its interval for each type of flight procedure);

c) validation upon amendment of flight procedures; and

d) other validation conducted for special needs.

Validation services may cover ground validation, flight validation or both.

3.3 PROCESS AND PROCEDURES TO BE ESTABLISHED FOR A PDSP

The service provider shall establish its own process and procedures in accordance with this MOS. If a process and procedure is not covered by this MOS, the PDSPs' process and procedures should be established in accordance with the latest versions of applicable ICAO SARPs and PANS documents.

CAAP understands that PDSPs that will be allowed to provide services for CAAP may not be domestically based, and therefore, may be covered by the laws of their respective States. It is however, important that the international standards and recommended practices set by the ICAO be given credence and be observed as faithfully as practicable to establish commonality between different States.

Note. – Chapter 4 provides guidelines for establishing an FPD process.

3.3.1 PDSP OPERATIONS MANUAL

3.3.1.1 One of the responsibilities of PDSPs as specified under CAR-ANS Part 16, 16.6 is the development and maintenance of their own operations manual. CAR-ANS Part 16, 16.11 enumerates the minimum information to be incorporated in a PDSP's operations manual. The operations manual should be customized to the unique qualities of each organization.

3.3.1.2 CAAP understands that PDSPs providing services for others States may have to comply with the regulatory framework of their respective States.

3.3.1.3 The operations manual, in as much as practicable, should be in the English Language for easy understanding by CAAP Inspectors. Table 3-1 provides guidance in the development of a PDSP's operations manual.

Table 3-1. Sample contents of an operations manual for a service provider

PART / Chapter	***Contents***
PART: Administrative	
Chapter: Responsibility for revision of the operations manual	● Describe ➢ Under whom the operations manual is established ➢ The person responsible for the technical contents ● Version control
PART: General Provisions and Organization	
Chapter: General	● Purpose of the operations manual ● Precedence of the operations manual ● Scope of the operations manual ● Functions to be performed by the PDSP
Chapter: Roles and responsibilities	● Describe the roles and responsibilities of the department, section and/or position (Descriptions for each department, section and/or position).
Chapter: Staffing requirement	● Describe the staffing requirements such as: ➢ number of personnel per procedure, or ➢ number of procedures which can be designed by a designer (The statement does not have to be quantitative; a statement such as "a sufficient number of qualified staff is required…" may be acceptable.) ● Define the hierarchy – e.g. supervisor, chief designer, senior designer, designer, trainee designer (depending on each organization) ● Provide organizational chart.
Chapter: Training and qualification	● Provisions concerning training and qualification of personnel, including checking of staff and how that information is being tracked ● Appointment of special position (e.g. chief or supervisor) ● Describe types of training and their contents, duration, interval (frequency)
Chapter: Facility and resources	● Define the facilities and resources to be utilized to perform the task such as: ➢ building, office, table, and other equipment ➢ reference material, personnel records ➢ software and design tool ➢ aircraft and on-board equipment (for PDSPs providing flight validation service) ● Define how these facilities, reference materials, personnel records and equipment are maintained
Chapter / Appendix: Agreements with other organizations	● Define the procedures and/or rules to establish agreements with other organizations (AIS, Flight Validation Organizations, Aerodrome Authorities, etc.) including procurement of service and/or goods (software provider, training organizations, etc.) (Reference to another document is acceptable, such documents should be readily available for CAAP inspectors)
Chapter: Compliance	● Define the processes to comply with regulations and verification (Reference to another document is acceptable)

	● Describe how to demonstrate the compliance
Chapter: Operational instructions	● Define the methodology to provide operational instructions to staff members such as: ➢ circular ➢ information bulletin ➢ amendment to existing document (including notification of changes in design criteria)
Chapter: Services to be provided	● Define the services (and/or product) to be provided by the organization such as those listed under 3.2.1 ● Define the types of flight procedure to be provided by the organization such as those listed under 3.2.2 ● Define the types of flight validation to be provided by the organization such as those listed under 3.2.3 ● Describe the criteria needed to determine the necessity of these types of service ● Describe the criteria needed to determine the necessity of simulator evaluation
Contingency measures	● Define plans in the event of part or total system failure for which the PDSP provides a service
Security arrangements	● Define a security plan to ensure that pertinent data, documents, equipment are protected from theft and other malicious intent
PART: Flight procedure design process	
Chapter: Design process	● Define the process to be followed
Chapter: Acquisition of data/ information	● Define ➢ types of data/information required for the design of instrument flight procedures ➢ how to acquire such data/information ➢ from whom/where to acquire such data/information
Chapter: Consultation with stakeholders	● Identify stakeholders ● Describe ➢ on which matters consultation with stakeholders is needed ➢ with whom ➢ when ➢ how
Chapter: Environmental consideration	● Describe what should be considered in the design of flight procedures
Chapter: Documentation	● Describe ➢ how to record the activities ➢ how to maintain documents ● Define the period of maintenance of records
Chapter: Format	● Provide the format (template) for design documents to record: ➢ rationale for the design ➢ controlling obstacle ➢ summary of calculation process ● Provide the format (template) for flight validation report (for flight validators)
Chapter: Validation	● Describe:

	➢ who validates the procedures ➢ how the procedures are validated ● Define the process to be followed ● Define the items (charts, aeronautical data, obstacle, flyability, Navaid/lighting) to be validated for each type of validation ● Define tolerance ● Define the type of result (pass, pass on condition, fail) ➢ what are the actions to be taken for failed procedure
Chapter: Preparation of publication	● Define the types of material to be submitted to AIS (depending on the protocol with AIS) ● Define the timing of submission
PART: Safety and Quality	
Chapter: SMS and QA system	● Define how to be involved in the SMS (e.g. the SMS of an entire ANSP) ● Provide a reference to the organization's quality manual ● Define policy and procedures for fault and defect reporting ● Provide a statement on the resolution of safety/quality-related issues
Chapter: Oversight by regulator	● Describe how to manage the oversight activities

3.3.2 QUALITY MANUAL

3.3.2.1 Organizations with a QMS will have their own quality manual (QM). In this case, the procedure design process is also subject to this QM. Chapter 4 provides basic guidelines to establish a quality assurance system for IFPDS.

3.3.2.2 The QM may be a part of the PDSP's operations manual.

Note. - Considering the characteristics of an IFPDS, implementation of a QMS can be achieved by implementing specific safety assurance methodologies developed for this service. Provisions to establish a quality assurance methodology are contained in PANS-OPS, Volume II, Part I, Section 2, Chapter 4 — Quality Assurance, enforced by CAAP as stipulated in CAR-ANS Part 16 and 3.5 of this MOS.

3.4 PROVISION OF SERVICE

3.4.1 Design and publication of new procedures

3.4.1.1 IFPs must be designed in accordance with the design criteria specified in 1.4, as adopted by CAAP. If deviation from the criteria is required, consultation with the regulator for approval is needed.

3.4.1.2 The PDSP should establish its own work process and describe it in its operations manual (see Table 3-1), in accordance with CAAP regulations. For details on the FPD process, see Chapter 4.

3.4.1.3 In accordance with CAR-ANS Part 11, any significant safety-related change to the air traffic services (ATS) system, including the implementation of a reduced separation minimum or a new procedure, must be put in effect only after a safety assessment has demonstrated that an acceptable level of safety will be met and users have been consulted. When appropriate, the PANS-OPS Safety Inspectorate may require the PDSP to conduct post implementation monitoring to verify that the defined level of safety continues to be met. Depending on the organizational arrangements, either a PDSP or the organization that requested a procedure design (ANSP, aerodrome, air operator, etc.) may be responsible for a safety assessment that would be submitted to AANSOO to support the approval of the IFP for publication.

3.4.2 Periodic review

3.4.2.1 All published IFPs must be subject to a periodic review. Upon periodic review, the following tasks are to be conducted:

a) Assessment of the impact of all changes to obstacle data. This may be conducted by applying amended obstacle data to the design data (design document, design file, etc.) of the published IFP. For example, if the minimum obstacle clearance (MOC) is not ensured due to a newly developed obstacle, amendment to the existing IFP is required.

b) Assessment of the impact of all changes to aerodrome, aeronautical and navaid data. In most cases, changes to this data will require amendment to the existing IFP.

c) Assessment of the impact of all criteria amendments and changes to depiction standards. It is intended that all IFPs be maintained to current design criteria and depiction standards in accordance with CAAP's regulatory framework time frame. CAAP depiction standards are described in CAR-ANS Part 4 and MOS-Aeronautical Charts. 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. However, even if the resulting IFP depiction is unchanged, the design file may be amended and updated to current criteria to facilitate IFP maintenance.

d) Assessment of the impact of all changes to user requirements. Such changes to user requirements include, but are not limited to:

   i) fleet type (performance)

   ii) scheduled service route

   iii) ATM procedures

   iv) airspace.

Even if the user requirements are not a safety-related issue, IFP amendments and/or new IFPs may be needed to satisfy current user requirements.

3.4.2.2 In order to conduct a periodic review efficiently, it is essential to obtain and store design data.

3.4.2.3 If it is determined that any action is required, such as amendment to the existing IFP, due to new obstacle and/or changes in design criteria which have a safety impact, return to the "initiation" step (Step no. 1 in the FPD process, see Chapter 4) to reinitiate the FPD process.

3.4.2.4 Periodic review must be conducted in accordance to 1.8 and 4.4.17.

3.4.2.5 A level of procedure design competency equivalent to that necessary for the design of a new procedure is required to conduct a periodic review.

3.5 QUALITY ASSURANCE

3.5.1 A PDSP shall establish and comply with an appropriate quality assurance methodology. Chapter 4 provides guidelines to establish a quality assurance methodology for IFPDS.

3.5.2 The safety of air navigation is highly dependent on the quality of aeronautical data. Processes for data quality assurance, from data origination to publication in the Aeronautical Information Publication (AIP) Philippines, are also detailed in Chapter 4.

3.6 TRAINING AND QUALIFICATIONS

A PDSP must establish and comply with its own scheme for training and qualification of its procedure designers and its flight validators in accordance with this MOS. ICAO Doc 9906, Volumes 2 and 6 provide guidance for establishing a training scheme for both flight procedure designers and flight validation pilots which also served as a basis of CAAP in the development of CAAP's regulatory framework aligned with the aim to promote a reasonable degree of standardization in IFPDS.

While ICAO Doc 9906, Volume 2 focuses on the competency requirements that a flight procedure designer should achieve, it should be understood that the designer's work depends on other personnel (Surveyors, AIS personnel, ground validation personnel, flight validation pilots) also meeting competency standards.

3.6.1 Competency-based approach in general

3.6.1.1 The development of competency-based training and assessment must be based on a systematic approach whereby competencies and their standards are defined; training is based on the competencies identified and assessments are developed to determine whether these competencies have been achieved. Competency-based approaches include mastery learning, performance-based training, criterion-referenced training and instructional systems design.

3.6.1.2 Competency-based approaches to training and assessment must include at least the following features:

a) the justification of a training need through a systematic analysis and the identification of indicators for evaluation;

b) the use of a job and task analysis to determine performance standards, the conditions under which the job is carried out, the criticality of tasks, and the inventory of skills, knowledge and attitudes;

c) the identification of the characteristics of the trainee population;

d) the derivation of training objectives from the task analysis and their formulation in an observable and measurable fashion;

e) the development of criterion-referenced, valid, reliable and performance-oriented tests;

f) the development of a curriculum based on adult learning principles, with a view to achieving an optimal path to the attainment of competencies;

g) the development of material-dependent training; and h) the use of a continuous evaluation process to ensure the effectiveness of training and its relevance to line operations.

h) the use of a continuous evaluation process to ensure the effectiveness of training and its relevance to line operations.

3.6.2 The competency framework for procedure designers

3.6.2.1 The competency framework for procedure designers consists of competency units, competency elements, performance criteria, evidence and assessment guide, and range of variables. The competency framework for procedure designers must be based on the following competency units:

a) Design departure procedure;

b) Design en-route procedure;

c) Design arrival route procedure;

d) Design approach procedure;

e) Design reversal and holding procedures; and

f) Review instrument flight procedures.

3.6.2.2 Competency units, competency elements and performance criteria must be derived from job and task analyses of procedure designers and describe observable outcomes.

Note. - Definitions of competency units, competency elements and performance criteria are provided in the Definitions section.

3.6.2.3 In general, work involved in each design stage corresponds to some competency elements in the competency framework. However, they are not identical. For instance, one single competency element is applicable to multiple work stages.

3.6.2.4 The performance criteria make use of action verbs. For example:

a) *Apply criteria*. Applying criteria is the action of defining and assessing areas of airspace intended for use as an aircraft flight path, length of segment, angle of turn, etc., in accordance with CAAP-approved instrument procedure design criteria.

b) *Collect.* The action of bringing together, collating, assembling, editing and formatting from recognized sources data required for the development of an instrument procedure design.

c) *Incorporate*. As in to incorporate electronic and/or paper data into a procedure design file, to create congruency with other design data.

d) *Plot.* The action of determining, positioning and drawing over top of terrain, aeronautical, aerodrome and obstacle data the optimal flight path of a procedure design, its associated fixes, assessment airspace, assessment surfaces and minimum safe altitudes.

e) *Promulgate.* The action of submitting to CAAP, an instrument procedure design package for distribution to the international aviation community via CAAP-published Aeronautical Information Regulation and Control (AIRAC) document.

f) *Originate*. The process of creating a data element or amending the value of an existing data element.

Note: Refer to Table 2-1. "Competency framework of flight procedure designer" of ICAO Doc. 9906 Vol. 2 – "Flight Procedure Designer Training" for evidence and assessment guide for applicable competency elements.

3.6.3 Training phases for procedure designers to be included in the PDSP Training Program

3.6.3.1 Ab initio training for procedure designers

3.6.3.1.1 Before conducting initial training, the skills and knowledge of the trainees are assessed. Procedure designers can be recruited from different domains (ATM, AIS, engineer, technician, pilots, just to name a few) therefore their skills and knowledge vary, and ab initio training may be necessary to meet the entry level required in the different domains to be able to successfully complete initial training (see 3.6.3.2). Ab initio training will not cover any procedure design technique or criteria, but basic skills and knowledge that need to be mastered prior to commencing initial training. The purpose of ab initio training is to harmonize trainees' entry skills and knowledge before they start initial training. The program for this phase of training should not be developed from the competency framework.

3.6.3.2 Initial training for procedure designers

3.6.3.2.1 Initial training is the first phase of training where actual procedure design topics and criteria are covered. The purpose of initial training is to provide basic skills and knowledge to procedure designers who have been recently recruited or transferred from another job. The curriculum of initial training is derived from the competency framework. The associated duration and mastery test are relevant to the program.

3.6.3.2.2 Initial training should be followed by on-the-job training in order to ensure that the acquired skills and knowledge from initial training are consolidated.

3.6.3.3 On-the-job training (OJT) for procedure designers

3.6.3.3.1 While on-the-job training cannot be considered a specific training course in the formal sense, it is an essential phase in a training program. Its purpose is to reinforce formal training and support the achievement of competency standards.

3.6.3.3.2 Similar to initial training, the on-the-job training curriculum will be derived from the competency framework and driven by training objectives. If appropriate, OJT phases can also follow advanced or refresher training.

3.6.3.4 Advanced training for procedure designers

3.6.3.4.1 The purpose of advanced training is to augment the skills and knowledge of active procedure designers in dealing with more complex procedure design problems. The curriculum of advanced training should be derived from the competency framework.

3.6.3.5 Recurrent training for procedure designers

3.6.3.5.1 The purpose of recurrent training is to address changes in the available criteria and regulations. It is essential that the procedure designer updates his or her knowledge and skills in accordance with the latest criteria and technologies and benchmarks his or her usual design process against identified best practices. Regular recurrent training should therefore be planned accordingly.

3.6.3.6 Refresher training for procedure designers

3.6.3.6.1 The purpose of refresher training is to strengthen skills and knowledge that have weakened through disuse and the passage of time. Given the safety-critical nature of the flight procedure design function, it is strongly recommended that designers identify skills and knowledge that have weakened with time and that refresher training be planned accordingly.

3.6.3.6.2 The refresher training curriculum should be derived from the competency framework.

3.6.4 Minimum qualification for flight validation/ inspection pilots

3.6.4.1 Flight validation pilots should at least have a commercial pilot license with instrument rating, or an equivalent authorization from CAAP meeting the PCAR Part 2 knowledge and skill requirements for issuance of the commercial pilot license and instrument rating, in the aircraft category (e.g. airplane or helicopter) appropriate for the procedure to be validated. If the flight validation pilot is not the pilot-in-command of the flight validation aircraft, then the provisions of this paragraph also apply to the pilot-in-command of the flight validation aircraft.

3.6.4.2 In order to achieve the safety and quality assurance objectives of the flight validation, CAAP through oversight activities, shall ensure that flight validation pilots have acquired and maintain the required competency level through training and supervised on-the-job training.

Note 1. - Recommended qualifications and training, as well as guidance concerning the skills, knowledge and attitudes to be addressed in the training and evaluation of flight validation pilots can be found in Appendix 5 of this MOS.

Note 2. - Additional detailed information and guidance concerning flight inspection, as well as qualifications and certification of flight inspectors, can be found in the ICAO Manual on Testing of Radio Navigation Aids, Volumes I, II, and III (ICAO Doc 8071).

3.6.5 The competency framework for flight validation pilots

3.6.5.1 The competency framework for flight validators also consists of competency units, competency elements, performance criteria, evidence and assessment guide and range of variables. The competency framework for flight validation pilots should be based on the following competency units:

a) Conduct pre-flight validation;

b) Conduct flight preparation;

c) Conduct simulator evaluation (as required);

d) Conduct flight evaluation (as required); and

e) Conduct post-flight analysis.

3.6.5.2 Competency units, competency elements and performance criteria are derived from job and task analysis of flight validation pilots and describe observable outcomes.

Note. - Definitions of competency units, competency elements and performance criteria are provided in the Definitions section.

3.6.5.3 In general, work involved in flight validation (see Figure 5-1 of ICAO Doc. 9906 Vol. 5 —"Validation of Instrument Flight Procedures") correspond to some competency elements in the competency framework. However, they are not identical. For instance, one single competency element is applicable to multiple work stages.

3.6.5.4 The table in 2.4 "Competency framework for flight validation pilots (FVP)" of ICAO Doc. 9906 Vol. 5 — "Validation of Instrument Flight Procedures" provides evidence and assessment guide for applicable competency elements.

3.6.6 Training phases for flight validators to be included in the FVSP Training Program

3.6.6.1 Initial training

3.6.6.1.1 Initial training is the first phase of training where actual procedure design topics and criteria are covered. The purpose of initial training is to provide basic skills and knowledge to flight validation pilot trainees. The curriculum of initial training is derived from the competency framework. The associated duration and mastery test are relevant to the program.

3.6.6.2 On-the-job training (OJT)

3.6.6.2.1 While on-the-job training cannot be considered a specific training course in the formal sense, it is an essential phase in a training program. Its purpose is to reinforce formal training and support the achievement of competency standards. Similar to initial training, on-the-job training curriculum will be derived from the competency framework and driven by training objectives. If appropriate, OJT phases can also follow recurrent and refresher training.

3.6.6.3 Recurrent training

3.6.6.3.1 The purpose of recurrent training is to address changes in the available criteria and regulations. It is essential that the flight validation pilot updates his or her knowledge and skills in accordance with the latest criteria, technologies, and benchmarks from his/her usual flight validation activity against identified best practices. Regular recurrent training should therefore be planned accordingly. It is recommended that recurrent training be conducted at least once every two years.

3.6.6.4 Refresher training

3.6.6.4.1 The purpose of refresher training is to strengthen skills and knowledge that have weakened through disuse and the passage of time. Given the safety critical nature of the flight validation function, it is strongly recommended that FVSPs identify skills and knowledge that have weakened with time and that refresher training is planned accordingly. Refresher training curriculum should be derived from the competency framework and can be combined with recurrent training.

3.7 SAFETY MANAGEMENT SYSTEM (SMS)

3.7.1 The ATS provider’s interfaces with IFPDS can make a significant contribution to the safety of its products or services. Therefore, the SMS aspects of IFPDS products would be normally Included as part of an ATS provider’s SMS.

3.7.2 A safety risk assessment of an IFP is considered completed when the IFPD is in compliance with CAAP regulatory framework.

3.7.3 A safety risk assessment must be conducted and submitted to AANSOO when there is a deviation from CAAP regulatory framework.

Note 1. - Guidance on interface management as it relates to SMS is provided in the Safety Management Manual (SMM) (ICAO Doc 9859).

Note 2. – A sample form for Pre-Implementation Checklists for Preparation of IFP Implementation Safety Assessment is in Appendix 4.

CHAPTER 4

FLIGHT PROCEDURE DESIGN QUALITY ASSURANCE SYSTEM

4.1 GENERAL

4.1.1 This chapter addresses two levels of processes:

a) A high-level process, called the instrument flight procedure (IFP) process, covers all elements from initiation to publication of the procedure and the relevant maintenance, safety, validation and flight inspection activities. The process does not end with publication. Feedback from users must be considered in the improvement process; and

b) A second specific process, for the design of the instrument flight procedure — the flight procedure design (FPD) process — is part of the IFP process.

4.1.2 Although not always specifically mentioned in this MOS, all process steps are followed by a verification and validation step in order to guarantee the quality of the resulting elements of each step.

4.1.3 This chapter describes the measures CAAP endorses to assure the quality of the process used to apply procedure design criteria (Also see 4.4.11 and Appendix 2 - "IFP Quality Assurance Checklist"). These measures ensure the quality and safety of the procedure design product through a more focused review, verification, coordination and validation by the concerned PDSP (final validation of FPD by PDSP must be conducted by a designer not involved in the specific design project) at appropriate points in the process, so that corrections can be made at the earliest opportunity. Quality records or evidence that quality control was conducted following each process steps must be submitted to AANSOO as part of the IFP technical package.

4.1.4 AANSOO, specifically the PANS-OPS Safety Inspectorate under the ATMSID, upon submission of the IFP technical package also conducts review, verification, coordination and validation of the resulting IFP to ensure that all processes were accomplished and that quality control procedures were implemented. CAAP process for approval of an IFP is discussed more in detail under 4.4.11.

4.2 THE NEED FOR QUALITY

4.2.1 With the advent of new navigation systems, the IFP process and its products have become key enablers of the worldwide air traffic management (ATM) system. They must therefore be managed effectively to ensure that quality assured procedures are provided in support of ATM operations.

4.2.2 The quality of an IFP is flight critical. The en-route structure, departure, arrival, holding and approach procedures are derived from an IFP process which covers various steps from collection of user requirements to AIP publication to the integration into airborne systems. In consequence, the FPD and the resulting IFP, from data origination through publication to incorporation into an end-user system, must be quality assured.

Note - This chain involves various organizations which should apply quality assurance processes as stated in the existing applicable Standards, notably CAR-ANS Part 15, for the origination of data and MOS AIS for the processing and release of aeronautical data (see Figure 4.1).

4.2.3 The development of an IFP follows a series of steps from the origination of data through survey to the final publication of the procedure and subsequent coding of it for use in an airborne navigation database (refer to Figures 4.2 and 4.3). There should be quality control procedures in place at each step to ensure that the necessary levels of accuracy and integrity are achieved and maintained. The process involved in the overall IFP implementation is illustrated in Figure 4.3.

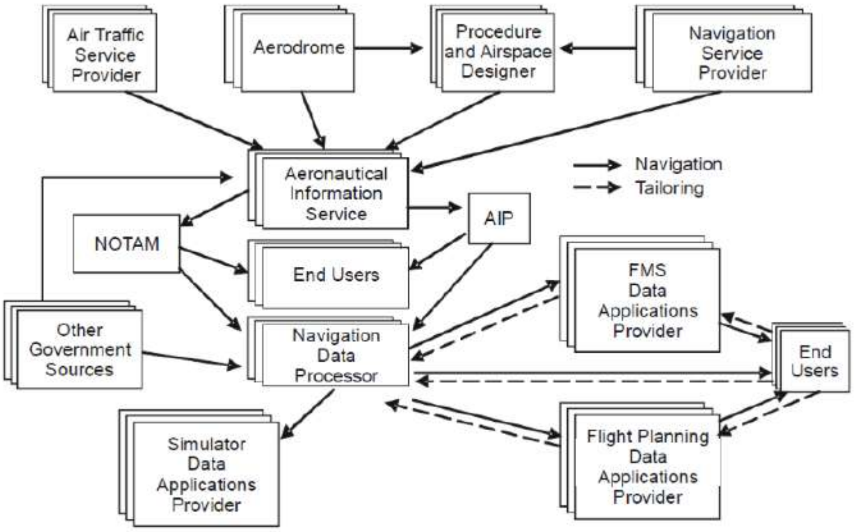
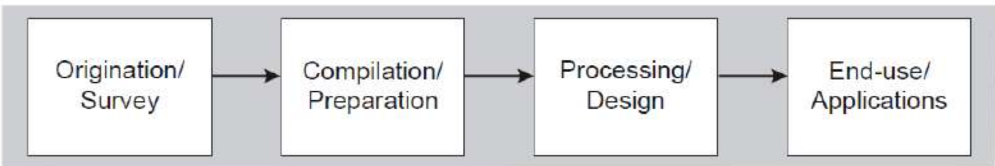


Figure 4.1 Participants in the development of an IFP

The procedure design chain is as follows



4.2.4 Checks must be carried out throughout the whole chain by each "participant" (organization) to ensure that the final procedure meets quality requirements. In particular, the accuracy, resolution and integrity of data elements, together with any changes to the data, need to be addressed. The preferred method for the transmission of the data elements is by electronic means, as this preserves the integrity of the data.

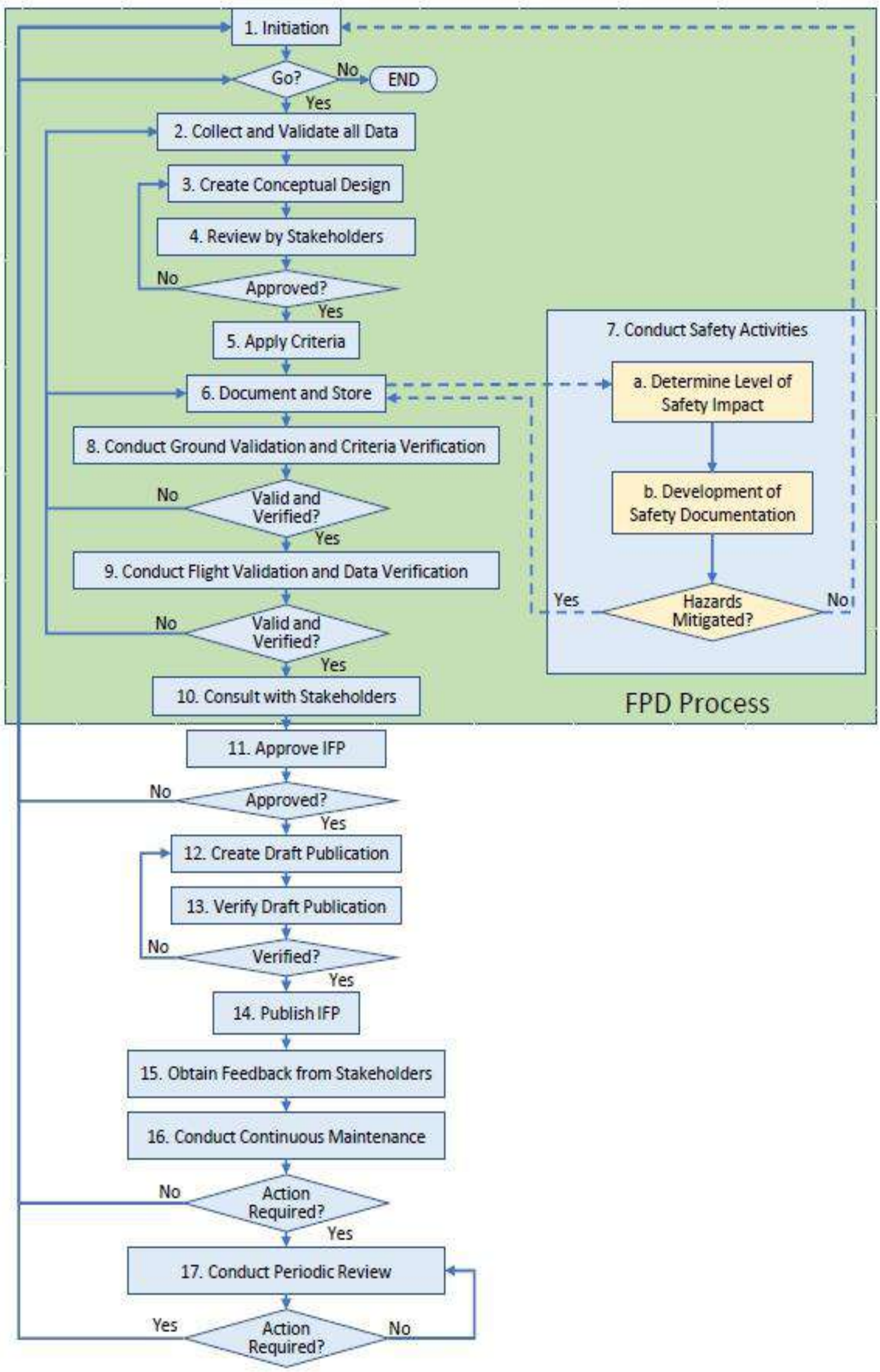


Figure 4.2 IFP process flow diagram

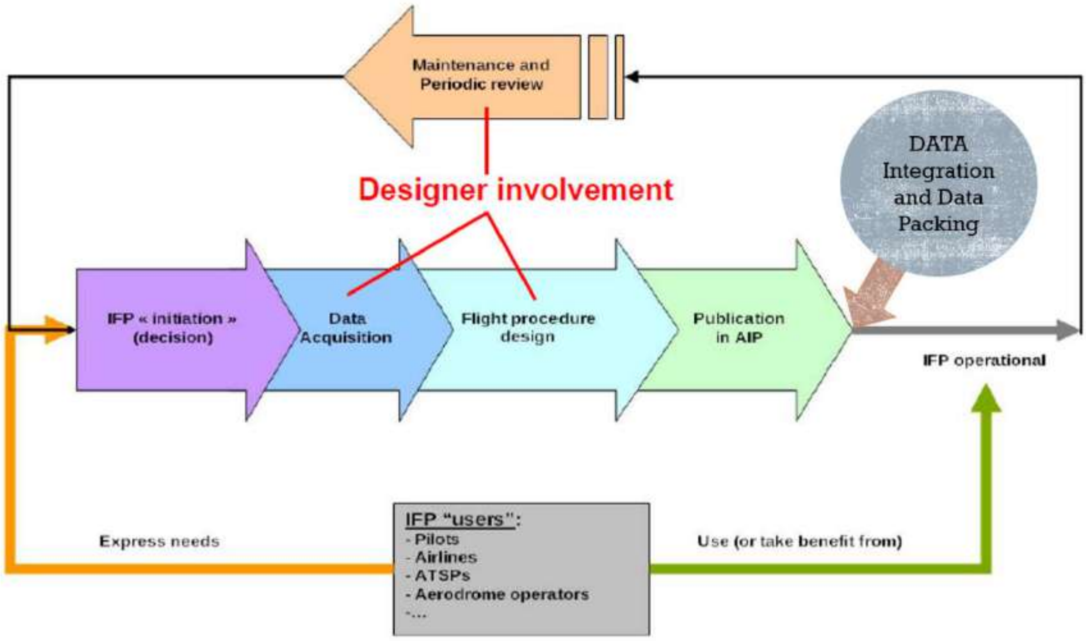


Figure 4.3 Over-all IFP Implementation Process

4.3 THE INSTRUMENT FLIGHT PROCEDURE PROCESS

4.3.1 *Overview*

4.3.1.1 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.

4.3.1.2 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.

4.3.1.3 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.

4.3.1.4 This process is reviewed every 5 years and may be amended by AANSOO as necessary to ensure continuous improvement, particularly after the release of updates to ICAO reference materials.

4.3.1.5 This process if properly applied, should provide consistent results with an appropriate level of quality.

4.3.2 *Output of the Quality Process*

4.3.2.1 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.

4.3.2.2 The decommissioning of the IFP is the termination of the quality process (except for the archiving requirements).

4.3.2.3 Throughout the life cycle of the procedure, several outputs are generated and evolve to a next level in the "production line".

4.3.2.4 Listed below from the beginning of the process are the main outputs:

a) A formal written approval to proceed with the development of the IFP design;

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

c) The FPD, including the procedure layout, the relevant technical report containing calculation outputs, data used in the design, coordinates of points including obstacles identified, coding tables (if applicable), textual description of the intended procedure and the determined level of safety impact and/or a safety documentation;

d) Validation and verification reports for the IFP;

e) Approval of the procedure by the Director General of CAAP;

f) Documentation throughout the various stages from the input through the publication process; and

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

4.3.2.5 At the end of the life cycle, a decision to withdraw the procedure will be issued (and documented). All changes permitting the withdrawal will be included in the quality documentation but will also be part of the replacement procedures' (if any) documentation.

4.3.3 *<u>Process Description</u>*

Step 1 - INITIATION	
Description	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 Nos. 12 to 14). Justification for the FPD must be clearly stated and must be in accordance with the airspace concept and CAAP navigation strategy. It is a managerial responsibility to make a decision at this point to "**go**" or "**no go**".
Input	• 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.
Output	Managerial decision to set up the procedure design process or to discontinue the activity.
Parties involved	Stakeholders.
Quality Records	• A formal written approval/ service order/ signed contract to proceed with the development of the IFP design.

	• Pertinent documents, studies, assessments, implementation plans supporting the decision made.
References	ISO 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".
Step 2 - COLLECT AND VALIDATE ALL DATA	
Description	• Specific ATS stakeholders' 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 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. • Data collected by the PDSP which do not coincide with data published in the AIP must be coordinated immediately to the data owner who will in-turn coordinate with the AIS for amendment of published information in accordance to CAR-ANS Part 15 and MOS AIS.
Input	• All stakeholder requirements • Previous designs • Data from sources recognized by CAAP (e.g. AIP, ADMS Survey Airfield Update Report, Obstacle Survey from aerodromes not operated by CAAP) • All other data.
Output	Preliminary work file containing summary of stakeholder requirements, summary of all data.
Parties involved	• Designer • ATM • AIS • Stakeholders • Airport Authorities • Data sources (e.g. CNS, ADMS, surveyors, charting agencies, MET offices, etc.)
Quality Records	• Summary of stakeholder requirements that can be verified thru minutes of meetings, emails and other forms of correspondence. • Duly signed obstacle surveys.

	• Summary of collected data stating the source document and the person/ organization that validated the data and the method thru which data was validated (e.g. ground validation and simulation/ flight validation).
References	• Safety Management Manual (ICAO Doc 9859). • This MOS • MOS AIS • MOS for Charting • Quality Assurance Manual for Flight Procedure Design (ICAO Doc 9906). • ISO 9001:2000. • CAR-ANS 11, 15 and CAR Aerodromes. • World Geodetic System-1984 (WGS-84) Manual (ICAO Doc 9674). • Guidelines for electronic terrain, obstacle and aerodrome mapping information (ICAO Doc 9881).
Step 3 - CREATE CONCEPTUAL DESIGN	
Description	A conceptual design is drafted with the key elements considering the overall strategy.
Input	Preliminary work file.
Output	Conceptual design (textual description and proposed procedure layout).
Parties involved	Designer.
Quality Records	• Proposed procedure layout of the conceptual design. • Textual description of the conceptual design. • Summary of stakeholder requirements that can be verified thru minutes of meetings, emails and other forms of correspondence.
References	• ICAO 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”.
Step 4 - REVIEW BY STAKEHOLDERS	
Description	Formal agreement and approval of the conceptual design is sought at this stage. If agreement and approval are not possible then either the designer must redesign the conceptual design or the stakeholders must reconsider their requirements.
Input	• Work program to serve as basis for decision, including the scope of the activity to be performed. • Conceptual design.
Output	• Formally approved conceptual design or formal decision to discontinue, updated with any consequential changes, if applicable. • Planned implementation AIRAC date, based on available resources and any other technical/ operational/ training constraints.
Parties involved	• PDSP. • Concerned stakeholders (Air Operator, Airport Operator, ATS). • Designer and management. • AIS for planned publication date with reference to AIRAC calendar. • AANSOO for any regulatory clarifications that may be raised (optional).
Quality Records	Formally approved conceptual design or formal decision to discontinue, updated with any consequential changes, if applicable. (stakeholders-approved proposed procedure layout annotating any amendments from the original proposal or the textual description of the procedure with affixed signatures of stakeholders is acceptable)

References	ISO 9001:2000: section 7.3.1 “Design and development planning”; and section 7.3.4 “Design and development review”.
Step 5 - APPLY CRITERIA	
Description	Using the stakeholder-approved conceptual design, apply criteria.
Input	• Preliminary work file. • Formally approved conceptual design. • Planned implementation AIRAC date. • Resource allocation for the design and planning for publication.
Output	• FPD. • Draft procedure layout. • Report. • Calculation outputs • Coordinates. • Textual description of the procedure.
Parties involved	Designer.
Quality Records	None
References	• ICAO Doc 8168 (or applicable criteria). • ICAO Doc 9905 (or applicable criteria). • ISO 9001:2000: section 7.3 “Design and development”.
Step 6 - DOCUMENT AND STORE	
Description	• For traceability, complete necessary submission / calculation forms in paper and / or electronic formats. • Create a draft instrument procedure graphical depiction (same as the output in Step 5). • 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.
Input	• FPD. • Draft procedure layout. • Report. • Calculation outputs. • Coordinates. • Textual description of the procedure.
Output	• Data store FPD containing: ➢ all calculations; ➢ all forms and reports, including consensus from stakeholders; ➢ all charts/maps AIRAC textual description (used in the design and not necessarily created for the design); ➢ path terminators (if applicable); ➢ and procedure plate (draft graphical depiction).
Parties involved	Designer.
Quality Records	• PDSP Operations Manual detailing procedure for data storage. • Implementation to be verified and documented during industry visits.

References	• ICAO Doc 8168 (or applicable criteria). • ICAO Doc 9905 (or applicable criteria). • CAR-ANS Parts 4 and 15. • ICAO Doc 9906. • This MOS.
Step 7 - CONDUCT SAFETY ACTIVITIES	
Description	• <u>Determine Level of Safety Impact</u> ➢ Perform an assessment of the magnitude of change to determine the amplitude needed for the safety case. • <u>Develop Safety Documentation</u> ➢ 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 CAAP in case the PDSP falls under 1.2.2 (b).
Input	FPD containing draft procedure layout, report, calculation outputs, coordinates, textual description of the procedure.
Output	Formal statement on the significance of change, allowing to determine the amplitude of the safety case that needs to be performed.
Parties involved	Quality and safety officer, affected stakeholders, supported by designers.
Quality Records	• Pre-Implementation Checklists for Preparation of IFP Implementation Safety Assessment (Appendix 4). • Safety Assessment or hazard identification and safety risk assessment form (See Appendix 4)
References	• ICAO Doc 9859. • ISO 9001:2000. • CAR Safety Management. • AC AN/ATM-SRM-01-14 – “Guidelines for Preparing Safety Arguments Covering CAR-ANS Part 11(ATS).
Step 8 - CONDUCT GROUND VALIDATION AND CRITERIA VERIFICATION	
Description	• Validate all data used in the procedure design (i.e. data resolution and format). • Validate the “intended use” of FPD as defined by stakeholders and described in the conceptual design. • Verify that the criteria have been properly and accurately applied.
Input	• FPD package. • Safety case.
Output	Ground validated and Criteria verified IFP.
Parties involved	• Designer. • Validation team or another designer not involved in the particular design project.
Quality Records	• Results of ground validation (Ground Validation Report signed by validator). • Results of criteria verification (Criteria Verification Report signed by verifier).
References	• ICAO Doc 8168 (or applicable criteria). • ICAO Doc 9905 (or applicable criteria). • CAR-ANS Parts 4 and 15.
Step 9 - CONDUCT FLIGHT VALIDATION AND DATA VERIFICATION	
Description	• To be performed as necessary (see 4.4.8)

	• Verify for accuracy of terrain data, obstacle data, aerodrome data, aeronautical data, navaid data. • Validate the "intended use" of FPD as defined by stakeholders and described in the conceptual design. • Validate flyability and/or human factors. • Validate safety case.
Input	• Ground validated/ Criteria verified IFP. • Safety documentation.
Output	Validated IFP.
Parties involved	• Designer. • All concerned stakeholders. • Flight validation organization. • Flight inspection organization.
Quality Records	• Results of flight validation (Flight Validation Report signed by FVP). • Results of flight inspection (when performed).
References	• ICAO Doc 8168 (or applicable criteria). • Manual on Testing of Radio Navigation Aids (ICAO Doc 8071). • This MOS.
Step 10 - CONSULT WITH STAKEHOLDERS	
Description	Present all pertinent information to all relevant stakeholders for consultation.
Input	Validated IFP.
Output	Stakeholder endorsement/ approval.
Parties involved	• Designer. • Relevant stakeholders. • AANSOO for any regulatory clarifications that may be raised (optional).
Quality Records	• Stakeholder endorsement/ approval. • A written statement from those entities, or other proof of concurrence (duly signed minutes of meetings by those entities, emails, etc.).
References	This MOS.
Step 11 – Approve IFP	
Description	• Submit IFP documentation to AANSOO for validation of the "completeness" of the IFP implementation process prior to the approval of the DG.

Input	• IFP Technical Package
	  ➢ Validated IFP.
	  ➢ Procedure lay-out.
	  ➢ Stakeholder endorsement.
	• Other relevant quality records.

Output	• Approved IFP to be forwarded by AANSOO to owner of the procedure or the PDSP, whoever submitted the FPD Package for approval. • Endorsement from procedure owner for the AIS to create draft chart/s of approved IFP/s.
Parties involved	• Designer. • AANSOO.
Quality Records	• Quality Assurance Report. • Formal approval of the FPD for new procedures (or for relevant changes on existing procedures).
References	This MOS.

Step 12 - CREATE DRAFT PUBLICATION	
Description	Provide FPD package, including a graphical depiction, to the AIS to create a draft publication.
Input	Approved IFP for publication, including the procedure layout from PDSP and coding tables (if applicable).
Output	Draft publication.
Parties involved	• Designer. • AIS.
Quality Records	None
References	• CAR-ANS Parts 4 and 15. • MOS AIS • MOS-Aeronautical Charts • ISO 9001:2000 section 4.2 “Documentation requirements” section 7.3.5 “Design and development verification”.
Step 13 - VERIFY DRAFT PUBLICATION	
Description	Verify the draft publication for completeness and consistency.
Input	• Draft publication. • Validated FPD.
Output	• Cross-checked draft publication. • Decision for publication release.
Parties involved	• Designer. • Procedure owners. • AANSOO for any regulatory clarifications that may be raised (optional) • AIS. *Note: “Aviation Authority” referred to in Step 13 under ICAO Doc 9906 Vol.1 applies only when the publication is delegated to another entity aside from the AIS operated by the state authority.*
Quality Records	• Coordination/ communication/ correspondence between designer and AIS.
References	• Regional regulation/ agreement. • This MOS. • MOS AIS. • ICAO Doc 8168 Volumes I and II (or applicable criteria). • All applicable CAR-ANS, ICAO Annexes and Docs. • ISO 9001:2000 section 7.3.5 “Design and development verification”; and section 7.3.6 “Design and development validation”.
Step 14 - PUBLISH IFP	
Description	AIS initiates the AIRAC process.
Input	• Cross-checked draft publication. • Decision for publication release.
Output	AIP chart, documentation.
Parties involved	AIS.
Quality Records	Published charts.
References	CAR-ANS Parts 4 and 15.
Step 15 - OBTAIN FEEDBACK FROM STAKEHOLDERS	
Description	• Request and analyze feedback from stakeholders on the acceptability of the work performed.

	• Cross-check the AIP chart, documentation.
Input	• AIP chart, documentation. • Reports from stakeholders.
Output	Decision for ongoing activities.
Parties involved	• AIS • Manager of the PDSP. • Stakeholders. • AANSOO for any regulatory clarifications that may be raised (optional).
Quality Records	Formal order/ decision for the ongoing activities.
References	• MOS AIS
Step 16 - CONDUCT CONTINUOUS MAINTENANCE	
Description	• 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 No. 1 to reinitiate process.
Input	Significant changes in the FPD environment or design criteria changes that are safety related.
Output	Revision as required.
Parties involved	• AIS. • Designer. • AANSOO. • Procedure owner. • Airport authorities, if the procedure owner is another organization. • Pilots (when applicable and possible).
Quality Records	• If modifications or amendments, the reason(s) for the change(s).
References	• ICAO Doc 8168 (or applicable criteria). • ICAO Doc 9905 (or applicable criteria). • CAR-ANS Parts 4 and 15. • CAR Safety Management. • This MOS.
Step 17 - CONDUCT PERIODIC REVIEW	
Description	• On a periodic basis (every 5 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 No. 1 to reinitiate process.
Input	All changes in the FPD environment, design criteria or depiction standards.
Output	Revisions as required.
Parties involved	• Designer. • AANSOO (as oversight) • AIS. *Note: "Aviation Authority" referred to in Step 13 under ICAO Doc 9906 Vol.1 applies only when the publication is delegated to another entity aside from the AIS.*

Quality Records	• Results of the periodic review. • If modifications or amendments, the reason(s) for the change(s).
References	• ICAO Doc 8168 (or applicable criteria) or ICAO Doc 9905 (or applicable criteria). • CAR-ANS Parts 4 and 15. • CAR - SM • This MOS.

4.3.4 *Related Processes*

The FPD and the IFP processes should not be considered as stand-alone processes. It is important to consider the supporting processes (mostly activities that are performed once, such as the software validation, or on a regular schedule, such as training) and the upstream and downstream processes that trigger or are triggered by the FPD and IFP processes.

4.3.4.1 *Supporting processes*

This section describes various activities that should be performed prior to the procedure design process.

4.3.4.1.1 *Use and validation of procedure design software tools*

4.3.4.1.1.1 Software-based tools provide automated functions for calculations and/or designs and layouts and include products such as spreadsheets, commercial computer-aided design (CAD) packages and custom-made software packages. They can facilitate the design work through a certain level of automation in calculation and procedure layout generation. Procedure design tools may be used throughout the procedure design process, from initial data input to final procedure output, maintaining the data integrity throughout the entire process.

4.3.4.1.1.2 Consequently, the use of procedure design tools is encouraged in the framework of the quality process of IFP design. However, it is of paramount importance to note that the use of automation does not replace the procedure designer's expertise. Additionally, the use of software should not prevent designers from using manual techniques.

4.3.4.1.1.3 The user requirements (e.g. type of functions, coverage of the tool in reference to the applicable criteria, adequacy of human-machine interface (HMI) should be captured and taken into consideration during the selection of the software solution. This selection should consider the needs of the end user and should be based on the volume, complexity and type of flight procedure(s) to be designed or maintained by the flight procedures design unit.

4.3.4.1.1.4 To address specific issues that might appear later during the operational use of the software, a close relationship between the user and the software provider is encouraged.

4.3.4.1.1.5 Although procedure design tools provide a significant step toward improved quality assurance in FPD, there is a risk that software errors or non-compliance with criteria can result in poor quality, or even dangerous flight procedures. When automation is used during the procedure design process, CAAP requires that automation functions have been validated to ascertain compliance of the final results with applicable criteria. Chapter 6 of this MOS — Flight Procedure Design Software Validation provides guidance on such validation processes and details one method that may be employed for validation of procedure design tools.

4.3.4.1.2 *Training*

4.3.4.1.2.1 Training is a key element of a quality management system (QMS) (ISO 9001:2000 Quality management systems — Requirements, section 6.2.2 “Competence, awareness and training”). Delivering training is one element of a training program. Other elements include identifying training requirements, developing a training curriculum and maintaining training records.

4.3.4.1.2.2 Identifying training requirements is a process that includes defining required competencies (knowledge and skills). Ensuring the procedure design staff possess and maintain the competencies requires a review(s) of an individual's qualifications which may include prior training, education level and experience. As required competencies evolve, new and/or recurrent training may be indicated to ensure that procedure designers maintain the required level of competency. Each procedure design organization must establish required competency levels and maintain records of personnel training, qualification and experience as a means of tracking individual competency in accordance to 3.6 of this MOS.

Note. –In addition to the provisions in this MOS regarding trainings, ICAO Doc. 9906 – Quality Assurance Manual for Flight Procedure Design, Volume 2 — Flight Procedure Designer Training may be used for guidance for both PDSPs and for procedure design training organizations.

4.3.4.1.2.3 Training records (TRs) provide historical tracking of activities that support the qualification of a person to do a specific task. TRs are the evidence of due diligence by an organization to keep its staff competent for assigned tasks or functions. Training and TRs by themselves do not demonstrate competency. Competency is demonstrated through the actions of performing a task and must be monitored through a management process.

4.3.4.2 *Upstream and downstream processes*

This section describes various activities that trigger or are triggered by the IFP process.

4.3.4.2.1 Data origination

4.3.4.2.1.1 Quality assurance for the IFP process starts at the point of data origination. Data origination addresses the functions performed by requesting authorities and originating authorities, surveyors and any other third-party organizations supplying aeronautical data to procedure designers. Such functions include, for example, surveying coordinates of the runway end or of navigation aids.

4.3.4.2.1.2 The data origination phase is one of the most critical stages of the data chain, as some errors cannot be easily detected in the subsequent steps of the process.

4.3.4.2.1.3 Historically, most aeronautical data are originated by CAAP. Other originators may supplement CAAP-originated data or originate data that are independent of CAAP. Examples of other data chain participants that may originate aeronautical data include, but are not limited to, airlines, aircraft manufacturers, airport authorities, defense mapping agencies and communication service providers.

4.3.4.2.1.4 CAR-ANS Part 15 provides the regulations relating to the horizontal (WGS-84) and vertical (MSL/EGM-96) reference system as well as terrain and obstacle data.

Note. - For more details refer to ICAO Doc 9674 (the WGS-84 Manual) and the Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information (ICAO Doc 9881).

4.3.4.2.2 *Aeronautical Information Service (AIS)*

4.3.4.2.2.1 The FPD process is closely linked to the AIS process, since one of the objectives of the design is to have the procedure published in the AIP. For this purpose, the procedure design process includes a phase related to the preparation of the elements to be published. These may include basic elements being provided to the AIS office in the preparation of a detailed (draft) procedure chart to be subsequently processed by AIS. The AIS office is responsible for the integration of the designed procedure in the official CAAP publication (AIP), according to the regulations laid down in CAR-ANS Part 4 and CARANS Part 15.

4.3.4.2.2.2 The AIS office may have to process the elements forwarded by the procedure designer, including the procedure layout of the design, in order to make them compliant with the applicable regulations and consistent with the national publication standards, as appropriate. The outcome from this process may be different from the original submission of the procedure designer. It is therefore essential that the procedure designer review the outcome of the AIS process prior to publication. This review must include a check of completeness and of consistency of the publication with the result of the FPD.

4.3.4.2.2.3 The processes between the procedure design office and the AIS office shall be defined and formalized, for example, through a quality process or through a service level agreement.

4.3.4.2.3 *Data integration*

4.3.4.2.3.1 When the completed IFP is published, it should be forwarded to the commercial database suppliers so they may encode the IFP into a database for airborne applications. The database suppliers encode the

IFP according to the ARINC 424 Navigation System Database Standard which is the international industry standard. When the IFP is loaded by each database supplier, numerous edit checks are performed to ensure that when flown in airborne navigation units the procedure will function as designed by the procedure designer. These edit checks, however, do not check for information such as altitudes, compliance with PANS-OPS or procedure design

4.3.4.2.3.2 The database suppliers consider submitted path/terminators to be advisory when included with RNAV IFPs. Database suppliers enter both RNAV and conventional procedures into airborne databases to automatically fly the IFPs in the manner in which they were intended to be flown. For new IFPs, or IFPs that have had significant modifications, it is recommended that the procedures be forwarded to the database suppliers significantly in advance of the aeronautical information regulation and control (AIRAC) date to assist in providing time to exchange information regarding inconsistencies that may be found during the database coding process.

4.3.4.2.3.3 There are three significant layers of standards in the ARINC 424 document. The first is the standardization of the fields that contain various items of aeronautical information. The next level is the standardization of what attributes are assigned to each type of information, e.g., VORs include frequency, coordinates, class of navaid. The next level is the standardization of each record of information, e.g., VOR records include in column one whether the navaid is standard or tailored, and columns two through four include the geographical area of the world.

4.3.4.2.4 *Data packing*

4.3.4.2.4.1 When the database supplier completes the coding of the database and the ARINC 424 compliant database is created for the next AIRAC cycle, the next step of the process is to create the airborne database for the specific avionics system, specific airline, specific geographical coverage and various other parameters. This process of converting ARINC 424 data into airborne databases is typically known as the packing process. The packing process is sometimes performed by the avionics manufacturers and sometimes by the database supplier using software created and maintained by the avionics manufacturer.

4.3.4.2.4.2 There is typically an earlier information cut-off date for the database suppliers since the creation of the ARINC 424 compliant database must be followed by the packing process and then sent to the airlines. Most airlines need at least seven days to ensure that all their airplanes get to a location where the next data cycle can be loaded before the effective date.

4.3.4.2.4.3 Because avionics systems using databases have been in use since the early 1970s, there are many differences in the capability of the systems in operation today.

4.3.4.2.4.4 It is important to note that some of the packing processes will make modifications to the ARINC 424 compliant database to ensure it will work in the target avionics system.

4.4 STEP-BY-STEP DESCRIPTION OF ACTIVITIES WITHIN THE PROCESS

The following subsections reflect all the steps of the process flow in Figure 4.2 and provide additional comments and explanations. All of the steps relate to the same number of the process (for example, 4.4.1 Initiation relates to process Step 1 — Initiation).

4.4.1 INITIATION (STEP 1)

4.4.1.1 The IFP process (origination or modification of an IFP) is generally initiated upon request from one of the stakeholders specified in 4.4.1.7. The development of the airspace concept for a particular airspace can also trigger this process.

4.4.1.2 A formal written approval/ service order/ signed contract to proceed with the development of the IFP design and a copy of the formal request from stakeholders (if such is the reason for initiation) stands as the quality record valid for submission as evidence that Step 1 has been appropriately implemented.

4.4.1.3 The necessity for a change can also ensue from the need to review existing procedures. Published procedures must be subjected to a periodic review to ensure that they continue to comply with changing criteria and meet user requirements. The interval for this review is five years.

4.4.1.4 The main reasons for the request must be stated, e.g., safety enhancement, efficiency of operations, environmental considerations. The request may be tied to a change in the aerodrome infrastructure or airspace structure.

4.4.1.5 Key objectives associated with the request must be identified. Examples of objectives include, but are not limited to, reduction of minima, improving the access to an aerodrome, implementation of a new procedure type corresponding to an overall program or strategy, reorganization of the airspace, or response to flight calibration results.

4.4.1.6 As far as possible, indicators associated with the key objectives should be provided (Example: reduction of the minima by [xx] ft).

4.4.1.7 *Stakeholders*

4.4.1.7.1 A request for initiation or modification of an IFP may be submitted by any of the IFP stakeholders including CAAP regulatory bodies (AANSOO and FSIS), air navigation or air traffic service providers, air operators, airport authorities, aviation associations, municipal/civil/military authorities, environmental authorities and the procedure designer. Additionally, requests from other sources such as industry or environmental committees may be considered for submission by the appropriate authority.

4.4.1.7.2 If the request for the initiation of an IFP is submitted with a predetermined solution that might not fit into the global picture, discussions with the involved stakeholders should take place. The final request should be an agreed consensus, as far as possible, between the stakeholders including the procedure designer.

4.4.1.8 *Required information*

The request should specify:

a) the nature of the changed or new IFP*;

b) the reason for the change; the expected benefits*;

c) the expected users*;

d) required operational implementation date;

e) consequences of not achieving the implementation date;

f) additional external partners and activities needed (such as flight validation and checking);

g) resource planning (human and financial, if possible, with a funding plan);

h) what coordination has been carried out with other stakeholders; and

i) what responses have been received from other stakeholders.

* - *Minimum required information.*

4.4.1.9 *Approval of request*

4.4.1.9.1 The request should be submitted to a formal review by the organization responsible for approving the initiation of the IFP process, usually the procedure owner or the concerned ATS. This approval process should consider the request in the light of all outstanding requests and when making a decision should take account of the available resources, the expected benefits and the urgency of the requirement.

4.4.1.9.2 The review process should also ensure that the proposed change:

a) fulfils the expected operational requirements;

b) meets the needs of the airspace users;

c) complies with the requirements of relevant government departments (such as Transport and Environment);

d) is achieved within the proposed timescale;

e) is adequately resourced; and

f) does not conflict with any other airspace plans.

4.4.1.10 *Documentation*

The IFP request and the results of the formal review, including reasons for approval or rejection, should be fully documented. Copies of the document should be retained by the reviewing organization, the originator and within the IFP work file. An overall plan for all outstanding requests and ongoing IFP projects with assigned priorities should also be maintained and made available to all stakeholders.

4.4.2 COLLECT AND VALIDATE ALL DATA (STEP 2)

4.4.2.1 The procedure designer must ensure that specific ATS requirements related to local traffic patterns (altitude, direction and airspeed), feeder/transitions, arrival/departures, preferred routes, ATS routes, communication facilities, time, restrictions and any ATS needs, restrictions or problems are available from the ATS provider.

4.4.2.2 The designer 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:

a) terrain data: electronic raster and/or vector data or paper cartographic maps;

b) obstacle data: man-made and natural with their coordinates and elevation;

c) 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;

d) 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;

e) navaid data: coordinates, elevation, service volume, frequency, identifier, magnetic variation; and

f) existing significant points to local navigation.

4.4.2.3 *User requirements*

The IFP is the interface between all the stakeholders. It is important to have a common agreement on the requirements to change or to create an IFP. These may be addressed under the following headings:

4.4.2.3.1 Air Traffic Control (ATC)

Compatibility of the IFP with existing ATS procedures for the elected location and for the immediate surroundings if several aerodromes operate IFPs.

4.4.2.3.2 Users

a) Need to shorten trajectories;

b) Enhanced guidance;

c) Availability of vertical guidance;

d) Lower minima; and

e) Enhanced flyability.

4.4.2.3.3 Airspace design

a) Constraints given by existing airspaces;

b) Requirements for additional / restructured airspace; and

c) Danger / restricted and prohibited areas.

4 4.4.2.3.4 Environmental constraints

a) Avoidance of populated areas;

b) Avoidance of sensitive areas (such as chemical, nuclear or other facilities); and

c) Noise abatement procedures, when applicable.

4.4.2.3.5 Schedule

a) Timing of the foreseen implementation with regard to the complexity of existing airspace structure.

b) Additional constraints might result from:

i) the need for training on the ANSP side for the integration of the new traffic flows;

ii) the implementation schedule of new CNS/ATM systems; and

iii) the requirements of the airline operators.

4.4.2.4 *Data/metadata inputs to the procedure design process*

The term metadata refers to information “about” the data rather than the data themselves. For example, the quality characteristics associated with a data value are metadata. As an example: an accuracy definition of plus or minus one meter for runway length is metadata about the actual value of the runway length. The use of the term “data” below addresses both actual data values and metadata.

4.4.2.5 *Data quality requirements*

4.4.2.5.1 Defined data quality requirements for inputs to the FPD process are key elements to ensure proper safety margins required by procedure design criteria. For example, appropriate obstacle clearance altitude/heights can only be determined if the accuracy of the input data is known.

4.4.2.5.2 Accuracy, resolution and integrity are the key quality requirements related to the data inputs to the FPD process as defined in CAR-ANS Part 11 – “Air Traffic Services”, CAR Aerodromes, CAR-ANS Part 15 – “AIS” and MO- AIS.

4.4.2.5.3 Ensuring the quality of aeronautical data is the responsibility of the “owner” of the data:

a) AIS – as the owner of published data is required to have established quality assurance system;

b) Aerodrome operator/ Land surveyors – as data originators for aerodrome and obstacle data should ensure that the data in the publication is valid and updated;

c) CNS Office - as data originators for navaid data should ensure that the data in the publication is valid and updated;

d) Other Stakeholders (i.e. ATS and Air Operator) – provides user requirements and other concerns that should be valid and justifiable; and

e) Other data owners include MET service provider for MET information, ATS for data on the airspace environment, etc.

4.4.2.5.4 To ensure quality of aeronautical data from data origination, a formal arrangement (Service Level Agreement) shall be established between AIS and its data originators in relation to the timely and complete provision of aeronautical data and aeronautical information as stipulated in 1.2.1. CAR-ANS Part 15.

4.4.2.5.5 The “validation” of the data collected from the list above, is the responsibility of the IFP designer in such a way that he/she gains sufficient confidence of the quality (integrity, accuracy and resolution), of data necessary for IFP design. Data collected by the IFP designer which do not coincide with data published in the AIP must be coordinated immediately to the data owner who will in-turn coordinate with the AIS for amendment of published information in accordance to CAR-ANS Part 15 and MOS AIS.

4.4.2.5.6 The vector or the mechanism used to transmit the data is critical to maintain data integrity. PDSPs should as much as practicable minimize manual human intervention in transmitting/ encoding data.

4.4.2.6 *Procedure design data acquisition*

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 (see verification, section 4.4.2.8) occurs prior to use.

4.4.2.7 *Data sources and supplier status*

4.4.2.7.1 All data sources must be identified. The status of the suppliers of critical and essential data elements should be established and reviewed on a regular basis.

4.4.2.7.2 Additionally, if a supplier does not have an approved quality management system, the supplied data must be considered to be of unknown quality characteristics (invalid against the data requirements) and must be verified as described in 4.4.2.8.

4.4.2.7.3 The AIP Philippines, being required to have undergone a QMS process for publication is endorsed by CAAP, as a reliable source of quality data.

4.4.2.8 *Incoming data verification and validation*

4.4.2.8.1 All data received from a supplier that will be used in the FPD process must be validated against the data quality requirements. If the data are validated as having met the data quality requirements, then the data may be used without additional verification.

4.4.2.8.2 Where a supplier is unable to state data quality characteristics, or the quality characteristics are below the stated requirements, the data must be replaced with data of known and adequate quality characteristics, or be verified as adequate to the specifics of the procedure being designed. Data verification or mitigation for use in the FPD process can take many approaches including, but not limited to:

a) analysis against other data of known quality characteristics such as control points;

b) imposition of appropriate buffers based on the actual procedure;

c) a determination of negligible effect on the actual procedure; or

d) flight validation / checking.

4.4.2.8.3 The validation of the data quality requirements must be documented and can serve in later studies.

4.4.2.9 *Documentation*

Required documentation to support the processing of incoming data for the FPD process must pertain to incoming inspection of the data quality characteristics, disposition of the incoming data (valid or invalid), updating of the data source and supplier status documentation, and for non-verified data, clear documentation indicating the need for appropriate verification prior to use in the FPD process. All documentation needs to be clearly labelled as to the data it applies to, versioned and stored as necessary.

4.4.3 CREATE CONCEPTUAL DESIGN (STEP 3)

4.4.3.1 Once the collection of requirements and constraints has been completed and all necessary data have been acquired and verified, the designer can commence with the conceptual design.

4.4.3.2 An individual designer should be nominated as the designer responsible for the design concept and for the development of the actual design.

4.4.3.3 Coordination with interested/affected stakeholders should continue throughout the conceptual phase and the subsequent design phase of this process.

4.4.3.4 The procedure designer may, as an input for this activity, draw on 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.

4.4.3.5 The intention would then be to develop a design strategy for the procedure based on PANSOPS (ICAO Doc 8168) and/or other applicable criteria (e.g. ICAO Doc 9906 for RNP AR) as well as the key inputs stated above.

4.4.3.6 In a more complex design environment, it might be helpful or even necessary to develop one or more design alternatives in order to provide sufficient input for the review of the design concept.

4.4.4 REVIEW BY STAKEHOLDERS (STEP 4)

4.4.4.1 The conceptual design is reviewed by the stakeholders. It is important that the stakeholders, including the AIS, the designer and the designer's management agree on the conceptual design and on the planned implementation AIRAC date. This will allow a common understanding of the development stages of the design and will also increase the chances of a successful implementation.

4.4.4.2 At least two (2) AIRAC cycles from the cut-off date shall be considered for the planned effective date.

Example: For an IFP with a target date of effectivity on December 31, 2020, the complete data shall be submitted to the AIS before the cut-off date, August 21, 2020.

4.4.5 APPLY CRITERIA (STEP 5)

Once the relevant data have been collected and the conceptual IFP has been approved, the design activity can commence. An individual designer should be nominated as the responsible designer. Continued coordination with interested/affected stakeholders should be maintained throughout the design phase.

4.4.5.1 *Criteria*

4.4.5.1.1 CAAP adopts the international procedure design criteria detailed in the current applicable version of PANS-OPS (ICAO Doc 8168), Volume II. Procedure design criteria for Required Navigation Performance Authorization Required (RNP AR) IFPs can be found in the RNP AR Procedure Design Manual (ICAO Doc 9905). ICAO regularly reviews and amends these criteria.

4.4.5.1.2 It is important that the current applicable criteria be used by all personnel involved in the FPD process in order to ensure international harmonization.

4.4.5.1.3 Whenever changes to the criteria are published, the procedure design organization should review these to determine an appropriate implementation plan. If the change in the criteria is deemed to be a safety-critical element, it should be carried out immediately.

4.4.5.1.4 CAAP may also elect to define national procedure design criteria for use with existing PANSOPS criteria as applicable in the interest of aviation safety. Such additional or alternate design criteria should never be used together with PANS-OPS criteria unless they have been developed specifically for that purpose.

4.4.5.1.5 In both cases, such criteria should be fully documented, regularly reviewed and reflected in the AIP Philippines.

4.4.5.1.6 Under no circumstances may a mixture of different sets of criteria be used in the design of an IFP.

4.4.5.2 *Methods and tools*

4.4.5.2.1 In order to make sure that a procedure design tool is appropriate for the FPD concept, it must be subjected to both a validation process (for compliance with applicable criteria) and an assessment of compliance with user requirements (concerning available functions, HMI and documentation).

4.4.5.2.2 The design methods employed during the FPD process should be thoroughly validated and clearly documented. Procedure designers should receive adequate training in applying the approved methods. Care should be taken that only the approved methods are applied during the FPD process.

4.4.5.2.3 Software tools should be used, where appropriate, to ensure design consistency. All software tools should be validated in accordance to Chapter 6 of this MOS.

4.4.5.2.4 Calculation and construction techniques should comply with the guidelines contained in the relevant ICAO documentation or in the relevant national criteria (if any is published in the AIP Philippines).

4.4.5.3 *Design methods*

4.4.5.3.1 Procedures may be designed using one or a combination of three possible methods:

a) Manual method. The manual method involves the use of paper charts, tracing paper, paper/plastic templates (Such as OAS templates, as detailed in PANS-OPS, Volume II and Holding, Reversal and Racetrack templates, as detailed in the “Template Manual for Holding, Reversal and Racetrack Procedures” (ICAO Doc 9371), pencils or drawing pens and calculators/spreadsheets. Photocopies or low-grade reproductions of charts should not be used;

b) COTS software method. The COTS method involves the use of commercial off-the-shelf software, such as CAD packages, and imported, or manually input, electronic topographic, aeronautical and obstacle data. Tool-specific macros and templates may be developed and used, after appropriate validation; and

c) Custom-made software method. The custom-made method involves the use of specialist software tools developed specifically for supporting the FPD process. These tools must have been validated in accordance with Chapter 6 and must be used in accordance with the published user manual.

4.4.5.3.2 To enhance the integrity throughout the design process, the use of automated or semi-automated tools is recommended.

4.4.5.4 *Documentation*

4.4.5.4.1 On the basis of these activities, the resulting FPD usually comprises one or several draft procedure layouts, a textual description of the procedures as well as calculations and coordinates. These documents are then used as a basis for the design verification and are the input for the determination of the "level-of-safety" impact of the design.

4.4.5.4.2 All aspects of the FPD process should be documented including:

a) version of applicable design criteria;

b) all data sources;

c) service volume coverage analysis (Many navigation signals can be received outside of the design service volume. The service volumes are determined by an analysis of many factors including the minimum transmission strength, the worst-case receiver sensitivity, worst case signal to noise ratio, etc. Often the requirements can be met at greater distances than the service volume and when needed by the procedure or airway, they are flight tested at the required additional distances. When they are not required for use outside of the service volume, then flight testing is restricted to verifying that the criteria is met inside of the service volume.);

d) all calculations including transformation parameters used (i.e. the parameters used to convert from a local datum to WGS 1984 or another geocentric datum.);

e) all parameters used (speeds, bank angles, wind velocity, temperature, descent gradient, climb gradient, timings, height loss margins, obstacle assessment surface (OAS) coefficients, etc.);

f) specific validation requirements (e.g. flyability, service volume coverage confirmation);

g) flight inspection results (if required);

h) full design rationale;

i) design assumptions and constraints;

j) alternative designs that were considered and the reasons for their rejection;

k) stakeholder feedback during the design process;

l) document version and date;

m) draft elements for publication (when available), including coding advice (when applicable); and

n) any other pertinent points of interest resulting from the FPD process, e.g. software tools used for the design; advantages and drawbacks of the assessed scenarios; potential difficulties for the execution of certain phases of the procedure; environmental issues; financial aspects.

4.4.5.4.3 The documentation should include a clear statement of compliance with CAAP-approved criteria together with detailed notes on any deviations and evidence of approval for each deviation. There should also be a record of each design review and sign-off.

4.4.6 DOCUMENT AND STORE (STEP 6)

4.4.6.1 Traceability is the key element in the design of a new IFP. All assumptions made and methods used in the implementation of a new or modified FPD should be documented in a uniform manner and kept available at least during the lifetime of the IFP.

4.4.6.2 All supporting documentation, such as spreadsheets, drawing files and other relevant files should, as far as practicable, remain in a common location, and for the lifetime of the procedures, be stored in an exploitable method.

4.4.6.3 The IFP designer has to document:

a) Necessary data used as input for the design;
b) IFP design file;
c) Design criteria and rationale;
d) Calculations;
e) Parameters;
f) Publication drafts (or the data to be put in AIP);
g) Tools and SW;
h) Stakeholder feedback;
i) Ground and flight validation reports;
j) IFP related studies (such as the safety assessment); and
k) Results of Maintenance and Periodic Reviews.

4.4.6.4 After the withdrawal of a procedure, the PANS-OPS Safety Inspectorate of the ATMSID-AANSOO shall archive the withdrawn IFP package, containing the data that were used during the FPD process. The PDSP in-charge of the design should also keep an archive of such data. The archived data should remain available in CAAP permitting a repetition or validation of the process in a later stage or for other purpose such as, for incident/ accident investigation or for a legal or liability case.

4.4.6.5 The minimum period of time during which this documentation must remain available after a full re documentation following a review of the procedure or a withdrawal of the existing procedure shall be no less than five (5) years from the official date of review or withdrawal.

4.4.7 CONDUCT SAFETY ACTIVITIES (STEP 7)

This section provides a minimum of information on safety activities. For more detailed information please refer to the CAR - SM or Safety Management Manual (ICAO Doc 9859).

4.4.7.1 *Safety concepts*

4.4.7.1.1 *Safety definition*

Safety is generally defined as "freedom from unacceptable risk ". From a formal point of view, a system can only be considered to be safe for operational use if its inherent risks have been identified, assessed and agreed to be below predefined limits. If such a commitment is reached, the system can be considered as acceptably safe.

4.4.7.1.2 *Safety assessment*

A safety assessment is a formal process by which an organization may ensure that risks associated with a system change have been properly identified and mitigated prior to going into operation. The results and conclusions of a safety assessment are usually described in a safety case. Broadly, the safety case is the documented assurance of the achievement and maintenance of safety.

4.4.7.1.3 *Demonstrating safety*

Primarily, the safety case is a matter of the organization assuring itself that its operations are safe. Only secondarily is it a matter of demonstrating the safety of the operation to a regulatory body.

4.4.7.1.4 *Safety targets*

The aim should be to provide safety assurance based on an appropriate combination of the following general criteria:

a) the so-called absolute approach - compliance with a target level of safety (TLS);

b) the relative approach - indication that the risk will be no higher than, or (where a safety improvement is required) substantially lower than, the pre-change situation; and

c) the minimal approach - that the risk will be reduced as far as reasonably practicable.

4.4.7.1.5 *Safety system*

When considering the ATM system lying within managerial control, it is important to understand the word system as the aggregation of the human (H) making use of the supporting equipment (E) based on appropriate procedures (P) in order to deliver safe and efficient services in a particular operational environment. This kind of "system-thinking" approach is of utmost importance to guarantee consistency of safety assessments.

4.4.7.1.6 *Safety assessment of safety issues*

A "safety assessment of changes" must be systematically and formally conducted each time an element is changed or newly introduced in the ATM system lying within the Air Traffic Service Provider's managerial control. However, existing elements not being affected by modifications may also be questioned in respect to safety. In such cases, the trigger is different but a "safety assessment of safety issues" may be conducted based on the usage and application of similar tools and principles.

4.4.7.1.7 *Assessing the type of safety case needed*

4.4.7.1.7.1 To assess the impact on safety of the change, conduct a preliminary hazard analysis to determine the likely hazards that may arise from the change.

4.4.7.1.7.2 It is important to assess the level of the safety impact. Determining this may be accomplished by measuring the impact in various domains, such as:

a) operational consequences of the change;

b) operational consequences for external partners;

c) level of new functionality introduced in contrast to the existing systems;

d) number of technical systems affected by the change;

e) amount of training or amount of additional staffing needed; and

f) complexity of the transition from the existing system.

4.4.7.2 *Implication of safety in the flight procedure design process*

4.4.7.2.1 It is impossible for an individual to possess the background and an entire understanding of all the criteria contained in the relevant ICAO and/or CAAP documentation. For this reason, it should be accepted that the criteria, as long as applied completely in accordance with the reference material, are safe.

4.4.7.2.2 Safety assessments for the FPD should therefore focus on two main elements. These are:

a) application of methods for the design of a flight procedure, looking at the methods from the reception of the requests, the application of the criteria, the handling of data throughout the process, the design aspects, including cross-checking, the publication process, etc.; and

b) the implementation of a procedure, looking at the interface with other procedures available in that location, the complexity and the workload imposed on ATC, cockpit workload, flyability, etc.

4.4.7.2.3 The overall aim should be to address the following five (5) safety assurance goals:

a) show that the underlying concept of the whole procedure is intrinsically safe — i.e. that it is capable of satisfying the safety criteria, assuming that a suitable design could be produced — and what the key parameters are that make it so;

b) show that everything necessary to achieve a safe implementation of the procedure — related to equipment, people and airspace design issues — has been specified;

c) the design is correct — meaning, for example, that:

   i) the design is internally coherent — It is consistent in functionality (in equipment, procedures and human tasks), and in use of data, throughout the system;

   ii) all reasonably foreseeable normal operational conditions have been identified, including such elements as adjacent procedures and airspace; and

   iii) the design is capable of meeting the safety criteria under all reasonably foreseeable normal operational conditions/range of inputs (in the absence of failure);

d) show that the design is robust — meaning that:

   i) the system can react safely to all reasonably foreseeable external failures; and

   ii) the system can react safely to all other reasonably foreseeable abnormal conditions in its environment;

e) show that the risks due to internal failure have been mitigated sufficiently such that, overall, the safety criteria are still satisfied. This typically needs to show that:

   i) all reasonably foreseeable hazards not directly linked to the safety case but possibly impacting the safety case have been identified (e.g. loss of communication, loss of navigational capabilities);

   ii) the severity of the effects from each hazard has been correctly assessed, taking account of any mitigations that may be available / could be provided external to the system;

   iii) safety objectives have been set for each hazard such that the corresponding aggregate risk is within the specified safety criteria;

   iv) all reasonably foreseeable causes of each hazard have been identified;

   v) safety requirements have been specified (or assumptions stated) for the causes of each hazard, taking account of any mitigations that are/could be available internal to the system, such that the safety objectives are satisfied; and

   vi) those safety requirements are realistic — i.e. they are capable of being satisfied in a typical implementation of aircraft and ground equipment, people and procedures.

4.4.7.3 *Safety implications for new procedures*

New IFPs may be designed in accordance with the reference documentation and be, as a stand-alone procedure, fully acceptable with respect to the target level of safety. The publication of a new IFP and its implementation in the existing ATM environment might trigger safety issues. These safety issues should be considered and adequately mitigated prior to the operational use.

4.4.7.4 *Safety team*

The safety assessment should not be performed by a sole individual, but should ideally be conducted by a team comprised of all relevant stakeholders. This allows consideration of the full implications of all interactions and possible hazards resulting from the operational use of a procedure. Normally, safety studies should not be led by the designer, but they can be the one in-charge of organizing or convening such an activity.

The designer is normally an active participant in the creation of the safety documentation.

4.4.8 CONDUCT GROUND VALIDATION AND CRITERIA VERIFICATION (STEP 8)

4.4.8.1 Prior to the ground validation, a designer (can be a designer from another organization) who was not involved in the original design should perform a review of the procedure (Criteria Verification). This review of the FPD may be done by sampling or by a complete review based on complexity and downstream verification and validation processes. It should include a review of the subjective logic employed by the procedure designer. The use of independent methods and tools adds to the verification effectiveness.

4.4.8.2 The purpose of criteria verification is to ensure the IFP design is complete and correct.

4.4.8.3 The verification should contain both;

a) a review of the design criteria that were used;
   i) Confirm correct application of criteria,
   ii) Confirm data accuracy and integrity,
   iii) Verify the graphical procedure lay-out and the textual description of the procedure,
   iv) Conform the procedure is correctly coded (if applicable),
b) an assessment of the subjective logic of the designed IFP (the IFP designer “choices”).

4.4.8.4 The “verifier” designer should endorse the IFP design technical report.

4.4.8.5 Validation is the necessary final quality assurance step in the procedure design process (FPD), prior to publication. The purpose of validation is to verify all obstacle and navigation data, and assess the flyability of the procedure. Validation normally consists of ground validation and flight validation. Ground validation must always be undertaken as arranged by the designer. When CAAP can verify, by ground validation, 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, then the flight validation requirement may be dispensed with.

Note. - Obstacle and navigation data verified by CAAP may be in the form of recently updated AIP and duly signed Airfield Update Reports as attested by data owners (i.e. aerodrome operator, ADMS Survey Team, CNS service provider) thoroughly reviewed and endorsed by AANSOO for publication.

4.4.8.6 Ground validation is a review of the entire instrument flight procedure package by a person or persons 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. Issues identified in the ground validation should be addressed prior to any flight validation.

4.4.8.7 The ground validation will also determine if flight validation is needed for modifications and amendments to previously published procedures. The ground validation should also:

a) Review IFP design outputs:
   i) Obstacle data,
   ii) Navigation data to be published / airport infrastructure,
   iii) ARINC 424 data and coding proposal,
   iv) Flyability of the trajectories,
   v) Charting information,
   vi) Operational characteristics and minima (wind, speed, bank angles, gradients…), and
   vii) Crew training or aircraft equipment requirements;

b) compare the intended use of the IFP to the initial stakeholder expectations and to the conceptual design; and

c) consider the outcome of the safety activities in regards to correct application.

4.4.8.8 Ground validation may include the use of desktop simulation tools and/or require the use of flight simulators. For RNP AR designs, the use of flight simulator prior to the actual flight validation is a must.

4.4.8.9 Flight validation should be conducted if:

a) the flyability of a procedure cannot be determined by other means;

b) the procedure requires mitigation for deviations from design criteria;

c) the accuracy and/or integrity of obstacle and terrain data cannot be determined by other means;

d) the new IFP differs significantly from existing IFPs;

e) the IFP is RNP AR;

f) the IFP is Helicopter PinS; and

g) required by CAAP (see 4.4.11).

4.4.8.10 Should flight validation be found necessary, the result of ground validation including identified issues that may affect the conduct of flight validation must be communicated with the flight validation pilot/ team so as to provide insights on what to expect during the actual flight validation.

Note. - Data validation and the documentation of the validation methodology are normally documented and stored as a quality record.

4.4.8.11 The results of the validation can trigger changes to the initial design. The changes can be communicated to the original designer for review and incorporation, or, the verifier may make the changes and submit them to the designer for verification. It is important that any changes made are clearly documented and traceable.

4.4.8.12 Chapter 5 of this MOS provides a more detailed description of the processes involved in validation of instrument flight procedures.

4.4.9 CONDUCT FLIGHT VALIDATION AND DATA VERIFICATION (STEP 9)

4.4.9.1 *Flight inspection and flight validation*

4.4.9.1.1 For the purposes of quality assurance in the procedure design process, flight inspection and flight validation are separate activities that, if required, may or may not be accomplished by the same entity. Flight inspection is conducted with the purpose of confirming the ability of the navigation aid(s) upon which the procedure is based to support the procedure in accordance with the standards in CAR-ANS Part 10 — Aeronautical Telecommunications and guidance in the Manual on the Testing of Radio Navigation Aids (ICAO Doc 8071). Flight validation is concerned with factors, other than the performance of the navigation aid, that may affect the suitability of the procedure for publication.

4.4.9.1.2 The PDSP does not normally have the expertise necessary to determine under which conditions flight inspection and/or flight validation may be necessary. CAAP is responsible for the overall performance of the procedure, as well as for the quality and suitability of the procedure for publication. For this reason, CAAP, may require a review of the procedure by the FICG or other flight inspection and flight validation organizations as part of the procedure design approval process. This function can also be accomplished during the ground validation if the personnel performing the ground validation are suitably qualified to make determinations concerning flight inspection and/or flight validation requirements. FVPs may participate in the conduct of ground validation as much as IFP designer can participate to the flight validation/inspection activities.

4.4.9.1.3 Chapter 5 of this MOS provides a more detailed description of the processes involved in validation of instrument flight procedures.

4.4.9.1.4 Personnel performing flight inspection duties should be qualified and certified in accordance with applicable ICAO Doc 8071, Volume I, Testing of Ground-Based Radio Navigation Systems. 3.6 of this MOS contains the prescribed minimum qualifications, competency and training requirements for flight validation pilots, including those flight inspection pilots that perform flight validation of IFPs. 3.6 of this MOS also contains the establish standards for the required competency for flight validation pilots. Appendix 5 contains qualifications and training, as well as guidance concerning the skills, knowledge and attitudes (SKA) to be addressed in training and evaluation of flight validation pilots.

4.4.9.2 *Data verification*

4.4.9.2.1 Where the FPD involves a complex new procedure or a significant change to existing procedures/routes in a complex airspace, CAAP should liaise with the major commercial navigation datahouses prior to promulgation.

4.4.9.2.2 This liaison should provide the datahouses with additional advance notice of the proposed changes and should allow them to review the proposed procedures, clarify any outstanding questions and advise CAAP of any technical issues that may be identified.

4.4.9.2.3 Advanced notification of procedures should contain the following elements:

a) graphical layout of the procedure;

b) textual description of the procedure;

c) coding advice, when applicable; and

d) coordinates of fixes used in the procedure.

4.4.10 CONSULT WITH STAKEHOLDERS (STEP 10)

4.4.10.1 At this stage of the development, all stakeholders should be consulted to get their opinion on the proposed procedure. Gathering their input at this stage allows the creation of a statement on the fulfilment of the initially agreed requirements.

4.4.10.2 At this stage, those areas of specific competency that the PDSP does not possess should be validated by the stakeholders competent in that domain. A written statement from those entities, or other proof of concurrence (duly signed minutes of meetings by those entities, emails, etc.) will serve for the approval process of the IFP.

4.4.11 APPROVE IFP (STEP 11)

4.4.11.1 Procedure approval is not the same as operational approval. AANSOO is the office delegated by CAAP to process the approval of IFPs to ensure the that the procedure is quality assured and can safely be integrated in the ATM or aerodrome environment. Whereas, the FSIS oversees operational approval to ensure that the aircraft and its flight crew is qualified to fly the procedure.

4.4.11.2 The IFP must be approved by CAAP, prior to publication and use. The approval process is meant to ensure that all the appropriate steps within the IFP process have been completed, documented and signed off by the competent authority.

4.4.11.3 Approval of the IFP is a formal decision of CAAP that endorses not just the overall implementation process but also the following "control steps" contained within the process ensuring that performance does not deviate from standards:

a) set standards;

b) measure performance;

c) compare performance to standards;

d) determine the reasons for deviations; and then

e) take corrective action as needed.

4.4.11.4 AANSOO validates the "completeness" of the IFP implementation process through a high-level verification process ensuring that the documents are duly signed and that they correspond to what they are meant to be.

a) Approval/ order to proceed;

b) Stakeholders acceptance of the conceptual design;

c) IFP design report;

d) Signature of validator who is a designer not involved in the design project or signed ground validation reports;

e) Flight validation reports;

f) Safety assessment;

g) Stakeholders endorsement of the design intended for approval;

h) Graphical procedure lay-out;

i) Textual description of the procedure; and

j) coding proposal (if applicable).

4.4.11.6 Verification by AANSOO does not focus on the substance of these documents, but more on the veracity that the processes involved in the development and maintenance of an IFP have been conducted by the appropriate qualified and competent staff. See Appendix 2 – "IFP Quality Assurance Checklist" for the checklist employed by AANSOO in performing tasks related to IFP approval.

4.4.11.7 The PANS-OPS safety inspectors may participate in any or all activities in the process as deemed necessary by AANSOO, or as requested by a stakeholder. Further, the PANS-OPS safety inspectors may conduct its own criteria verification, ground validation and/or employ the services of an FVSP to verify validation reports submitted by the PDSP as part of their tasks related to CAAP approval obligations.

4.4.12 CREATE DRAFT PUBLICATION (STEP 12)

4.4.12.1 This step commences when the IFP is approved by the DG or an endorsement from AANSOO is received to proceed with the creation of draft publication.

4.4.12.2 At this stage of the process, all the elements for the draft publication are available.

4.4.12.3 IFP designer forwards the following items produced during the design:

a) A procedure lay-out or draft of the chart to be published or

b) at least the data to be published;

 i) Drawing of the IFP,

 ii) Obstacle/terrain,

 iii) Navaids/Comms,

 iv) Textual information,

 v) Coding tables (if applicable),

 vi) List of points (waypoints/ reporting points) and coordinates,

 vii) Restrictions/ requirements and additional ATC procedures, and

 viii) Other pertinent data to be published.

4.4.12.4 The AIS or charting group develops the chart taking into account all relevant requirements for the safe operation of the procedure.

4.4.12.5 The charting must comply with CAR-ANS Part 4. Additional requirements valid for CAAP in which the procedure is to be implemented should also be considered.

4.4.13 VERIFY DRAFT PUBLICATION (STEP 13)

4.4.13.1 The draft of the new chart developed by the AIS should also be submitted to all stakeholders, particularly the designer and the procedure owner. Once all corrections, comments and suggestions solicited from the stakeholders, the designer and the procedure owner are aggregated, the drafting of the final chart for publication can proceed in consideration of the corrections, comments and suggestions.

4.4.13.2 The designer has to cross-check the final draft of the instrument flight procedure chart must be verified as to completeness and correctness. It is recognized that this may be considered an AIS responsibility also.

Note. - AANSOO may participate in this activity for any regulatory clarifications that may be raised.

4.4.14 PUBLISH IFP (STEP 14)

4.4.14.1 The stakeholders should also receive a copy of the draft publication at this stage to facilitate the data integration and packing while the AIRAC publication process is being implemented.

4.4.14.2 Publication will be in accordance to applicable exiting national regulations.

4.4.15 OBTAIN FEEDBACK FROM STAKEHOLDERS (STEP 15)

4.4.15.1 CAAP enjoins stakeholders (datahouses, ATC and pilots) to forward feedback on the actual use of the IFP via the formal correspondence (mail or e-mail) to the following addresses:

a) ATMSID-AANSOO, CAAP, Old MIA Road, Pasay City, 1300, Philippines; or

b) atmid.caap.gov.ph; or

c) Stakeholders may also provide feedback regarding published aeronautical information through the Philippine AIS HELPDESK:

AIS HELPDESK	AIS Operations
Postal Address	Ground Floor Philippine Air Traffic Management Center, Civil Aviation Authority of the Philippines, MIA Road, Pasay City 1300, Philippines
Telephone	(632) 8672-7710, 8672-7782, 8672-7785
Fax	(632) 8672-7783
Hours of Operation	H24
AFTN	RPLLYOYX
Official E-mail Addresses	phil.aisops@gmail.com (Primary)

4.4.15.2 PDSPs are advised to communicate the above information to the stakeholders.

4.4.15.3 CAAP appreciates any feedback from these stakeholders and shall treat it as particularly relevant.

4.4.15.4 CAAP also enjoins the PDSPs to conduct regular meetings and/or consultation (questionnaires) with stakeholders for the purpose of soliciting feedbacks regarding use of an IFP. Feedbacks solicited thru these means shall be forwarded to CAAP in the same manner described in 4.4.15.1.

4.4.15.5 In addition, CAAP gathers feedbacks regarding use of an IFP thru safety reports (mandatory or voluntary).

4.4.15.6 Feedback from stakeholders directly forwarded to CAAP shall be communicated to the concerned PDSP management. The management of the PDSP should then analyze the feedback. Elements that generate positive feedback should be considered for other procedures. Negative feedback should be evaluated. Any problems encountered or implementation issues identified should be carefully assessed with the procedure designers so that corrective action can be initiated as appropriate. The corrective action can range from minor corrections to the publication to a complete revision of the procedure.

4.4.15.7 Any decision/action by the PDSP management brought about by the feedback from stakeholders shall be documented and advised to AANSOO.

4.4.16 CONDUCT CONTINUOUS MAINTENANCE (STEP 16)

4.4.16.1 Continuous maintenance of the procedure shall be the joint responsibility of all the stakeholders concerned such as ADMS, ATS, CNS, AIS, Aerodrome Operators, etc., the PDSPs (as determined and notified by AIS) ensure that significant changes to obstacles, aerodrome, aeronautical and navaid data are assessed for their impact on the IFP. If action is required, return to Step 1 to reinitiate the process.

4.4.16.2 An authorized designer's responsibility for maintaining an IFP as designed under the designer's certificate of authorization or as delegated by CAAP in the case of AFPDD shall be in accordance to the processes and requirements stipulated. Herein, unless stipulated under CAR-ANS Part 16, 16.21.4.

4.4.16.3 Criteria changes are assessed only if required or during the next periodic review. Criteria changes may also be considered in cases where there would be a significant advantage to the user.

4.4.16.4 The airport or aerodrome authority takes responsibility for updating relevant data (e.g. aerodrome data) and the protection of the Obstacle Limitation Surfaces (OLS). When there is new or updated data or when the OLS are infringed, close cooperation with the Aeronautical Information Services (AIS) and designer for obstacle assessment on the IFP is needed. It is important to set up an agreement for relevant airport/obstacle data to be provided to the procedure designer. In the case where an obstacle will not infringe OLS surfaces, the procedure designer should also conduct an obstacle assessment to ensure that the procedures will not be affected.

4.4.16.5 Continuous maintenance of the procedure shall be the joint responsibility of all the stakeholders concerned such as ADMS, ATS, CNS, AIS, aerodrome operators, air operators, etc. It is also vital that agreements between the PDSPs and the other stakeholders be developed to ensure that significant changes and safety issues encountered during implementation of an IFP be provided to the PDSP responsible for the particular IFP.

4.4.16.6 The review of IFP during this step focuses only on a relevant particular part of the IFP.

4.4.16.7 Maintenance differs from the periodic review as it has no specific time for implementation, but rather is triggered for specific reason, such as but not limited to:

a) Feedback from users/stakeholders (see 4.4.15);

b) ATS wants modified trajectories for flow segregation and other ATC concerns;

c) Pilots not satisfied with final approach gradient;

d) Design criteria update/modification that is safety critical and there is significant advantage to the user;

e) Change in input data with safety critical impact;

f) Change in length of runway;

g) Change in PAPI slope; and

h) Others.

4.4.16.8 Basically, amendment or a redesign of an IFP may be implemented if there is immediate need, otherwise, amendment or redesign of an IFP may be initiated after the periodic review (4.4.17) to allow more accurate and updated data to come in therefore waste of efforts and resources can be avoided.

4.4.17 CONDUCT PERIODIC REVIEW (STEP 17)

4.4.17.1 In accordance to 1.8, the PDSPs should review the IFPs they developed and are tasked to maintain. The PDSPs should ensure that all changes to obstacles, aerodrome, aeronautical and navaid data, changes to criteria, user requirements and depiction standards are assessed. If action is required, return to Step 1 to reinitiate the process.

4.4.17.2 An authorized designer's responsibility for periodic review of an IFP under the designer's certificate of authorization or as delegated by CAAP in the case of AFPDD is designated to the PDSP in charge of the initial design or latest amendment thereto in accordance to the processes and requirements stipulated herein, unless in the evet specified under CAR-ANS Part 16, 16.22.4.

4.4.17.3 It is important to note that the IFP process, as such, does not have an "end" box. The quality process extends over the entire life cycle of the procedure. When the procedure is decommissioned, specific activities are needed to allow the withdrawal of an active procedure.

4.4.17.4 The quality assurance activities can be discontinued when the procedure has been removed from the publications and is no longer available for operation.

4.4.17.5 It is required to keep the quality assurance documentation for at least five (5) more years to allow traceability for later purposes.

4.4.17.6 CAAP through AANSOO's oversight activities will verify that this step is being implemented.

Note. – See also 3.4.2.

CHAPTER 5

VALIDATION OF INSTRUMENT FLIGHT PROCEDURES

5.1 PURPOSE AND OBJECTIVE

5.1.1 The purpose of validation is to obtain a qualitative assessment of procedure design including obstacle, terrain and navigation data, and provide an assessment of flyability of the procedure so as to ensure a proper standard for all publications.

5.1.2 The objective of conducting validation is to ensure safety, data accuracy and integrity and flyability of the instrument flight procedure. The validation process applies to fixed wing and helicopter instrument flight procedures.

5.2 VALIDATION PROCESS

5.2.1 The full validation process includes ground validation and flight validation.

5.2.2 Ground validation must always be undertaken. It encompasses a systematic review of the steps and calculations involved in the procedure design as well as the impact on flight operations by the procedure. It must be performed by a person(s) trained in flight procedure design and with appropriate knowledge of flight validation issues.

5.2.3 Ground validation consists of an independent IFP design review and a pre-flight validation. Flight validation consists of a flight simulator evaluation and an evaluation flown in an aircraft. An overview of the necessary steps in the validation process can be found in Figure 5-1. The validation process of IFP(s) must be carried out as part of the initial IFP design as well as an amendment to an existing IFP.

5.2.4 When CAAP can verify, by ground validation, 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, then the flight validation requirement may be dispensed with.

Note. - Obstacle and navigation data verified by CAAP may be in the form of recently updated AIP and duly signed Airfield Update Reports as attested by data owners (i.e. aerodrome operator, ADMS Survey Team, CNS service provider) thoroughly reviewed and endorsed by AANSOO for publication.

5.2.5 Flight validation is required under the following conditions:

a) the flyability of a procedure cannot be determined by other means;

b) the procedure requires mitigation for deviations from design criteria;

c) the accuracy and/or integrity of obstacle and terrain data cannot be determined by other means;

d) the new IFP differs significantly from existing IFPs;

e) the IFP is RNP AR;

f) the IFP is Helicopter PinS; and

g) required by CAAP (see 4.4.11).

5.2.6 The validation process flow diagram in the context of the flight procedure design process is as follows:

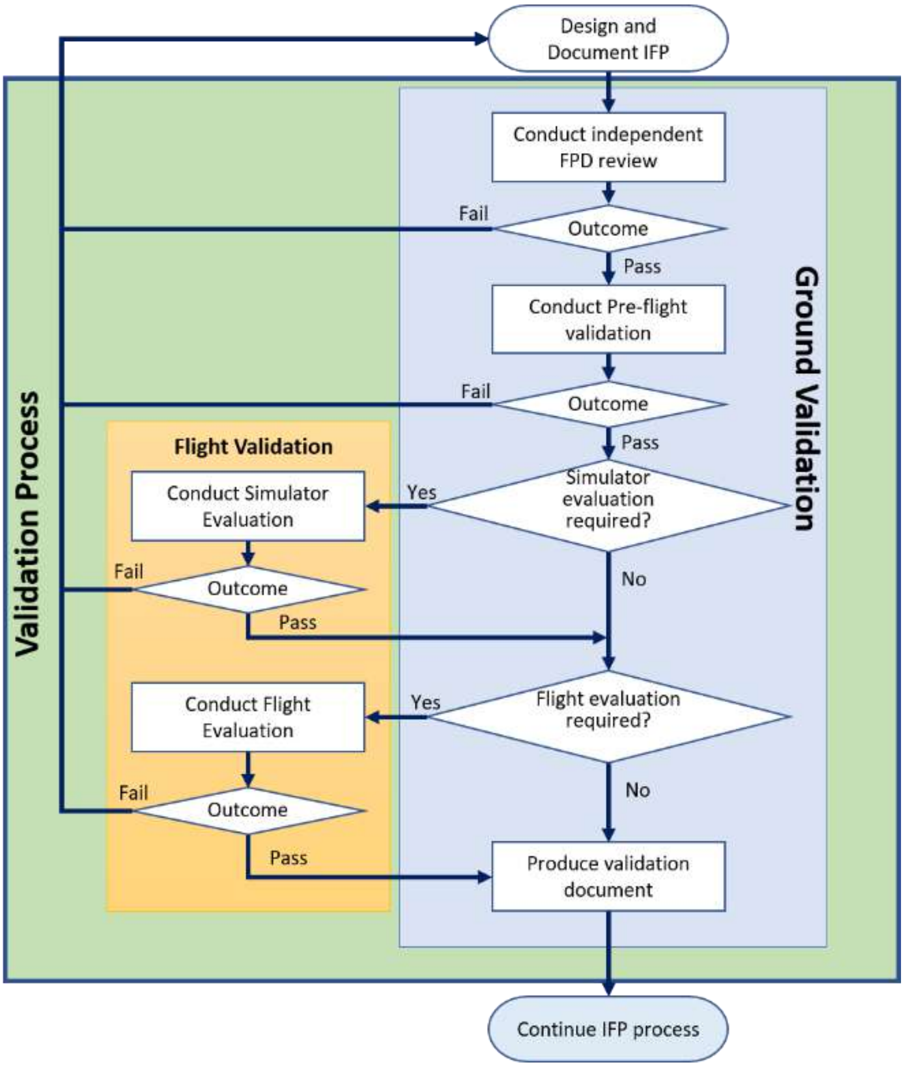


Figure 5-1. Validation process flow chart

5.3 VALIDATION REPORT AND DOCUMENTATION

5.3.1 As part of the flight procedure design documentation, a validation report should be completed at the end of the process including reports of individual steps performed. The minimum requirements are the:

a) name and signature of the validation experts (flight procedure designer and/or flight validation pilot),

b) date,

c) activities performed,

d) type of simulator or aircraft,

e) any findings and flight validation pilot comments and operational recommendations.

5.3.2 If a flight validation is performed, a printed graphic and/or electronic file of sufficient detail that depicts the flight track flown must be included in the report. Such a file should show procedure fixes, the maximum and minimum altitude, ground speed, climb rate and climb gradient and a comparison of the actual track flown with the desired track of the instrument flight procedure.

5.4 VALIDATION PROCESS DESCRIPTION

Phase	**STEP 1**	**Conduct Independent IFP Design Review**
Ground Validation	**Description**	Review of the IFP design package by a flight procedure designer other than the one who designed the procedure. • Confirm correct application of criteria • Confirm data accuracy and integrity • Verify mitigations for deviations from design criteria • Verify draft chart is provided and correct • Confirm correct FMS behavior through the use of desktop simulation tools (if required) • Perform obstacle assessment for cases where obstacle/terrain data accuracy and integrity cannot be guaranteed (if required) (see Appendix 9)
	Input	Detailed report of IFP design
	Output	Approval to proceed forward in the validation process
	Parties Involved	• Flight procedure designer • Any other appropriate stakeholder, such as: ➢ FVP ➢ ARINC 424 database coder ➢ Airports ➢ Airspace designers
	Quality Records	GV report
	References	• ICAO Doc 8168, Volumes. I and II • CAR-ANS Parts 4, 10, 11, 15, CAR Aerodromes • PCAR Part 8 • ICAO Doc 9368 • ARINC 424 • This MOS • AIP Philippines • Applicable CAAP regulations
Phase	**STEP 2**	**Conduct Pre-Flight Validation**
Ground Validation	**Description**	Determination of impact of IFP on flight operations by a person(s) with appropriate knowledge of flight validation issues (best practice: flight validation pilot). The goal of PV is to familiarize and identify potential issues in the procedure

		design from a flight operational perspective. The necessary further steps in the validation process are determined. • Inventory and review IFP package • Evaluate ARINC 424 data and coding • Review special operational and training requirements • Coordinate operational issues • Determine required further steps in the validation process

	Input	• IFP package including:
		  ➢ IFP graphical depiction
		  ➢ Submission forms
		  ➢ Charts/ maps
		• Flight inspection records for navaids/sensors used in the development of IFP
		• Safety assessment report as applicable

	Output	• Approval to proceed with the validation process. If correction is required, return IFP to designer to reinitiate validation process after correction. • Determination of further steps in the validation process • Crew and required aircraft scheduling • Determination of required weather minima and navaids to proceed to FV • Determination of FI requirements in conjunction to FV • Determination of simulator evaluation requirements • Input to final safety assessment report as applicable

	Parties Involved	• FVP
		• Flight procedure designer
		• Any other appropriate stakeholder, such as:
		  ➢ ATC
		  ➢ Airports
		  ➢ Flight inspection/validation service provider

	Quality Records	PV report
	References	• CAR-ANS Parts 4, 10, 11, 15, CAR Aerodromes • PCAR Part 8 • ICAO Doc 8071 • ICAO Doc 8168, Volumes I and II • Quality Assurance Manual for Flight Procedure Design (ICAO Doc 9906) • ARINC 424 • Applicable CAAP regulations • CAAP forms (see appendices)
Phase	**STEP 3**	**Conduct Simulator Evaluation**
Flight Validation	**Description**	Recommended step for complex procedures or procedures requiring waiver/mitigation for deviations from design criteria. • Verify chart depictions and details • Assess flyability and Human Factors • Conduct associated validation tasks • Record flight validation

		• Document the results
	Input	• IFP graphical depiction • ARINC 424 IFP database
	Output	• Flyability validation • Input to final safety assessment report as applicable • Recorded data • Findings and operational mitigations
	Parties Involved	• FVP • Flight procedure designer as appropriate
	Quality Records	• Flight simulator evaluation report • Findings and operational mitigations
	References	• Quality Assurance Manual for Flight Procedure Design (ICAO Doc 9906) • This MOS
Phase	**STEP 4**	**Conduct Flight Evaluation**
Flight Validation	**Description**	Perform flight evaluation in order to: • Verify data • Verify chart depictions and details • Assess obstacle infrastructure • Assess airport infrastructure • Assess flyability and Human Factors • Conduct associated validation tasks • Record flight validation
	Input	• FV package • SIM evaluation report (if available)
	Output	• Validated IFP • Findings and operational mitigations • Input to final safety assessment report as applicable • Recorded data
	Parties Involved	• FVP • Flight procedure designer as appropriate
	Quality Records	• Findings and operational mitigations • Recorded data
	References	• Manual on Testing of Radio Navigation Aids (ICAO Doc 8071) • Quality Assurance Manual for Flight Procedure Design (ICAO Doc 9906) • CAR-ANS Part 4 and MOS-Aeronautical Charts • ICAO Doc 8168, Volume II
Phase	**STEP 5**	**Produce Validation Report**
Ground Validation	**Description**	This final step is to assure proper completeness of all forms and reports to validate the entire FPD package. The validation report should consist of individual reports of all steps performed in the validation process.
	Input	• Findings and operational mitigations • Recorded data
	Output	• Validation report • Flight Inspection report (when performed)

	Parties Involved	• FVP and/or • Flight procedure designer
	Quality Records	• GV report • FV report • Flight inspection report (when performed)
	References	• Quality Assurance Manual for Flight Procedure Design (ICAO Doc 9906) • CAAP forms (see appendices)

5.5 PREPARATION FOR VALIDATION

This section describes various activities that should be performed prior to the validation process.

5.5.1 *Procedure package*

5.5.1.1 The procedure package, provided by the procedure design service provider, must contain the following minimum data in an acceptable format to conduct a validation.

5.5.1.2 The IFP package includes:

a) IFP summary;

b) proposed instrument procedure chart/depiction of sufficient detail to safely navigate and identify significant terrain, obstacles and obstructions;

c) proposed ARINC 424 path terminators (for PBN procedures only);

d) list of relevant obstacles, identification and description of controlling obstacles and obstacles otherwise influencing the design of the procedure, waypoint fix lat/long, procedural tracks/course, distances and altitudes;

e) airport infrastructure information, such as visual aids (ALS, VASIS);

f) information on aerodrome obstacle limitation/safeguarding processes applied;

g) any special local operational procedure (e.g., noise abatement, non-standard traffic patterns, lighting activation);

h) detailed listing of deviations from design criteria and safety assessment with proposed mitigation;

i) For non-standard IFP: training, operational or equipment procedure specific requirements; and

j) appropriate validation checklist and report forms.

5.5.2 *Flight inspection*

Flight inspection may be required to assure that the appropriate navigation system (radio navigation aid/navigation sensor, GBAS data broadcast and/or final approach segment (FAS) data) adequately supports the procedure. Flight inspection is carried out as part of the program detailed in ICAO Doc 8071 and CAR-ANS Part 10. Flight inspection must be performed by a qualified flight inspector using a suitably equipped aircraft.

5.5.3 *Data integrity and ARINC encoding requirements*

Flight procedures to be validated should be contained in the suitable navigation system (i.e. FMS). The procedure may be on a pre-production custom navigation database. It could be downloaded from an electronic media with adequate data integrity protection such as CRC wrapping. If no other means exist manual entry is permissible if sufficient mitigation means have been considered and implemented. All procedure coding data must originate from the official data source.

5.5.3.1 Custom navigation database (preferred method)

A navigation database can be customized by an official database supplier to include procedures for flight validation. A customized navigation database is the most desirable source because it will contain a normal operational navigation database and new official source coded flight procedures for validation/inspection.

The custom navigation database should be updated on a periodic schedule.

5.5.3.2 Electronic media

Some procedure design tools output an electronic ARINC 424 code of the final procedure that can be input to commercial aircraft flight management systems. This process, when used with cyclic redundancy checks, ensures that the procedure design remains unchanged through the final production chain thus ensuring a high degree of data integrity.

5.5.3.3 Manual entry

This method of entry should be limited to LNAV procedures only. It should be used sparingly and requires additional verification steps to confirm proper data entry. If the navigation system used allows manual input of ARINC path/terminators they should be used. It is recommended that the coded procedure provided by an official database supplier be used as soon as available, to confirm appropriate coding prior to public use.

5.6 STEP BY STEP DESCRIPTION OF ACTIVITIES WITHIN THE PROCESS

The validation process consists of two phases, namely; ground validation and flight validation. Ground validation must always be performed. Each phase consists of several important steps as illustrated in Figure 5-1. The following subsections reflect all the steps of the process flow shown in Figure 5-1 and provide additional comments and explanations.

5.6.1 *Step 1, Conduct Independent Procedure Design Review*

A flight procedure designer other than the one who designed the procedure must perform this step. The designer can be assisted by specialists in other fields of expertise as necessary.

5.6.1.1 *Confirm correct application of criteria*

The use of the correct design criteria in PANS-OPS, Volume II or ICAO Doc 9905 and their correct application should be assured. Depending on the complexity and downstream verification and validation processes involved in the design, this step can be achieved by assessing and recalculating every single element of the procedure design or by performing selected checks and calculations as appropriate.

5.6.1.2 *Confirm data accuracy and integrity*

The origin of any data (airport data, navigation aids data, waypoints data, obstacles data, terrain data) should be known. Using data from a known source usually allows the accuracy and the integrity of the data to be determined. If data from unknown sources is used or if data accuracy and/or integrity cannot be adequately determined, the data should be validated. This can be done through flight validation or through CAAP-approved ground-based methods (see 5.6.1.6).

Note: - Obstacle and navigation data verified by CAAP may be in the form of recently updated AIP and duly signed Airfield Update Reports as attested by data owners (i.e. aerodrome operator, ADMS Survey Team, CNS service provider) and thoroughly reviewed and endorsed by AANSOO for publication.

5.6.1.3 *Verify mitigations for deviations from design criteria*

If deviations from procedure design criteria are used, mitigations must provide an acceptable level of safety. A flight evaluation should be performed to verify the acceptability of previously performed safety studies.

5.6.1.4 *Verify a draft chart (if required) is provided and is correct*

A draft chart is required to conduct a flight validation. It should be verified that a draft chart is provided and contains the required elements to perform the flight validation efficiently.

5.6.1.5 *Confirm correct FMS behavior using desktop software simulation tools (if required)*

The correct translation of a procedure into ARINC 424 code can initially be assessed with a desktop simulation tool. Such tools provide feedback of the correct selection of ARINC 424 path terminators as well as any issues with the choice of waypoint positions and segment lengths (e.g. route discontinuity).

5.6.1.6 *Perform obstacle assessment with CAAP-approved ground-based methods (if required)*

5.6.1.6.1 For cases where obstacle and/or terrain data accuracy and/or integrity cannot be guaranteed, ground-based obstacle assessment methods can provide an alternative to an assessment with an aircraft. Ground-based methods acceptable to CAAP includes on-site obstacle survey using industrial-grade handheld GPS and range finders with vertical accuracy of at least ± 3meters and lateral accuracy of at least ± 3meter under ideal conditions. The use of drones is encouraged, provided, the drone operation is conducted in accordance to CAAP regulations on the use of RPAS. The ground validation report should include, the individual/ group who conducted the on-site survey, their signatures, the findings of the activity, a description of the methodology employed with the accuracy specifications of the equipment used.

5.6.1.6.2 Contracting of surveyors, geodetic engineers are also accepted, as long as the designer or the verifier of the IFP is present during the surveying activity to ensure that the correct areas of concern are properly assessed for completeness and correctness of obstacle data.

5.6.2 *Step 2, Conduct Pre-Flight Validation*

Pre-flight validation must be conducted by a person(s) trained in flight procedure design and with appropriate knowledge of flight validation issues. This may be a joint activity by flight procedure designers and pilots. The pre-flight validation should identify the impact of a flight procedure to flight operations, and any issues identified should be addressed prior to the flight validation. The pre-flight validation determines the subsequent steps in the validation process.

5.6.2.1 *Conduct inventory and review IFP package*

The person(s) performing the pre-flight validation must ensure that the IFP documentation is complete and all necessary charts, data and forms are available. As a minimum, the following tasks must be performed:

a) Ensure completeness of package (all forms, files and data included) as described in 5.5.1 of this MOS.

b) Ensure charts and maps are available in sufficient detail for assessment of the IFP during the FV.

c) Familiarize with target population of the procedure (e.g. aircraft categories, type of operation).

d) Discuss the procedure package with the procedure designer, as necessary.

e) Verify procedure graphics and data match.

f) Compare the IFP design, coding and relevant charting information against the navigation database used for flight validation.

g) Verify that controlling obstacles and obstacles otherwise influencing the design of the procedure are properly identified.

h) Review airport infrastructure and special airport regulations.

i) Review the navigation infrastructure used by the procedure.

j) Review pertinent flight inspection documentation, if required.

5.6.2.2 *Evaluate data and coding*

5.6.2.2.1 For an IFP based on area navigation, the true course to next waypoint, distances, and altitudes that reflect the flight procedure design must be verified. Leg segment data accuracy must be evaluated by comparison of the procedural waypoint data to the flight plan waypoint data.

5.6.2.2.2 When evaluating CF legs or holding legs (HM, HF, HA), aircraft navigation performance with the instrument procedure design must be compared. Any tolerance to course-to-fix values cannot be applied. Confirmation of proper ARINC coding must be accomplished with either an appropriately equipped aircraft, or by a desktop evaluation of the current navigation database.

5.6.2.2.3 Out-of-tolerance values or questionable ARINC 424 coding must be resolved.

5.6.2.2.4 For an IFP based on ground-based navigation aids, the course, distances, and the FPA indicated on the IFP depiction and submission form of the procedure design should be verified. Where positive course guidance is required by the IFP design, it must be confirmed that the performance of navigation aids meets all required flight inspection tolerances in conjunction with the flight validation.

5.6.2.2.5 Steps to evaluate data and coding:

a) Prepare loadable data and coding.

b) Compare true courses and distances for segments between data file and procedural data.

c) Compare ARINC 424 coding for legs and path terminators between data file and procedural data.

5.6.2.2.6 Where the flight procedure design involves a complex new procedure or a significant change to existing procedures/routes in a complex airspace, CAAP shall liaise with the major commercial navigation data houses prior to promulgation. This liaison should provide the data houses with additional advance notice of the proposed changes and should allow them to review the proposed procedures, clarify any outstanding questions and advise CAAP of any technical issues that may be identified. Advance notification of procedures should contain the following elements:

a) graphical layout of the procedure;

b) textual description of the procedure;

c) coding advice, when applicable; and

d) coordinates of fixes used in the procedure.

5.6.2.3 *Review special operational and training requirements*

a) Review deviations from criteria and equivalent level of safety provided by waivers/mitigations.

b) Review safety case supporting the waiver/mitigation.

c) Assess restricted procedures for special training and equipment requirements.

5.6.2.4 *Document the results of the pre-flight validation*

a) Determine if flight inspection is necessary.

b) Determine need for flight simulator evaluation, especially where there are special or unique design considerations.

c) Determine need for flight evaluation in the aircraft, especially where there are special or unique design considerations, when accuracy/integrity of data used in the IFP design and/or the aerodrome environment is not assured.

d) Record specific additional actions required in a flight validation (if required).

5.6.2.4.1 A flight validation (simulator and/or aircraft as required) is required when conditions listed under 5.2 exists.

5.6.2.4.2 However, a flight evaluation is required in the following cases:

a) procedures where runway or landing location infrastructure have not been previously assessed in flight for instrument operations; and

b) as determined by CAAP.

   i) Provide a detailed written report of the results of the pre-flight validation. (See Appendix 6 for fixed wing sample report forms. See Appendix 7 for helicopter sample report forms.)

5.6.2.5 *Coordinate operational issues (if flight evaluation is required)*

a) Consideration should be given to temperature and wind limitations, air speeds, bank, angles, climb/descent gradients, etc.

b) Determine aircraft and equipment required to complete the flight validation of the IFP.

c) Determine airport infrastructure and navigation aid/sensor availability.

d) Check weather minima and visibility required for the flight validation. Initial assessment must be conducted in daylight conditions in VMC in each segment with visibility requirements sufficient to perform obstacle assessment.

e) Assess the need for a night evaluation in the case of at least one of the following circumstances:

   i) IFP developed for airport with no prior IFR procedures;

ii) IFP to newly constructed runways or to runways lengthened or shortened;

iii) addition or reconfiguration of lights to an existing system already approved for IFR operations; and

iv) circling procedures intended for night use.

f) Coordinate with ATS and other stakeholders, in accordance with the instrument flight procedure process.

5.6.3 *Step 3, Conduct Simulator Evaluation*

5.6.3.1 A simulator evaluation must be accomplished by a qualified and experienced flight validation pilot (FVP), certified or approved by CAAP.

5.6.3.2 To provide an initial evaluation of database coding, flyability, and to provide feedback to the procedure designers, a simulator assessment might be necessary. Simulator evaluation must not be used for obstacle assessment. Preparation for the simulator evaluation should include a comprehensive plan with description of the conditions to be evaluated, profiles to be flown and objectives to be achieved. A review of the results of the simulator evaluations should be completed before the flight evaluation.

5.6.3.3 The simulator used, should be suitable for the validation tasks to be performed. For complex or special procedures where simulator evaluation is desired, the evaluation should be flown in a simulator, which matches the procedure requirements. When the procedure is designed for a specific aircraft model or series and specific FMS and software, the simulator evaluation should be flown in a simulator with the same configuration used by the operator in daily operations.

5.6.3.4 Required navigation performance authorization required (RNP AR) IFP(s) must always undergo simulator evaluation.

5.6.3.5 Simulator steps:

a) *Evaluate the suitability of simulator equipment*

i) FMS and avionics.

ii) Simulator type and/or category.

b) *Conduct simulator evaluation*

i) Evaluate flyability.

ii) Evaluate database coding and accuracy.

iii) Verify that waivers/mitigations for deviations from design criteria do not compromise safety.

iv) Where permitted by the simulator, evaluate any other factors (such as wind, temperature, barometric pressure etc.) that may be pertinent to the safety of the procedure.

c) Document the results of the simulator evaluation

i) Assess whether the IFP is ready for further processing in the validation process.

ii) Provide a detailed written report of the results of the simulator evaluation.

5.6.3.6 *Assess flyability and human factor*

5.6.3.6.1 To assess the flyability and human factor issues, at least one on-course/on-path of the proposed procedure in an appropriate aircraft capable of conducting the procedure should be flown. If different minima are provided for the same final segment (e.g. LNAV, LNAV/VNAV, LPV), the evaluation of the final segment must be accomplished on separate runs. See Appendix 8 for more detailed Human Factors information.

5.6.3.6.2 The objectives of flyability assessment of instrument flight procedures are:

a) evaluate aircraft maneuvering areas for safe operations for each category of aircraft for which the procedure is intended; and

b) review the flyability of the instrument procedure as follows:

i) Fly each segment of the IFP on-course and on-path.

ii) Validate the intended use of IFP as defined by stakeholders and described in the conceptual design.

iii) Evaluate other operational factors, such as charting, required infrastructure, visibility, intended aircraft categories, etc.

v) iEvaluate the aircraft maneuvering area for safe operations for each category of aircraft to use the IFP.

v) Evaluate turn anticipation and the relationship to standard rate turns and bank angle limits.

vi) Evaluate the IFP complexity, required cockpit workload, and any unique requirements.

vii) Check that waypoint spacing and segment length are suitable for aircraft performance.

viii) Check distance to runway at decision altitude/height or minimum descent altitude/height that are likely to be applied by operators and evaluate the ability to execute a landing with normal maneuvering.

ix) Evaluate required climb or descent gradients, if any.

x) Evaluate the proposed charting for correctness, clarity, and ease of interpretation.

xi) Evaluate TAWS warnings.

5.6.3.6.3 The flyability assessment must be flown at speeds and aircraft configurations consistent with the normal instrument flight rules (IFR) operations and meet the design intent (aircraft category). The final approach fix to threshold of an instrument approach procedure must be flown in the landing configuration, on profile, on speed with the

Terrain Awareness Warning System (TAWS) active. Flyability should be evaluated with the simulator/aircraft coupled to the autopilot (to the extent allowed by the aircraft flight manual or SOP(s)) and may require additional evaluation by hand flying.

5.6.3.6.4 Aircraft category restrictions might be published and must be confirmed acceptable. In every case, the pilot is required to pay particular attention to the general safe conduct of the procedure and efficiency of the flight for the intended aircraft category.

Note. - It is recommended that if different minima are provided for the same final segment (e.g. LNAV, LNAV/VNAV, LPV), that the evaluation of the final segment is accomplished on separate runs.

5.6.3.7 *Document the results of the flight simulator evaluation*

A detailed written report needs to be provided of the results of the flight simulator evaluation. (See Appendix 6 for fixed wing sample report forms. See Appendix 7 for helicopter sample report forms.)

5.6.4 *Step 4, Conduct Flight Evaluation*

5.6.4.1 Flight evaluation must be accomplished by a qualified and experienced flight validation pilot (FVP), certified or approved by CAAP.

5.6.4.2 The objectives of a flight evaluation are to validate the intended use of IFP as defined by stakeholders and described in the conceptual design and to evaluate other operational factors, such as charting, required infrastructure, visibility, intended aircraft category, etc.

5.6.4.3 The FVP must occupy a seat in the cockpit with visibility adequate to conduct the flight validation, and additional crew members must be briefed on FV requirements. Only task related persons should normally be allowed on such flights.

5.6.4.4 Ground track path error performance varies with mode of flight guidance system coupling. New procedures should be evaluated coupled to the flight director and autopilot (when not prohibited). Lateral and vertical disconnects from the autopilot/flight director should be evaluated.

5.6.4.5 Procedures design is based on true altitudes. Flight evaluation should be conducted at true altitudes with consideration for temperature variations from standard day. Lateral and vertical transitions from departure, en-route, descent, and approach must produce a seamless path that ensures flyability in a consistent, smooth, predictable, and repeatable manner.

5.6.4.6 The procedure must be flown in the navigation mode using the correct sensor, or with navigation equipment that permits the flight to be conducted at an equivalent level of performance, as required by the design. For example, for IFP based on GNSS, it needs to be ensured that only the GNSS sensor is utilized during the FV. All following required steps should be adapted to the specifics of each design and IFP:

a) Conduct an assessment of flyability to determine that the procedure can be safely flown.

b) Provide the final assurance that adequate terrain and obstacle clearance has been provided.

c) Verify that the navigation data to be published is correct.

d) Verify that all required infrastructure, such as runway markings, lighting, and communications and navigation sources are in place and operative.

e) Ensure the documentation of navigation systems confirms the applicable navigation system(s) (navigation aid/sensor, GNSS, radar, etc.) supports the procedure.

f) Evaluate other operational factors, such as charting, required infrastructure, visibility, intended aircraft category, etc.

g) Verify that waivers/mitigation for deviations from design criteria do not compromise safety.

Note. - Where applicable, credit for the results of a simulator evaluation can be given.

5.6.4.7 For complex procedures including Helicopter PinS and RNP AR, additional flyability checks are required in the proponent’s aircraft or simulator.

5.6.4.8 IFP(s) based on SBAS or GBAS require analysis of additional parameters contained in the final approach segment (FAS) data block and data link (GBAS). These parameters include:

a) glide path angle;

b) threshold Crossing Height (LTP or FTP);

c) landing threshold point (LTP) coordinates or fictional threshold point (FTP); and

d) final path alignment point (FPAP) coordinates.

5.6.4.9 Verification of the spatial data contained in the final approach segment definition is required. Any error in the coded data with respect to the proper reference datum may result in improper final approach guidance to the pilot. The FAS data evaluation system must be capable of performing the necessary analysis in a documented, quantitative process as described in paragraph 5.6.4.10.2.

Note. - For GBAS, additional inspection requirements are specified in the ICAO Manual on Testing of Radio Navigation Aids (ICAO Doc 8071, Volume II; Chapter 4).

5.6.4.10 *Verify data*

It is essential that the data used in the procedure design is consistent in the charts, flight management system (FMS) data, or suitable navigation system data. The validation flights (simulator or aircraft) should be recorded with a collection/recording device that archives the procedure and aircraft positioning data (see paragraph 5.6.4.15, record flight validation). The procedure development package, charts, and airport data must match. It is recommended that PBN procedures are packed and loaded electronically into the FMS or suitable navigation system without manually coding the ARINC 424 path/terminator data. Integrity measures such as cyclic redundancy check (CRC) should be used to assure that data are not corrupted. This allows evaluation of the data as designed, without manipulation. If the procedure waypoint data is manually entered into the FMS, it must be independently compared to the procedure data to ensure they match.

5.6.4.10.1 *Steps to data verification*

a) Ensure the data from the flight validation database matches that used in the procedure design.

b) Ensure the data produces the desired flight track.

c) Ensure that the final approach course glide path deliver the aircraft to the desired point in space.

5.6.4.10.2 *SBAS/GBAS FAS data requirements*

5.6.4.10.2.1 For SBAS and GBAS FAS data, the LTP/FTP latitude and longitude, the LTP/FTP ellipsoid height and the FPAP latitude and longitude contribute directly to the final approach alignment and angle. Corrupted data may skew lateral, vertical, and along track alignment from the intended design. A direct assessment should be made of the LTP latitude/longitude, LTP ellipsoid height, and FPAP latitude/longitude coordinates used in the procedure design. This may be accomplished using a survey grade GNSS receiver on the runway threshold while making a comparison with the actual final approach segment data to be published. Another indirect method is to evaluate the following IFP characteristics as a means of validating the FAS data.

5.6.4.10.2.2 Horizontal course characteristics:

a) misalignment type, linear or angular; and

b) measured angular alignment error in degrees (when applicable) and linear course error/offset at the physical runway threshold or decision altitude point.

5.6.4.10.2.3 Vertical path characteristics:

a) achieved/measured TCH/RDH; and

b) glide path angle.

5.6.4.11 *Assess obstacles*

Detailed guidance regarding obstacle assessment is contained in Appendix 9. In general, obstacles should be visually assessed to the lateral limits of the procedure design segment. The aircraft should be positioned in a manner that provides a good view of the obstacle environment that is under consideration. This may require flying the lateral limits of the procedure protection areas in order to detect if unaccounted obstacles exist. The controlling obstacle should be verified for each segment of the IFP. Should unaccounted obstacles be observed, further investigation by the FVP is required.

5.6.4.12 *Assess flyability and human factor*

The same provisions as in 5.6.3.6 apply.

5.6.4.13 *Conduct associated validation tasks*

5.6.4.13.1 The following associated tasks should be performed in conjunction with the obstacle or flyability assessment as appropriate:

a) Verify that all required runway markings, lighting, and communications are in place and operative in accordance to MOS-Aerodromes.

b) Verify whether all weather equipment are in place in accordance with CAR-ANS Part 3 and MOS-Aerodromes.

c) Verify that any required navigation aids/sensors have been satisfactorily flight inspected to support the procedure design.

d) Ensure that the components of the Visual Approach Segment Indicator System (VASIS) angles appear as intended or charted when evaluating vertically guided procedures.

e) Adequate ATS communications according to CAR-ANS Parts 10 and 11 must be available.

f) Where required, ensure radar coverage is available for all portions of the procedure.

g) Indicate any TAWS warnings or alerts. Record details of the alert to include latitude/longitude, aircraft configuration, speed, and altitude.

h) If night evaluation is required, determine the adequacy of airport lighting systems prior to authorizing night operation. Conduct night evaluations during VMC following appropriate daytime evaluation.

5.6.4.13.2 The light system needs to be evaluated for:

a) correct light facilities (particularly if pilot activated) and light patterns as charted; and

b) local lighting pattern in the area surrounding the airport to ensure they do not distract, confuse, or incorrectly identify the runway environment.

5.6.4.13.3 It needs to be verified that waivers/mitigations for deviations from design criteria do not compromise safety.

5.6.4.14 *Verify chart depiction and details*

a) Check to ensure the chart has sufficient detail to safely navigate and identify significant terrain or obstacles.

b) Ensure all required notes are included (e.g. DME required, do not confuse RWY 14 with RWY 16, non-standard approach angle etc.)

c) Ensure that the chart accurately portrays the procedure in both plan and profile view and is easily interpreted. Ensure flight track matches chart and takes aircraft to designed point.

d) Verify true and magnetic course to next waypoint indicated on the FMS or GNSS receiver accurately reflects the procedure design. (Magnetic courses displayed by the FMS/GNSS navigator may be dependent upon the manufacturer's software processing of magnetic variation.)

e) Verify segment distances indicated by the aircraft navigation system accurately reflect the procedure design.

f) Verify the flight path angle (FPA) indicated on the FMS or GNSS receiver accurately reflects the procedure design.

g) Check that waypoint spacing and segment length are sufficient to allow the aircraft to decelerate or change altitude on each leg without bypassing.

5.6.4.15 *Record flight validation*

5.6.4.15.1 A recording device should be used that is capable of the following: IFP storage, time and 3-dimensional position in space with an acceptable sampling rate (not less than 1 Hz), and ability to post-process recorded data.

5.6.4.15.2 Record and save the minimum following flight data:

a) processing date and time;

b) number of satellites in view;

c) minimum number of satellites;

d) average position dilution of precision (PDOP);

e) maximum observed horizontal dilution of precision (HDOP) (SBAS procedures only);

f) vertical protection level (VPL) (SBAS/GBAS procedures only);

g) horizontal protection level (HPL) (SBAS/GBAS procedures only);

h) maximum observed vertical dilution of precision (VDOP) (SBAS procedures only);

i) for each segment, the maximum and minimum altitude, ground speed, climb rate, and climb gradient; and

j) a printed graphic or an electronic file of sufficient detail that depicts the horizontal (and the vertical for VNAV procedures) flight track flown referenced to the desired track of the approach procedure, including procedure fixes.

Note. - The recording of HDOP, PDOP, VDOP, HPL and VPL are a collection of data in a limited timeframe and their purpose is to document the actual situation at the time of the validation flight.

5.6.4.15.2 SBAS and GBAS IFP(s) require analysis of additional parameters contained in the final approach segment (FAS) data block. FAS data block validation requires verification of the coordinates and heights used in the FAS or by indirect flight inspection system analysis of the IFP characteristics described in paragraph 5.6.4.10.2.

5.6.5 *Step 5, Produce Validation Report*

5.6.5.1 Assess the results of the validation process.

a) Review all aspects of the validation process to complete the assessment.

b) Make a determination of satisfactory or unsatisfactory results, based on criteria adopted by CAAP (ICAO Doc 8168 Vol II and ICAO Doc 9905).

5.6.5.2 For satisfactory validation, complete the IFP processing.

a) Ensure the completeness and correctness of the IFP package to be forwarded.

b) Propose suggestions for improved operation of the procedure, where such factors are outside the scope of the procedure design (e.g. ATC issues).

5.6.5.3 For unsatisfactory validation, return the IFP to the procedure designer(s) for corrections.

a) Provide detailed feedback to the procedure designer(s) and other stakeholders.

b) Suggest mitigation and/or corrections for unsatisfactory results.

5.6.5.4 Document the results of the validation process.

a) Complete a detailed written report of the results of the validation process including justification for any steps in the validation process deemed not required. This involves a compilation of reports provided by the individual steps in the validation process.

b) Ensure any findings and operational mitigations are documented.

c) Forward uncharted controlling obstacle position and elevation data to procedure designer(s).

d) Ensure recorded data is processed and archived together with the IFP and validation documentation.

Note. - Templates of checklists and reports are contained in Appendix 6 (fixed wing) and Appendix 7 (helicopters).

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CHAPTER 6

FLIGHT PROCEDURE DESIGN SOFTWARE VALIDATION

6.1 INTRODUCTION

When automation is used during the procedure design process, ICAO requires that States must ensure that automation functions have been validated to ensure compliance of the final results with applicable criteria.

Implementation of the validation can be carried out by a service provider under CAAP or by delegation to any recognized third party (such as another State, an ATS provider or a private company).

This chapter provides the guidelines for implementing a validation program by a PDSP or any organization intending to engage in FPD software validation; it provides one means, but not the only means, for validation of the functions of procedure design tools. Other means include a Software Safety Assurance System, as part of a Safety Management System (comprising requirements for software assurance level, software verification assurances, software configuration management assurances, software requirements traceability assurances, software requirements validity assurance).

Note. – For software development companies wishing to demonstrate conformance to applicable criteria, ICAO Doc 9906 Vol. 3 may be more useful, as it provides a more detailed guidance.

The term “procedure design tool” stands for any numerical automation system that provides calculations and/or designs and layouts in the field of procedure design. This encompasses products ranging from automated formulas included in spreadsheets to dedicated software packages.

Procedure design tools aim to aid the design of conventional and/or area navigation (RNAV) procedures for the departure, en-route, arrival, terminal and/or approach phases, through a series of dedicated integrated functions. They facilitate design work through a certain level of automation in calculations and procedure layout generation compliant with the applicable criteria. In addition, this automation in calculations contributes to the improvement of data integrity.

Procedure design tools include devices which facilitate the work of the designer during the whole process of procedure design, from data management to the final output (preparation of the publication).

Use of automation is not intended to replace the procedure designer’s expertise.

6.1.1 The Need for Validation of Procedure Design Tools

6.1.1.1 Although procedure design tools are increasingly available to designers and can save significant time when creating designs, as well as improve compliance with collaborative work, they can be misleading if they contain errors, or if procedure design criteria compliance is not ensured through all the Functions provided by such tools. Thus, there is a significant need to define a validation process for procedure design tools. Additionally, the validation is a means for users to gain confidence in a tool.

6.1.1.2 It is recommended that both the procedure design organization using a tool and the procedure design software developer/provider be involved in its validation.

Note. - Validation is an acknowledgement that the standards derived from a series of tests have been complied with, and does not imply any certificate delivery. A procedure design tool validation means that compliance with standards is recognized for most significant cases of the tool use. A validation assumes the existence of applicable standards and a given methodology (guidance and pre-defined tests). Validation may occur after development, using "off-the-shelf" products.

6.1.2 Functional Validation

6.1.2.1 Functional validation consists of confirmation that the automation functions in the tool have been correctly implemented (e.g. when selecting an item in a menu, the item appears), and that the human machine interface complies with the user's requirements. As such, this validation type is dependent upon the user needs and can be carried out during the acceptance phase by the end users. Moreover, the functional validation does not refer to procedure design criteria, but to general specifications (interface and ergonomics, general computerized tool specifications, etc.).

6.1.2.2 Functional validation falls outside of the scope of this manual. However, it may be considered by users in addition to the guidelines provided in this MOS.

6.1.3 Validation with Regard to Criteria

6.1.3.1 Validation with regard to criteria consists of a compliance verification of the results obtained in a series of tests of the tool using applicable criteria. The applied tests must cover all the relevant functions of the tool (including general functions and some input/output functions). These tests should include the comparison between the results obtained with the tool and the ones obtained manually or with a previously validated independent tool. These tests must be carried out according to a predefined list and guidance.

6.1.3.2 The series of tests recommended in this MOS should be considered as a minimum, and the actual validation may include additional tests if deemed relevant.

6.2 REPORT OF THE VALIDATION WITH REGARD TO CRITERIA

6.2.1 The validation process must be recorded in a report that clearly states the criteria that were considered as reference (with dates and reference to the last considered amendment), and the extent of coverage of the software tool with respect to these criteria.

6.2.2 The report must precisely mention all the items that were tested (with detailed results) and the items that were excluded from the validation process. Any limitation to a given function (e.g. altitude restriction for holding patterns) must be recorded.

6.2.3 The validation report must mention the characteristics of the tests (dates, name of individuals that have conducted the tests, etc.). The version of the tool, of the software environment (GIS, CAD, database management system, etc.), and of the operating system that were used must be recorded in the report.

6.2.4 Notes and comments from the final users about the compliance with criteria should be recorded in the validation report.

6.2.5 A template for the validation report is provided in Appendix 10.

6.3 REQUIREMENTS FOR REVALIDATION

6.3.1 Whenever the applicable procedure design criteria are updated, the impact on the procedure design tool must be identified by the procedure design software developer/provider and evaluated. Should the changes have an impact on procedure design tool functions, the corresponding functions of the tool must be revalidated.

6.3.2 Whenever a new version of the software tool is issued, the changes with reference to the previous version must be identified and their consequences must be evaluated. Should the new version include new functions or amendments to previous functions, the tool must be revalidated.

6.3.3 As the computing environment of the software (operating system, GIS or CAD supporting system, database management system, etc.) evolves, the consequences on the tool must, whenever possible*, be identified and evaluated. If deemed necessary, full or partial revalidation should then be conducted.

**It is acknowledged that some updates may not be documented or notified. In those cases, the identification and evaluation of consequences may not be possible.*

6.4 IMPLEMENTING A VALIDATION PROGRAM

This chapter provides practical guidance for preparing and carrying out an actual validation program applied to procedure design tools. It is applicable to initial validation as well as revalidation for new functions and/or updates to the procedure design tool and/or to the system environment.

6.4.1 *Preparation*

6.4.1.1 The procedure design tool validation requires time and effort. It needs to be prepared early enough to ensure proper implementation.

6.4.1.2 For this purpose, it is recommended to develop a work plan defining:

a) the software validation coverage;

b) the overall objective schedule;

c) the available resources;

d) the validation team for the validation process, including the expertise according to the validation coverage;

e) the tasks to be carried out;

f) the roles and responsibilities of each team member for each task; and

g) a tentative detailed work program (work items and timeframe).

6.4.2 *Software Validation Coverage*

6.4.2.1 The software validation coverage corresponds to the overall work program related to the procedure design tool validation and must be based on the extent of the concerned procedure design functions of a given tool, or to the whole tool. It is acknowledged that an individual tool may not include all the procedure design functions and consequently some validation items may not be applicable to each and every tool. It is also recognized that a given user may not require a function included in a given tool. The applicability of each item of the validation manual should thus be determined at the time of the validation execution.

6.4.2.2 The software validation coverage needs to be defined to tailor the validation to the actual procedure design tool subject to validation.

6.4.3 *Tool Testing Requirements*

6.4.3.1 The validation implementation includes a series of tests to be carried out according to the validation coverage.

6.4.3.2 Prior to any validation task, it must be confirmed by the procedure design software developer that hardware and software are installed and configured according to the hardware and software specifications.

6.4.3.3 The validation should take into account the tests that the procedure design software developer may have performed. Whenever possible any evaluations previously performed by the developer should be repeated at the user site. The developer may be able to furnish the user with some of the test data sets to be used for this purpose.

6.4.3.4 The tool testing should follow a predefined written plan with a formal summary of testing and a record of formal acceptance. The tests should cover the full range of operating conditions so that the system can encounter a wide spectrum of conditions and events (detection of any latent faults not apparent during more normal activities).

6.4.3.5 Tool tests should be carried out at the user location, at least for part of the validation program. User site testing should be accomplished in the actual working environment that will be part of the installed system configuration. The testing should be accomplished through use of the tool within the context in which it is intended to function. During user site testing, records should be maintained of both proper system performance and any system failures that are encountered. The revision of the system to compensate for faults detected during this user site testing should follow the same procedures and controls as for any other procedure design tool change.

6.4.3.6 Knowledge of test planning, definition of expected test results, and recording of all test outputs are required. Support in these areas from the procedure design software developer/provider would be beneficial.

6.4.4 *Validation Methodology*

6.4.4.1 The validation methodology includes validation of basic parameters and basic elements as well as modeling of criteria validation through assessment of methods and concepts, input data, output data and graphical checks.

Note. – ICAO Doc 9906, Vol. 3, Chapter 7, provides guidance on the validation methodology that may be applied in implementing FPD software validation program.

6.4.5 *Validation Documentation*

6.4.5.1 During the validation implementation, detailed documentation of the tests being carried out should be compiled. This documentation should include the history of the tests, including input data and test results. A sample of validation documentation is provided in Appendix 10.

6.4.5.2 For the purpose of continuous improvement of the software, the user is encouraged to make the validation documentation available to the procedure design software developer/provider.

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APPENDIX 1

Third-Party PDSP Authorization Process

1.1 Introduction

1.1.1 CAR-ANS Part 16, Section 16.4 - "Requirement for Authorization as a Procedure Designer Service Provider (PDSP)" embodies the requirement that,

"No person or organization, shall design procedures or publish such procedures for air navigation services in Philippine airspace and aerodromes unless he or she belongs to any of the undermentioned categories:

a) *an authorized designer belonging to the following:*

   i) *a recognized procedure design service authority under CAAP as stipulated in CAR-ANS Part 11, Appendix 11.8, 1 (a); or*

   ii) *a 3rd party PDSP that holds a certificate of authorization issued by CAAP;*

b) *the person or organization has a co-operation arrangement with an authorized designer; or*

c) *there is a commercial agreement with an authorized PDSP."*

1.1.2 In general, like in any aviation organizations required to be certified, authorized, licensed or issued any form of regulatory approvals (e.g. Air Operators, ANSPs, Aerodromes, Aircraft Maintenance Organizations, Aviation Training Organizations, and others), all Instrument Flight Procedure Design Service activities shall be performed:

a) By approved Organization, having authorized by the state receiving the service;

b) In accordance with approved documents (e.g. Manual of Operations and Quality Manual);

c) Applying standard ICAO Criteria and/or Installing approved and certified tools (software and/or hardware) including access to relevant and current data, based on the data base integrity requirements described in Doc 9906 Vol 3-Flight Procedure Design Software Validation.

d) By qualified, trained and certified personnel (person designing, reviewing or amending IFP demonstrates required level of competency for design works, - Doc 9906 Vol 2- Flight Procedure Designer Training, - Doc 9906 Vol 6 - Flight Validation Pilot Training and Evaluation, etc.).

1.1.3 This appendix contains necessary information on applications to be made for 3rd-party PDSP authorization.

1.2 Schedule of Availability of Service

Monday - Friday 0000Z to 0900Z (UTC)
No noon-time break

1.3 Who may Avail of this Service

Flight Procedure Design Organizations or Procedure Design Service Providers (PDSPs) desiring to provide IFPDS within the Manila FIR.

1.4 Required Documentations

1.4.1 Letter of Request for New/Renewal of Authorization addressed to the, Director General of CAAP.

a) should indicate current business address;

b) should include a written statement setting out design procedures that the applicant proposes to provide in the Philippines (e.g. Conventional or PBN STARs, SIDs, IAP, Helicopter IFPs, etc.); and

c) should include a list of proposed projects within Philippine Airspace, if available.

1.4.2 Evidence regarding Practical Application of Theoretical Knowledge.

a) list of IFP projects completed in the past year (type of IFP, location, preferably copies of approved charts as evidence of quality records); and

b) List of IFP designed by the applicant company, published within Philippine Airspace (if any).

1.4.3 Evidence regarding Aviation Experience.

a) Company profile and track record

1.4.4 A copy of the PDSP's Manual of Operations (preferably in English).

1.4.5 Certified true copy or authenticated copy of certificates and other training records of designers employed by the company.

1.4.6 Certified true copy or authenticated copy of authorizations issued by other states or organizations (preferably ICAO member state).

1.5 Fees and Charges

CAAP is yet to fix a fee for the application and renewal of the 3rd-Party PDSP Authorization. However, the cost for the oversight activities (audits and inspections) of the PANS-OPS Inspectorate (travel and lodging expenses) will be shouldered by the concerned service providers.

1.6 Application and Acceptance Process

Step 1. Submit application letter together with the required documents to the CAAP.

Step 2. The Office of the Director General forwards the application to the CAAP regulatory body for ANS for processing.

Step 3. The PANS-OPS Inspectorate of the CAAP regulatory body for ANS reviews and assess the submitted documents for verification and validation. If not authenticated copies or certified true copies of documents were submitted, the authenticity of the documents provided may be verified by contacting the individual or organization issuing the document (e.g. the training center indicated in the training certificate, or the approving CEO for the operations manual and business information incorporated therein).

Step 4. If there are findings of non-compliance, CAAP regulatory body for ANS will communicate it with the applicant immediately. Else, proceed to Step 7.

Step 5. Applicant submits corrective action plans or additional evidence to address the finding.

Step 6. Repeat Step 3 until all requirements are satisfied.

Step 7. CAAP regulatory body for ANS prepares the Technical Report and Endorsement for approval/ disapproval for signature of the DG.

Step 8. Once signed by the DG, the certificate of authorization is issued to the applicant with a letter enumerating the conditions to be observed as a holder of authorization.

1.7 Surveillance Activities

Holders of authorizations will be subjected to audit every two years to ensure continuous compliance to standards and regulations. Inspections whether announced or unannounced may be conducted only as necessary.

1.8 Validity of Authorization

1.8.1 An authorization shall be valid for a period determined by the CAAP Regulatory Authority, such period shall not exceed five (5) years, calculated from the date of issuance or renewal thereof. The authorization shall remain in force until it expires, is suspended, or cancelled by the CAAP Regulatory Authority.

1.8.2 The validity period of the authorization will be indicated in the issued certificate and the letter of approval. Authorizations for first time applicants with less or no record of relevant experience in procedure design works may be valid for one or two years, after which, they may opt for renewal. While applicants that demonstrated satisfactory performance in the field of procedure design may be given authorizations valid for longer periods not exceeding 5 years.

1.9 Suspension, Cancellation or Variation of Procedure Design Service Provider Approval Certificate by the CAAP Regulatory Authority

The CAAP Regulatory Authority may, arising from the recommendation of a PANS-OPS Safety Inspector, by written notice given to a PDSP, suspend, cancel or vary the procedure design service provider's authorization if there are reasonable grounds in accordance to CAR-ANS Part 16, 16.17.

1.10 3RD PARTY Procedure Design Service Provider Authorization Approval Checklist

1.10.1 Reference of requirements:

a) CAR-ANS 16 - Procedure Design Services

b) MC 49-13 – Authorization for 3rd Party Procedure Design Organization

REQUIREMENT	SUBMITTED DOCUMENTS	ASSESSMENT	REMARKS
1. Application for issuance of Authorization or renewal thereof.		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
2. Evidence of Authorization issued by other states preferably another ICAO member State (if available)		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
3. Evidence of compliance with ICAO Doc. 9906 Vol I - Quality Assurance Manual for IFP		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
4. PANS-OPS/ IFP Design Training Certificates		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
5. Practical application of theoretical knowledge		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
6. Aviation Experience		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
7. Quality Record of Practical Application		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
8. Receipts for appropriate fees and charges imposed by the CAAP		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
9. PDSP Manual of Operations which contains the following:			
a) personnel requirements and the responsibilities of personnel;		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	

b) training and checking of staff and how that information is tracked;		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
c) quality assurance/safety management system;		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
d) contingency plans developed for part or total system failure for which the organization provides a service;		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
e) facilities and equipment and how those facilities are maintained;		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
f) fault and defect reporting;		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
g) maintenance of documents and records; and		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	
h) any other information requested by the CAAP Regulatory Authority.		☐ Satisfactory ☐ Unsatisfactory ☐ Not applicable	

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APPENDIX 2

IFP Quality Assurance Checklist

QUALITY ASSURANCE EVALUATION
OF ______________________________ (RP___)
__________ PROCEDURES RWY ____

This evaluation is based on *Manual of Standards for IFPDS* which specifies the step-by-step process in IFP and the requirements for the approval of the Instrument Flight Procedures (IFP).

Purposes:

a) To ensure that the Instrument Flight Procedure Design package has met the necessary documentation of the Quality Assurance Process for Instrument Flight Procedures.

b) To ensure that the instrument flight procedures can be safely flown and can be safely integrated in the ATM environment in accordance to 3.7 of the MOS for IFPDS.

c) To determine the viability of the Instrument Flight Procedure as submitted to the PANS-OPS Inspectorate Section of ATMSID-AANSOO for proper endorsement to the Director General of the CAAP for approval.

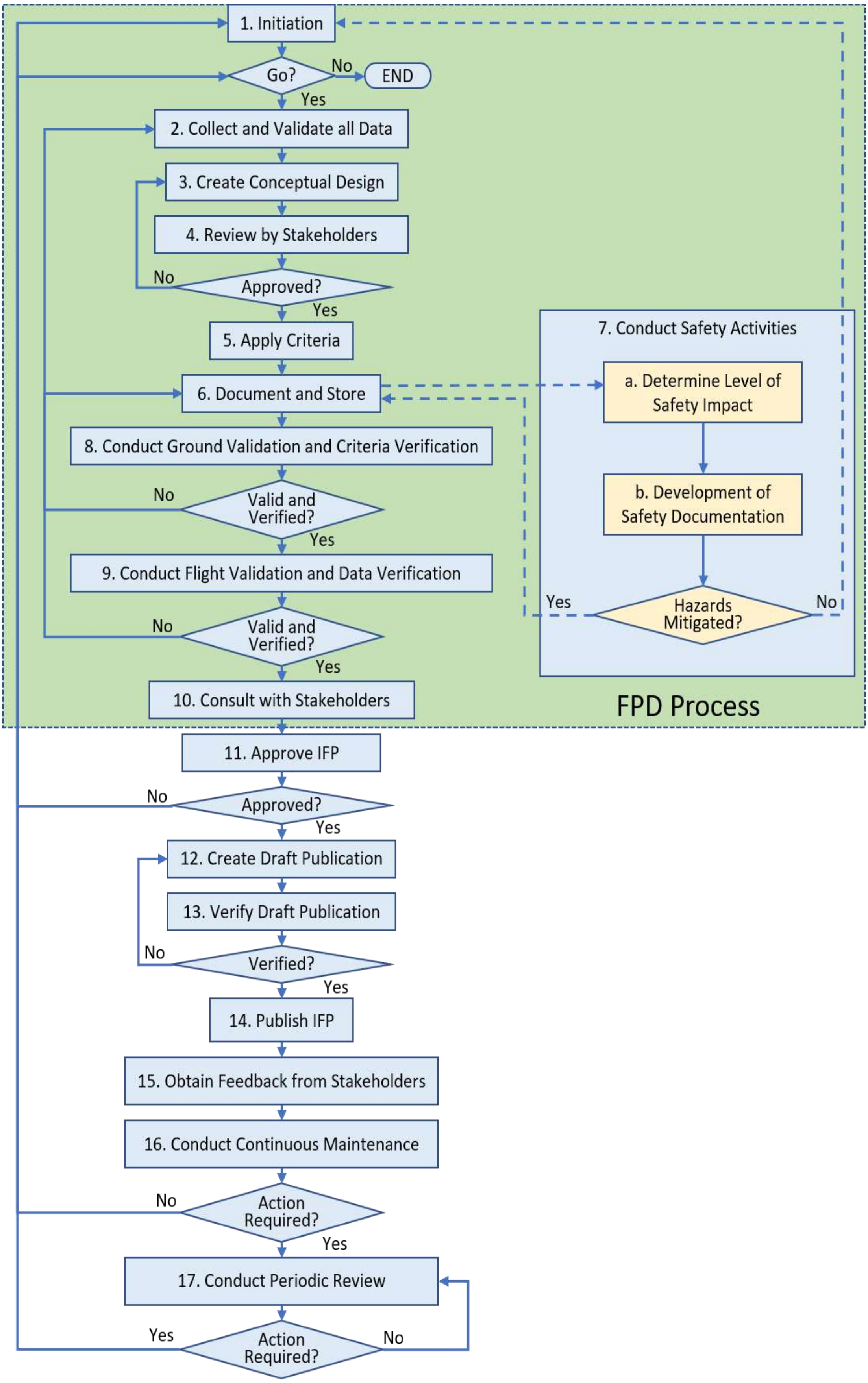
2.1 QUALITY ASSURANCE EVALUATION REPORT

The following list of instrument flight procedures are evaluated for quality assurance:

ITEM No.	Procedure Title	Description
1.	(sample) STAR ABCDE RWY XX	RNAV STAR
2.		
3.		
4.		
5.		
6.	(sample) SID ABCDE RWY XX	Conventional Departure
7.		
8.		
9.		
10.	(sample) Holding	
11.	(sample) RNP AP RWY XX	RNP 1 IAP
12.		

Note: The list of documents and evidences should be in place prior to the endorsement for the approval by the Director General of the CAAP.

2.2 THE IFP PROCESS FLOW CHART



2.3 QUALITY ASSURANCE EVALUATION

Quality Assurance Evaluation				
Item No.	**Item Description**	**Submitted Documents**	**Remarks**	**Evaluation**
1.	An approved request to design, modify or review of a procedure, or managerial directive/authority order to pursue the design, modification or review of an IFP	**Title:**		☐ Satisfactory ☐ Not satisfactory
2.	An approved conceptual design, including planned implementation dates, and resources needed to achieve the task. This is normally signed by the involved stakeholders such as, aircraft operators, aerodrome operators, pilots and ATCs, designers, local government organization, regulatory authorities (when necessary), etc.	**Title:**		☐ Satisfactory ☐ Not satisfactory
3.	The FPD package or the technical report of the	**Title:** **Prepared by:**		☐ Satisfactory ☐ Not satisfactory

	procedure, which includes the procedure layout, the relevant calculation outputs, navigation data (when applicable), coordinates and textual description of the intended procedure. ***Note:*** *The FPD and the resulting IFP, must be quality assured. STEP 8 states:* *"Prior to the ground validation, a designer who was not involved in the original design should perform a review of the FPD."* *The Q.A. for the FPD is the responsibility of the PDSP while the Q.A. of the resulting IFP is the responsibility of the AANSOO.*	**Author:** **Flight Procedure Designer:** **Validator:**		
4.	Ground validation and verification reports	**Title:** **Date:** **Submitted by:** **Noted by:**		☐ Satisfactory ☐ Not satisfactory
5.	Flight validation reports	**Title:** **Date:** **Findings/ Observations:**		☐ Satisfactory ☐ Not satisfactory

		Evaluator: **Noted:** **Procedure Assessment:**		
6.	Safety activity report	**Title:** **Date:** **Assessor:**		☐ Satisfactory ☐ Not satisfactory
7.	Draft charts/ graphical presentation for submission to AIS	**Title:**		☐ Satisfactory ☐ Not satisfactory

CONCLUSION:

Evaluated by:		(Signature)
Submitted by:	Chief, ATM Inspectorate Division, AANSOO	(Signature)
Noted by:	Chief, AANSOO	(Signature)

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APPENDIX 3

Sample PDSP Audit Protocol Questionnaire

This appendix to MOS IFPDS provides an idea of the scope of an audit and a guide to the requirements to be met by a PDSP.

Only a sample is provided, the actual protocol questions may vary during the actual audit. ATMSID normally provides the auditee with a copy of the checklists together with the audit notification. Any modification to the checklist shall be forwarded to the auditee at least two weeks before the first day of audit or during the entry meeting and takes measures to protect any working documents that involve confidential or proprietary information.

PDSP Protocol Questionaire **Prepared by: ATM Safety Inspectorate Division, AANSOO/Audit dates: …/…/… to …/…/… (dd/mm/yy)**					
Doc. Ref.	***Protocol question***	***Reply (Self-Assessment)***	***Guidance for review of protocol question***	***Status of implementation***	***Evidence /Notes/ Comments***
PDSP 001-013 –Procedure Design Service					
CAR ANS Part 16 16.6.1.9.2, CAR ANS Part 1 1.1.6.2	PDSP 001 – Are the relevant up-to-date ICAO documents and other technical and regulatory publications readily available to all PDSP technical staff?	□ Yes □ No	➢ Review procedures. ➢ Verify accessibility of documents: 1) Primary aviation legislation and PDSP specific operating regulations. 2) Annexes 4, 5, 10, 11, 14, 15 and 19. 3) PANS, guidance material and other ANS-related publications. 4) AIP Document control system. 5) Method to determine currency of documents. 6) Relevant CAR-ANS and MOS 7) Other technical/regulatory publications.	□ Satisfactory □ Not Satisfactory □ Not Applicable	

CAR ANS Part 16 16.6.1.5.1	PDSP 002 – Is the PDSP provided with adequate facility/ies for carrying on design work on instrument flight procedures?	□ Yes □ No	Verify a) premises and equipment appropriate for the PDSP's employees to carry on the design work; and b) ensuring that those employees have access to all necessary data for designing the procedures including: ➢ accurate and current databases or charts detailing terrain and obstacle information; and ➢ accurate and current navigation aid coordinate data; and ➢ accurate and current aerodrome reference point and threshold data.	□ Satisfactory □ Not Satisfactory □ Not Applicable	
CAR ANS Part 16 16.6.1.5.2	PDSP 003 – Has the PDSP established procedures to ensure the integrity of the database and the data required in procedure design work?	□ Yes □ No	a) Verify if PDSP maintains a database of aeronautical data b) Verify mechanism to maintain integrity of the data and the database c) Verify implementation	□ Satisfactory □ Not Satisfactory □ Not Applicable	
CAR ANS Part 16 16.6.1.7.1	PDSP 004 – Does the PDSP employ a sufficient number of personnel to enable the designer to carry on design work of instrument flight procedures?	□ Yes □ No	➢ Review mechanism to determine number of personnel required ➢ Check personnel turn-over rate ➢ Check actual number of qualified personnel involved in design works	□ Satisfactory □ Not Satisfactory □ Not Applicable	
CAR ANS Part 16 16.6.1.7.1 a)	PDSP 005 – Are minimum qualification requirements met by specialists who are	□ Yes □ No	➢ Review qualifications required for new procedures design staff. ➢ Review personnel records.	□ Satisfactory □ Not Satisfactory □ Not Applicable	

	responsible for the design of flight procedures?				
CAR ANS Part 10B 10.8.5.2 Doc 9734 Part A, C3	PDSP 006 – Has the PDSP developed job description for its PANS-OPS technical staff?	□ Yes □ No	➢ Review documented terms of reference and confirm consistent application.	□ Satisfactory □ Not Satisfactory □ Not Applicable	
CAR ANS Part 16 16.6.1.8 CAR-ANS Part 10B 10.8.4.4	PDSP 007 – Does the PDSP provide a training and checking program to ensure that the employees of the designer maintain their competence and are provided with ongoing training appropriate to their duties?	□ Yes □ No	➢ Review training programme and ensure that it includes competency on new equipment, and procedures. ➢ Verify if it includes, as applicable, initial, recurrent/refresher and specialized trainings. ➢ Review personnel training records ➢ Review evidence of completed training.	□ Satisfactory □ Not Satisfactory □ Not Applicable	
CAR-ANS Part 10B 10.8.5.2	PDSP 008 – Does the PDSP maintain training records for PANS-OPS technical staff?	□ Yes □ No	➢ Verify personnel training records	□ Satisfactory □ Not Satisfactory □ Not Applicable	
CAR ANS Part 16 16.6.1.11.1 CAR ANS Part 10B 10.8.5	PDSP 009 – Does the PDSP maintain all procedure design documentation, so as to allow any data anomalies or errors found during the production, maintenance or	□ Yes □ No	➢ Review the policies and procedures for making, amending, preserving and disposing of those documents and records ➢ Review working files, documentation and data.	□ Satisfactory □ Not Satisfactory □ Not Applicable	

PANS Doc 8168 (OPS) Vol. II, Part I, Section 2, C4, 4.5.2	operational use of the procedure to be corrected?				
CAR ANS Part 16 16.22	PDSP 010 – Are PANS-OPS published procedure designs by service providers reviewed periodically to ensure that they continue to comply with changing criteria and meet user requirements?	□ Yes □ No	➢ Review PDSP policy/ contract stipulating the period of validity for a procedure design ➢ Review PDSP plan/ timelines ➢ Review implementation	□ Satisfactory □ Not Satisfactory □ Not Applicable	
CAR ANS Part 16 16.7	PDSP 011 – Does the holder of a procedure design certificate of authorization displays the certificate in a prominent place, generally accessible to the public at such holder's principal place of business?	□ Yes □ No	➢ Conduct ocular inspection	□ Satisfactory □ Not Satisfactory □ Not Applicable	
MOS IFPDS	PDSP 012 – Are the conceptual design	□ Yes □ No	➢ Verify design procedures and quality assurance process	□ Satisfactory □ Not Satisfactory	

	developed by the PDSP reviewed by the stakeholders?		➢ Verify mechanism to communicate the conceptual design with stakeholders ➢ Verify replies from stakeholders	□ Not Applicable	
MOS IFPDS	PDSP 013 – Are safety activities conducted by the PDSP in the development of a procedure design?	□ Yes □ No	➢ Verify design procedures and quality assurance process ➢ Verify safety assessments and safety risk management documentations	□ Satisfactory □ Not Satisfactory □ Not Applicable	
CAR ANS Part 16 16.20	PDSP 014 – Does the PDSP design an instrument flight procedure in accordance with applicable standards contained in ICAO documents?	□ Yes □ No	➢ Verify design procedures ➢ Verify criteria verification reports ➢ Verify published charts	□ Satisfactory □ Not Satisfactory □ Not Applicable	
MOS IFPDS	PDSP 015 – Are flight inspections of instrument flight procedures, including obstacle checks, being carried out?	□ Yes □ No	➢ Verify design procedures and quality assurance process of the PDSP ➢ Verify implementation	□ Satisfactory □ Not Satisfactory □ Not Applicable	
CAR ANS Part 4 4.11.10.7 PANS Doc 8168 (OPS) Vol. II, Part I, Section 4, C5, 5.4	PDSP 016 – Does the PDSP publish obstacle clearance altitude/height (OCA/H)?	□ Yes □ No	➢ Verify design procedures ➢ Review published charts	□ Satisfactory □ Not Satisfactory □ Not Applicable	

& C9, 9.4.3.1					
CAR ANS Part 16 16.21.1	PDSP 017 - Are agreements established between the concerned aerodrome operators and the PDSP for relevant airport/obstacle data to be provided to the PDSP by the aerodrome operator whenever the Obstacle Limitation Surfaces are infringed?	□ Yes □ No	➢ Verify LOA/MOA ➢ Verify Flight and Ground Validation Reports	□ Satisfactory □ Not Satisfactory □ Not Applicable	

The preliminary findings indicated herein and the processes involved in the audit process were explained thoroughly by the inspector/s and the undersigned is amenable with the preliminary results.

________________________________ (Signature of Facility Chief/CEO)

APPENDIX 4

Sample Pre-Implementation Checklists for Preparation of IFP Implementation Safety Assessment

4.1 Introduction

This form is an example only and is accepted as a transitional material until ICAO global guidance material becomes available.

4.2 Purpose of the Checklist

a) To review PBN procedures using the items of the checklist; and

b) To identify hazards which may affect the safety of the procedures

4.3 How to Use of the Checklist

a) Read the check items and answer to each item.

b) Make comments to describe the situation.

c) If an item is identified as "Unsatisfactory", fill the **"Record on Identification, Analysis and Mitigation of Hazard"** form for the safety risk assessment.

d) Analyze the risk by probability and severity.

e) Determine safety risk tolerability using provided matrix.

f) If the result of the safety risk tolerability falls on "Acceptable Based on Risk Mitigation" or "Unacceptable", develop risk mitigation measures.

g) Using the identified mitigation measures, analyze the risk again (step 4 and 5).

h) If the risk still falls on "Acceptable Based on Risk Mitigation" category, the management may decide whether to implement or not.

Sample application:

Example 1

Step 1 & 2: assess the procedure using the checklist

In case the amendment of the LOA or the Local Operation Instruction (LOI) is in progress and the training for operating people has not begun yet (related to Item 4 of the checklists)

<table>
<tr><th colspan="5">IFP Implementation Safety Assessment</th></tr>
<tr><td colspan="2">Assessor:</td><td>☐ New</td><td colspan="2">☐ Amended</td></tr>
<tr><td>Procedure Name:</td><td></td><td>Date:</td><td colspan="2"></td></tr>
<tr><td colspan="5">S: Satisfactory / U: Unsatisfactory / N/A: Not Applicable</td></tr>
<tr><th>Item No.</th><th>Check Item</th><th>S</th><th>U</th><th>N/A</th></tr>
</table>

4	Did relevant ATC facilities review the new and/or amended IFP based on the Letter of Agreement (LOA) between facilities? Is the amended LOA published and in effect? **Comments:** *(Describe the current situation)*		✓	

Follow Steps 3-8: conduct safety activity in IFP Design, a PDSP may use a different hazard identification and safety risk assessment form.

Identification No.		*XX-APCH RWY 06*		Source	☐ Safety Report ☐ Safety Review ✓ Safety Assessment ☐ Safety Audit ☐ Safety Observation ☐ Safety Survey ☐ Sampling Survey ☐ Others	
Assessment Date:		*YYYY/MM/DD*				
Assessment Items		*(Procedure Name / SID/ STAR/ ATS Route/ IAPCH)*				
Category of Hazard		☐ Human Factors	☐ Equipment	✓ Operational	☐ Environment	
		Subject: (*LOA to be amended, Training yet to be implemented)*				
Identification of Hazards		Details (includes a review of safety incidents of the existing procedure(s), if any): *The amendment of LOA is in progress and training for ATCs will commence after amendment …*(list down hazards and its corresponding consequence)				
Risk Analysis	Probability	☐ 1	☐ 2	✓ 3	☐ 4	☐ 5
	Severity	☐ A	☐ B	☐ C	✓ D	☐ E
Resulting Risk Index		*(in this example) 3D*		☐ Unacceptable ✓ Acceptable based on risk mitigation ☐ Acceptable		
Mitigation Measures		*Amendment of LOA/LOI* *Conduct training for ATCO*				
Risk Index after Mitigation		*(in this example) 2E*		☐ Unacceptable ☐ Acceptable based on risk ✓mitigation ☐Acceptable		
Comments by Safety Assessment Team (if necessary)		*LOA amendment and ATC training should be completed by YYYY.MM.DD*				

Steps 8: In case the Risk Index after Mitigation falls under “Acceptable based on risk mitigation”, management decision may be based on the comments by the Safety Assessment Team.

4.4 Risk Index

Unacceptable   Acceptable based on risk mitigation   Acceptable

Frequency Severity	5 Frequent	4 Occasional	3 Remote	2 Improbable	1 Extremely improbable
A Catastrophic					
B Hazardous					
C Major					
D Minor					
E Negligible					

4.5 Severity Index

5 levels are defined for the severity.

Severity	A	B	C	D	E
Consequences on operations	Catastrophic	Hazardous	Major	Minor	Negligible
Examples of consequences (assessment beforehand)	One or several catastrophic accidents; One or more air collision; One or more ground collision; …	Important loss of separation (eg. < 50% of minimum separation) where aircrew or ATC can't fully control the situation or aren't able to put it right…	Important loss of separation (eg. < 50% of minimum separation) where aircrew or ATC fully control the situation and are able to put it right…	Increase in controllers or aircrew workload or slight deterioration of functional capacity in ATC system…	A situation that can generate danger : no direct or indirect impact on safety

4.6 Probability or Likelihood Index

Likelihood	*Meaning*	*Value*
Frequent	Likely to occur many times (has occurred frequently)	5
Occasional	Likely to occur sometimes (has occurred infrequently)	4
Remote	Unlikely to occur, but possible (has occurred rarely)	3
Improbable	Very unlikely to occur (not known to have occurred)	2
Extremely improbable	Almost inconceivable that the event will occur	1

Frequency	Extremely improbable	Improbable	Remote	Occasional	Frequent
	1 per 1000 years	1 per 5-10 years	1, 2 times per year	Several times per year	1 time per month

4.7 The IFP Implementation Safety Assessment Checklists for:

a) IFP Implementation Safety Assessment – for Instrument Approach (IAP)/ RNP APCH

IFP Implementation Safety Assessment – IAP/ RNP APCH-				
Assessor:		☐ New	☐ Amended	
Procedure Name:		Date:		
S: **S**atisfactory / **U:** **U**nsatisfactory / **N/A:** **N**ot **A**pplicable				
Item No.	**Check Item**	**S**	**U**	**N/A**
1	Is the safety assessor independent of the flight procedure team and has she/he been involved with the process? **Comments:**			
2	Were proposed flight procedures/amendments designed by a qualified flight procedure designer and reviewed independently by another qualified flight procedure designer? **Comments:**			
3	Did procedure designers coordinate with stakeholders such as ATC, operators, etc., regarding new and/or amended flight procedures? **Comments:**			
4	Did relevant ATC facilities review the new and/or amended procedures based on the Letter of Agreement (LOA) between facilities? Is the amended LOA published and effective? **Comments:**			
5	Are the locations of waypoints and restrictions (speed, altitude, etc.) appropriate for the aircraft types expected to use these procedures? List aircraft categories considered: **Comments:**			
6	Are there any expected difficulties or possibilities of phonetic confusion in the names used for reporting points/ waypoints and procedure? It is recommended that proximity check for like-sounding codes be done within 250NM for TMA waypoints using ICARD system. **Comments:**			
7	Are there any elements that may lead to misinterpretation or other difficulties while using the proposed procedures (e.g. textual description of the chart, local wind condition or temperature causing difficulties while climbing/descending, etc.)? **Comments:**			
8	In case of procedure amendment, was a review of safety incidents/accidents concerning the existing procedure conducted, with the view of mitigating them?			

	Comments:			
9	Referring to CARANS Parts 4, and 15, MOS Aeronautical Charts and ICAO Doc 8697, are there any errors on the chart(s)? (Items to focus on: Magnetic Bearings/True Headings, Distances, Climb/Descent Gradients, TAA/MSA, Magnetic Variation, Topography, Location of Obstacles, Coordinates, Restrictions, etc.)			
	Comments:			
10	Were all obstacles evaluated when calculating OCA/H in the proposed procedures properly documented?			
	Comments:			
11	Were RAIM/GNSS availability and prediction (as necessary) considered while implementing the proposed procedures?			
	Comments:			
12	If RAIM/GNSS availability/prediction information is provided by entities other than the ANSP, are there any agreements with those entities regarding the provision of this information?			
	Comments:			
13	Are the descent rates and descent angle, if not the same as the optimum value, of proposed approach procedure appropriate to enabling aircraft to complete its approach? If not, were operators consulted and consent obtained?			
	Comments:			
14	Do missed approach procedures enable aircraft to climb to the assigned altitude/s? Are climb gradients specified where the climb gradient exceeds the standard missed approach climb gradient of 2.5%? If so, have the operators been consulted?			
	Comments:			
15	Do the proposed procedures take into account adequate separation between aircraft using these approaches and other aircraft using other type of approaches (RNP, ILS, VOR, NDB)? Was the standard operating procedure/operating manual updated?			
	Comments:			
16	Have any alternative procedures been instituted if an aircraft conducting the proposed procedure/s is unable to complete the assigned procedure due to temporary GNSS and other navaid signal abnormality, airborne system failures, technical problems or other difficulties?			
	Comments:			
17	**For LNAV/VNAV Procedures:** Is the location of the altimeter setting source appropriate for the use of the Baro-VNAV approach procedure?			
	Comments:			

18	**For LNAV/VNAV Procedure:** Is the published minimum temperature reasonable for the application of the Baro-VNAV procedure?			
	Comments:			
19	Has implementation training been executed (or planned) for air traffic controllers on the use of the proposed procedures, including management of QNH in case of Baro-VNAV?			
	Comments:			
20	Are there any criteria applied for the RNP APCH design using the minimum or maximum value in ICAO PANS-OPS (Doc 8168)? If so, are they documented properly?			
	Comments:			
21	Are there any items requiring special authorization in the proposed procedures? If any, were sufficient reviews on criteria conducted and was the rationale for requiring such special authorization reasonable and necessary?			
	Comments:			
22	Are there any other safety considerations regarding the procedure(s)?			
	Comments:			

b) IFP Implementation Safety Assessment – SID/STAR

IFP Implementation Safety Assessment – SID/STAR-				
Assessor:		☐ New		☐ Amended
Procedure Name:		Date:		
S: **S**atisfactory / **U:** **U**nsatisfactory / **N/A:** **N**ot **A**pplicable				
Item No.	**Check Item**	**S**	**U**	**N/A**
1	Is the safety assessor independent of the flight procedure team and has she/he been involved with the process?			
	Comments:			
2	Were proposed flight procedures/amendments designed by a qualified flight procedure designer and reviewed independently by another qualified flight procedure designer?			
	Comments:			
3	Did procedure designers coordinate with stakeholders such as ATC, operators, etc., regarding new and/or amended flight procedures?			
	Comments:			
4	Did relevant ATC facilities review the new and/or amended procedures based on the Letter of Agreement (LOA)			

	between facilities? Is the amended LOA published and effective?			
	Comments:			
5	Are the locations of waypoints and restrictions (speed, altitude, etc.) appropriate for the aircraft types expected to use these procedures? List aircraft categories considered:			
	Comments:			
6	Are there any expected difficulties or possibilities of phonetic confusion in the names used for reporting points/ waypoints and procedure? It is recommended that proximity check for like-sounding codes be done within 250NM for TMA waypoints using ICARD system.			
	Comments:			
7	Are there any elements that may lead to misinterpretation or other difficulties while using the proposed procedures (e.g. textual description of the chart, local wind condition or temperature causing difficulties while climbing/descending, etc.)?			
	Comments:			
8	In case of procedure amendment, was a review of safety incidents/accidents concerning the existing procedure conducted, with the view of mitigating them?			
	Comments:			
9	Referring to ICAO Annex 4, 15 and Doc 8697, are there any errors on the chart(s)? (Items to focus on: Magnetic Bearings/True Headings, Distances, Climb/Descent Gradients, TAA/MSA, Magnetic Variation, Topography, Location of Obstacles, Coordinates, Restrictions, etc.)			
	Comments:			
10	Were all obstacles evaluated when calculating OCA/H in the proposed procedures properly documented?			
	Comments:			
11	Were coverage and limitations of available avionics, ground navigational aids and GNSS considered while designing and validating the proposed procedures?			
	Comments:			
12	Were traffic flows in the terminal area considered while designing the proposed procedures?			
	Comments:			
13	Are climb/descent rates of the proposed procedures appropriate to enabling the climb/descent within the airspace?			
	Comments:			
14	Does the separation applied between instrument flight procedures of neighboring airport(s), airspaces including special use airspaces (SUAs) and the proposed procedures satisfy separation criteria specified in ICAO PANS-ATM (Doc 4444)/ MOS - ATS?			
	Comments:			

15	Do the proposed procedures consider separation between aircraft using PBN procedures and aircraft using other procedures specified in ICAO PANS-ATM (Doc 4444)/ MOS-ATS?			
	Comments:			
16	Did the proposed procedures consider current and expected future airspace capacity?			
	Comments:			
17	Are there any alternative methods when an aircraft conducting a proposed procedure is unable to conduct the procedure because of ground/satellite/airborne system failures, technical problems or other difficulties?			
	Comments:			
18	Is there any training plan for air traffic controllers on the proposed procedures? Has the training been conducted?			
	Comments:			
19	Are there any criteria applied for the SID/STAR design using the minimum or maximum value in ICAO PANS-OPS (Doc 8168)? If so, are they documented properly?			
	Comments:			
20	Are there any items requiring special authorization in the proposed procedures? If any, were sufficient reviews on criteria conducted and was rationale for requiring special authorization reasonable?			
	Comments:			
21	Are there any other safety considerations regarding the procedure(s)?			
	Comments:			

c) IFP Implementation Safety Assessment – ATS Route

IFP Implementation Safety Assessment – ATS Route –				
Assessor:		☐ New	☐ Amended	
Procedure Name:		Date:		
S: Satisfactory / **U: U**nsatisfactory / **N/A: N**ot **A**pplicable				
Item No.	**Check Item**	**S**	**U**	**N/A**
1	Is the safety assessor independent of the flight procedure team and has she/he been involved with the process?			
	Comments:			
2	Has proposed ATS route been reviewed independently by a qualified route designer?			
	Comments:			
3	Did procedure designers coordinate with stakeholders such as ATC, operators, etc., regarding new and/or amended flight procedures?			
	Comments:			

4	Did related ATC facilities review new and/or amended procedures based on the Letter of Agreement (LOA) between facilities? Is the amended LOA published and effective? **Comments:**			
5	Are the locations of waypoints and restrictions (speed, altitude, etc.) appropriate for the aircraft types expected to use these procedures? List aircraft categories considered: **Comments:**			
6	Are there any expected difficulties or the possibility of confusion on the name of waypoints phonetically? It is recommended that proximity check for like-sounding codes should be done within 500NM for en-route waypoints using ICARD system. **Comments:**			
7	Is the designator of ATS route appropriate for its application, i.e. domestic or international? Is the duplicity of the name confirmed with neighboring States? **Comments:**			
8	Are there any parts that may lead to mistakes or difficulties while using the proposed ATS routes (e.g. separation from other ATS routes and/or airspace including military controlled airspace, coordination with other facilities including military, identification of navigation specification, difference of turn performance, introduction of FRT, etc.)? **Comments:**			
9	In case of procedure amendment, was a review of safety incidents/accidents concerning the existing procedure conducted, with the view of mitigating them? **Comments:**			
10	Referring to CARANS Parts 4 and 15, MOS Aeronautical Charts and ICAO Doc 8697, are there any errors on the AIP publication? (check items: magnetic bearing/true heading, distance, coordinates, restrictions, directions, etc.) **Comments:**			
11	Were all obstacles evaluated in the proposed ATS route and properly documented? **Comments:**			
12	Were coverage and limitations of available avionics, ground navigational aids and GNSS considered while designing and validating the proposed procedures? **Comments:**			
13	Does the separation applied between instrument flight procedures of neighboring airport(s), airspaces including special use airspaces (SUAs), neighboring ATS routes and the proposed ATS route satisfy separation criteria specified in ICAO PANS-ATM (Doc 4444)/ MOS ATS and PANS-OPS (Doc 8168)? **Comments:**			

14	Does the separation applied between instrument flight procedures of neighboring airport(s), airspaces including special use airspaces (SUAs) and the proposed procedures satisfy separation criteria specified in ICAO PANS-ATM (Doc 4444)/ MOS - ATS?			
	Comments:			
15	Did the proposed ATS route consider current and expected future airspace capacity?			
	Comments:			
16	Are there any alternative methods when an aircraft flying the proposed ATS route is unable to maintain the requirement of the route because of ground/satellite/airborne system failures, technical problems or other difficulties?			
	Comments:			
17	Is there any training plan for air traffic controllers on the proposed ATS route? Has the training been conducted?			
	Comments:			
18	Are there any items requiring special authorization on the use of the proposed ATS route, e.g. reduction of lateral separation between ATS routes? If any, were sufficient reviews on criteria conducted and was rationale for requiring special authorization reasonable?			
	Comments:			
19	Are there any other safety considerations regarding the proposed route(s)?			
	Comments:			

APPENDIX 5

FLIGHT VALIDATION PILOT TRAINING AND EVALUATION

Flight validation pilots must acquire and maintain the competency level required by CAAP stated herein through initial training and supervised on-the-job training (OJT). This is in order to achieve the safety and quality assurance objectives of the flight validation and to ensure that the quality assurance in the procedure design process and its output, including the quality of aeronautical information/data, meets the requirements of CARANS Part 15 and MOS AIS.

Training for flight validation pilots should at least include initial training and recurrent training at periodic intervals.

Initial training must ensure that the flight validation pilot is able to demonstrate a basic level of competency that includes at least the following elements:

a) knowledge of the information contained in PANS-OPS, Volumes I and II, and other related ICAO provisions relevant to the CAAP; and

b) knowledge of and skills in ground and flight validation of procedures.

Recurrent training must ensure that the flight validation pilot is able to demonstrate a basic level of competency that includes at least the following elements:

a) knowledge about updates in ICAO provisions and other provisions pertaining to procedure design and flight validation of procedures; and

b) maintenance and enhancement of knowledge and skills on ground and flight validation of procedures.

Flight validation pilots must undergo an adequate OJT under close supervision of a senior officer prior to being assigned to a task.

Competency of the flight validation pilot will be evaluated by the CAAP during audit (usually conducted every 2 years).

The following paragraphs address the SKAs that must be acquired and evaluated for a flight validation pilot to be competent to perform flight validation of IFPs. Flight inspection pilots may also perform the flight validation of procedures. Flight inspection pilots authorized by the CAAP to conduct flight validation of procedures must also meet these requirements.

These competencies are not exhaustive. They represent the minimum knowledge required to achieve the quality assurance objectives of the FPD process.

INITIAL TRAINING

1. Knowledge of information in PANS-OPS, Volumes I and II, and other related ICAO provisions
   - PANS-OPS, Volume I;
   - PANS-OPS, Volume II;
     a) General PANS-OPS subject areas:
        i) data quality requirements;

ii) charting requirements;

iii) environmental considerations;

iv) quality assurance requirements;

b) Procedure design criteria for each type of procedure to be validated:

i) obstacle protected areas;

ii) required obstacle clearance for any given segment of a procedure;

iii) climb and descent gradients;

iv) ARINC coding;

– Required Navigation Performance — Authorization Required Manual (if applicable);

– Quality Assurance Manual for Flight Procedure Design;

– Annex 14.

Note. - Substantial portions of the required knowledge in PANS-OPS can be obtained in a PANS-OPS procedure design course.

2. Knowledge and skills in ground and flight validation of procedure

a) Ground training in flight and ground validation duties:

i) Manual on Testing of Radio Navigation Aids (Doc 8071);

ii) flight inspection requirements;

iii) procedure package contents;

iv) procedure package review;

v) requirements, techniques and considerations for verifying that the navigation data to be published, as well as that used in the design of the procedure, are correct;

vi) techniques and considerations for ground validation of obstacle data;

vii) requirements, techniques and considerations for obstacle assessment in flight;

viii) techniques and considerations in the application of PANS-OPS procedures design criteria in the ground and flight validation of procedures;

ix) airport infrastructure assessment;

x) communications coverage;

xi) flyability/Human Factors assessment;

xii) charting considerations;

xiii) operational factors;

xiv) criteria to be met for waiving the requirement for a flight validation;

b) Flight training in flight validation duties:

i) flight inspection requirements;

ii) obstacle assessment requirements, techniques and considerations;

iii) techniques and considerations in the applications of PANS-OPS procedure design criteria in the flight validation of procedures;

iv) requirements, techniques and considerations for verifying that the navigation data to be published, as well as that used in the design of the procedure, are correct;

v) airport infrastructure assessment;

vi) communications coverage;

vii) flyability/Human Factors;

viii) charting considerations; and

ix) operational factors;

c) Supervised OJT adequate to achieve the required level of competency in flight and ground validation knowledge and skills;

d) Initial ground and flight evaluation.

RECURRENT TRAINING

The following are the minimum competencies to be addressed in a recurrent training program for flight validation pilots, which should be accomplished at least every two years, or when major changes occur:

e) update on changes in PANS-OPS criteria;

f) review portions of PANS-OPS criteria most relevant to current or projected duties;

g) review changes in airport infrastructure requirements; and

h) knowledge and skills related to new developments in flight validation.

The competency of the flight validation pilot will be evaluated by the CAAP at least once every two years (during audits). The skills, knowledge and attitudes to be addressed in the evaluation will at least include those areas that pose the greatest risk, if not accomplished correctly, to the overall quality of the CAAP's procedure design process.

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APPENDIX 6

VALIDATION TEMPLATES FOR FIXED WING AIRCRAFT

The following sample checklist and report templates contain minimum suggested data and information required to be recorded during the validation process. If certain items are not applicable to the intended IAP, identify the boxes in the form by strikethrough or the term “n/a”. Such forms must be signed.

The templates may be customized as applicable to the type of IFP to be validated as required.

6.1 Pre-Flight Validation Checklist — Fixed Wing

PRE-FLIGHT VALIDATION CHECKLIST — FIXED WING			
REPORT HEADER			
Date:		Validation Type (new/amended procedure)	
Organization:			
Procedure Title:			
Location:			
Airport:		Runway:	
Evaluator:		Contact Info:	
PBN Navigation Specification:			
PRE-FLIGHT VALIDATION			
		PASS	FAIL
IFP package forms, charts, and maps.			
Data verification (e.g. aerodrome/heliport, aeronautical, obstacle, ARINC coding).			
Location of the controlling obstacles.			
Graphical depiction (chart) correctness and complexity.			
Intended use and special requirements.			
Overall design is practical, complete, clear and safe.			
Consider impact on the procedure of waivers to standard design criteria.			
Segment lengths and descent gradients allow for deceleration/ configuration.			
Comparison of FMS navigation database with the IFP design, coding, and relevant charting information.			
Charting of notification of cold/warm temperature limits.			
Flight Inspection reports available.			
REMARKS			
Simulator evaluation needed.		Yes: ☐	No: ☐
Flight Evaluation Needed.		Yes: ☐	No: ☐
PROCEDURE:		PASS ☐	FAIL ☐
Evaluator Signature:		Date:	

6.2 Simulator Evaluation Checklist — Fixed Wing

<table>
<tr><th colspan="4">``SIMULATOR EVALUATION CHECKLIST — FIXED WING</th></tr>
<tr><th colspan="4">REPORT HEADER</th></tr>
<tr><td>Date:</td><td></td><td colspan="2">Validation Type (new/amended procedure)</td></tr>
<tr><td>Organization:</td><td colspan="3"></td></tr>
<tr><td>Procedure Title:</td><td colspan="3"></td></tr>
<tr><td>Location:</td><td colspan="3"></td></tr>
<tr><td>Airport:</td><td></td><td>Runway:</td><td></td></tr>
<tr><td>Evaluator:</td><td></td><td>Contact Info:</td><td></td></tr>
<tr><td>PBN Navigation Specification:</td><td colspan="3"></td></tr>
<tr><th colspan="4">PRE-FLIGHT VALIDATION</th></tr>
<tr><td colspan="2"></td><td>PASS</td><td>FAIL</td></tr>
<tr><td colspan="2">Comparison of FMS navigation database and source documents, including proper ARINC 424 coding.</td><td></td><td></td></tr>
<tr><td colspan="2">Document simulator aircraft information including FMS software.</td><td></td><td></td></tr>
<tr><td colspan="2">Assessed faster and/or slower than charted.</td><td></td><td></td></tr>
<tr><td colspan="2">Assessed at allowed temperature limits.</td><td></td><td></td></tr>
<tr><td colspan="2">Assessed with adverse wind components.</td><td></td><td></td></tr>
<tr><td colspan="2">Flight track matches procedure design.</td><td></td><td></td></tr>
<tr><td colspan="2">Flyability.</td><td></td><td></td></tr>
<tr><td colspan="2">Human Factors assessment.</td><td></td><td></td></tr>
<tr><th colspan="4">ADDITIONAL REQUIREMENTS FOR SIMULATOR ACTIVITIES</th></tr>
<tr><td colspan="2"></td><td colspan="2">COMPLETED</td></tr>
<tr><td colspan="2">Document the following information as satisfactory or not for each procedure segment as appropriate: heading/track, distance, TAWS alerts, flight path angle (for final segment only); and note the wind component and temperature conditions.</td><td colspan="2"></td></tr>
<tr><td colspan="2">Note the maximum bank angle achieved during any RF segments.</td><td colspan="2"></td></tr>
<tr><td colspan="2">Record simulation data (if applicable).</td><td colspan="2"></td></tr>
<tr><th colspan="4">REMARKS</th></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="2">PROCEDURE:</td><td>PASS ☐</td><td>FAIL ☐</td></tr>
<tr><td colspan="2">Evaluator Signature:</td><td>Date:</td><td></td></tr>
</table>

6.3 Flight Evaluation Checklist — Fixed Wing

FLIGHT EVALUATION CHECKLIST — FIXED WING			
REPORT HEADER			
Date:		Validation Type (new/amended procedure)	
Organization:			
Procedure Title:			
Location:			
Airport:		Runway:	
Evaluator:		Contact Info:	
PBN Navigation Specification:			
PLANNING			
		COMPLETED	
Check all necessary items from IFP package are available, to include: graphic, text, maps, submission form.			
Check that the necessary flight validation forms are available.			
Appropriate aircraft and avionics for IFP being evaluated.			
Does the procedure require use of autopilot or flight director?			
PRE-FLIGHT			
		COMPLETED	
Review pre-flight validation assessment.			
Review simulator evaluation assessment (if applicable).			
Obstacle assessment planning: areas of concern; ability to identify and fly lateral limits of obstacle assessment area (if required).			
Verify source of IFP data for aircraft FMS (electronic or manual creation).			
Evaluate navigation system status at time of flight (NOTAM, RAIM, outages).			
Weather requirements.			
Night evaluation requirement (if applicable).			
Required navigation (NAVAID) support (if applicable).			
Combination of multiple IFP evaluations.			
Estimated flight time.			
Coordination (as required) with: ATS, designer, airport authority.			
Necessary equipment and media for electronic record of validation flight.			
GENERAL			
		PASS	FAIL
IFP graphic (chart) is complete and correct.			
Check for Interference: document all details related to detected RFI.			
Satisfactory radio communication.			
Required RADAR coverage is satisfactory.			
Verify proper runway markings, lighting and VASIS.			
Altimeter source(s).			
Extra consideration should be given to non-surveyed areas.			
For approach procedures with circling minima, verify controlling obstacle for each circling category.			
FLYABILITY			
		PASS	FAIL

Comparison of FMS navigation database and source documents, including proper ARINC 424 coding. *Note. - If manual entry used N/A, but a note in the remarks section is required to alert the CAAP of the procedure that a table top review of the coded procedure, or an operational assessment by a company pilot, should be completed prior to operational approval granted.*		
Human Factors and general workload satisfactory.		
Was there any loss of RAIM.		
Was there any loss of required RNP navigation performance (when RNP pertains).		
Missed approach procedure.		
Descent/climb gradients.		
Use of autopilot satisfactory.		
Segment length, turns and bank angles, speed restrictions and deceleration allowance.		
TAWS.		
INSTRUMENT APPROACH PROCEDURE		
	PASS	FAIL
Segment lengths, headings/tracks, and waypoint locations match procedure design.		
Final segment vertical glide path angle (if applicable).		
Threshold crossing height (LTP or FTP), if applicable.		
Course alignment.		
Along track alignment.		
FAS datablock.		
REMARKS		

PROCEDURE:	PASS ☐	FAIL ☐
Evaluator Signature:	Date:	

6.4 Validation Report Checklist — Fixed Wing

<table>
<tr><th colspan="6">VALIDATION REPORT CHECKLIST — FIXED WING</th></tr>
<tr><th colspan="6">REPORT HEADER</th></tr>
<tr><td>Date:</td><td></td><td colspan="4">Validation Type (new/amended procedure)</td></tr>
<tr><td>Organization:</td><td colspan="5"></td></tr>
<tr><td>Procedure Title:</td><td colspan="5"></td></tr>
<tr><td>Location:</td><td colspan="5"></td></tr>
<tr><td>Airport:</td><td colspan="2"></td><td>Runway:</td><td colspan="2"></td></tr>
<tr><td>Evaluator:</td><td colspan="2"></td><td>Contact Info:</td><td colspan="2"></td></tr>
<tr><td colspan="2">PBN Navigation Specification:</td><td colspan="4"></td></tr>
<tr><th colspan="6">POST FLIGHT</th></tr>
<tr><td colspan="5"></td><td>COMPLETED</td></tr>
<tr><td colspan="5">Evaluate collected data.</td><td></td></tr>
<tr><td colspan="5">Submit flight validation report with recorded electronic flight data for archive.</td><td></td></tr>
<tr><td colspan="5">Request NOTAM action (if appropriate).</td><td></td></tr>
<tr><td colspan="5">Sign and submit the instrument flight procedure submission documentation.</td><td></td></tr>
<tr><th colspan="6">REMARKS</th></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="4">PROCEDURE:</td><td>PASS ☐</td><td>FAIL ☐</td></tr>
<tr><td colspan="4">Evaluator Signature:</td><td>Date:</td><td></td></tr>
</table>

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APPENDIX 7

VALIDATION TEMPLATES FOR HELICOPTERS

The following sample checklist and report templates contain minimum suggested data and information required to be recorded during the flight validation process of an RNAV IAP including SBAS. If certain items are not applicable to the intended IAP, identify the boxes in the form by strikethrough or the term “n/a”. Such forms must be signed.

The templates may be customized as applicable to the type of IFP to be validated as required.

7.1 Pre-Flight Validation Checklist — Helicopters

<table>
<tr><th colspan="4">PRE-FLIGHT VALIDATION CHECKLIST — HELICOPTERS</th></tr>
<tr><th colspan="4">REPORT HEADER</th></tr>
<tr><td>Date:</td><td></td><td colspan="2">Validation Type (new/amended procedure)</td></tr>
<tr><td>Organization:</td><td colspan="3"></td></tr>
<tr><td>Procedure Title:</td><td colspan="3"></td></tr>
<tr><td>Location:</td><td colspan="3"></td></tr>
<tr><td>Heliport:</td><td></td><td>Helipad:</td><td></td></tr>
<tr><td>Evaluator:</td><td></td><td>Contact Info:</td><td></td></tr>
<tr><td>PBN Navigation Specification:</td><td colspan="3"></td></tr>
<tr><th colspan="4">PRE-FLIGHT VALIDATION</th></tr>
<tr><td colspan="2"></td><td>PASS</td><td>FAIL</td></tr>
<tr><td colspan="2">IFP package forms, charts, and maps.</td><td></td><td></td></tr>
<tr><td colspan="2">Data verification (e.g. aerodrome/heliport, aeronautical, obstacle, ARINC coding).</td><td></td><td></td></tr>
<tr><td colspan="2">Location of the controlling obstacles.</td><td></td><td></td></tr>
<tr><td colspan="2">Graphical depiction (chart) correctness and complexity.</td><td></td><td></td></tr>
<tr><td colspan="2">Intended use and special requirements.</td><td></td><td></td></tr>
<tr><td colspan="2">Overall design is practical, complete, clear and safe.</td><td></td><td></td></tr>
<tr><td colspan="2">Consider impact on the procedure of deviations from to design criteria.</td><td></td><td></td></tr>
<tr><td colspan="2">Segment lengths and descent gradients allow for deceleration/configuration.</td><td></td><td></td></tr>
<tr><td colspan="2">Flight inspection reports available.</td><td></td><td></td></tr>
<tr><th colspan="4">REMARKS</th></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="2">Simulator needed.</td><td>Yes: ☐</td><td>No: ☐</td></tr>
<tr><td colspan="2">Simulator available.</td><td>Yes: ☐</td><td>No: ☐</td></tr>
<tr><td colspan="2">Flight Evaluation Needed.</td><td>Yes: ☐</td><td>No: ☐</td></tr>
<tr><td colspan="2">PROCEDURE:</td><td>PASS ☐</td><td>FAIL ☐</td></tr>
<tr><td colspan="2">Evaluator Signature:</td><td>Date:</td><td></td></tr>
</table>

7.2 Simulator Evaluation Checklist — Helicopters

SIMULATOR EVALUATION CHECKLIST — HELICOPTERS			
REPORT HEADER			
Date:		Validation Type (new/amended procedure)	
Organization:			
Procedure Title:			
Location:			
Heliport:		Helipad:	
Evaluator:		Contact Info:	
PBN Navigation Specification:			

PRE-FLIGHT VALIDATION		
	PASS	FAIL
Comparison of FMS navigation database and source documents, including proper ARINC 424 coding.		
Document simulator aircraft information including GPS/GNSS/FMS system/software.		
Assessed faster and/or slower than charted.		
Assessed with adverse wind components.		
Assessed with adverse wind components.		
Flight track matches procedure design.		
Flyability.		
Human Factors assessment.		

ADDITIONAL REQUIREMENTS FOR SIMULATOR ACTIVITIES	
	COMPLETED
Document the following information as satisfactory or not for each procedure segment as appropriate: heading/track, distance, TAWS alerts, flight path angle (for final segment only); and note the wind component and temperature conditions.	
Note the maximum bank angle achieved during any RF segments.	
Record simulation data (if applicable).	

REMARKS		
PROCEDURE:	PASS ☐	FAIL ☐
Evaluator Signature:	Date:	

7.3 Flight Evaluation Checklist — Helicopters

FLIGHT EVALUATION CHECKLIST — HELICOPTERS			
REPORT HEADER			
Date:		Validation Type (new/amended procedure)	
Organization:			
Procedure Title:			
Location:			
Heliport:		Helipad:	
Evaluator:		Contact Info:	
PBN Navigation Specification:			
PLANNING			
	COMPLETED		
Check all necessary items from IFP package are available, to include: graphic, text, maps, submission form.			
Check that the necessary flight validation forms are available.			
Appropriate aircraft and avionics for IFP being evaluated.			
Does the procedure require use of autopilot or flight director.			
PRE-FLIGHT			
	COMPLETED		
Review pre-flight validation assessment.			
Review simulator evaluation assessment (if applicable).			
Obstacle assessment planning: areas of concern; ability to identify and fly lateral limits of obstacle assessment area (if required).			
Verify source of IFP data for aircraft GPS/GNSS/FMS (electronic or manual creation).			
Evaluate navigation system status at time of flight (NOTAM, RAIM, outages).			
Weather requirements.			
Night evaluation requirement (if applicable).			
Required navigation (NAVAID) support (if applicable).			
Combination of multiple IFP evaluations.			
Estimated flight time.			
Coordination (as required) with: ATS, designer, airport authority.			
Necessary equipment and media for electronic record of validation flight.			
GENERAL			
	PASS	FAIL	
IFP graphic (chart) is complete and correct.			
Check for Interference: document all details related to detected RFI.			
Satisfactory radio communication.			
Required RADAR coverage is satisfactory (if RADAR required).			
Verify proper heliport markings, lighting and VASIS (if installed).			
Altimeter source(s).			
OBSTACLE ASSESSMENT			
	PASS	FAIL	

Verified controlling obstacle in each segment (including as appropriate: VFR, direct visual segment, or maneuvering visual segment area/s, missed approach); if any obstacles are missing or any new obstacles are observed, record the lat/long and elevation of obstacles observed.		
Where necessary, flown at lateral limits of the obstacle assessment area; most appropriate for procedures designed in challenging terrain, or when there are questionable obstacles. *Note. - Extra consideration should be given to non-surveyed areas.*		
FLYABILITY		
	PASS	FAIL
Comparison of GPS/GNSS/FMS navigation database and source documents, including proper ARINC 424 coding. *Note. - If manual entry used N/A, but a note in the remarks section is required to alert the CAAP of the procedure that a table top review of the coded procedure, or an operational assessment by a company pilot, should be completed prior to operational approval granted.*		
Human Factors and general workload satisfactory.		
Was there any loss of RAIM.		
Was there any loss of required RNP navigation performance (when RNP pertains).		
Missed approach procedure.		
Descent/climb gradients.		
Use of autopilot satisfactory.		
Segment length, turns and bank angles, speed restrictions and deceleration allowance.		
TAWS.		
INSTRUMENT APPROACH PROCEDURE		
	PASS	FAIL
Segment lengths, headings/tracks, and waypoint locations match procedure design.		
Final segment vertical glide path angle (if applicable).		
Heliport crossing height (HRP), if applicable.		
Course alignment.		
Along track alignment.		
FAS datablock (for SBAS APV procedures).		
REMARKS		
PROCEDURE:	PASS ☐	FAIL ☐
Evaluator Signature:	Date:	

7.4 Validation Report Checklist — Helicopters

VALIDATION REPORT CHECKLIST — HELICOPTERS			
REPORT HEADER			
Date:		Validation Type (new/amended procedure)	
Organization:			
Procedure Title:			
Location:			
Heliport:		Helipad:	
Evaluator:		Contact Info:	
PBN Navigation Specification:			
POST FLIGHT			
		PASS	FAIL
Evaluate collected data.			
Submit flight validation report with recorded electronic flight data for archive.			
Request NOTAM action (if appropriate).			
Sign and submit the instrument flight procedure submission documentation.			
REMARKS			
PROCEDURE:		PASS ☐	FAIL ☐
Evaluator Signature:		Date:	

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APPENDIX 8

HUMAN FACTORS

The purpose of flight validation is to determine whether a flight procedure is operationally safe, practical and flyable for the target end user. The criteria used to develop instrument flight procedures represent many factors such as positioning requirements, protected airspace, approach system and avionics capabilities, etc. Sensory, perceptual, and cognitive restrictions historically have been incorporated in the criteria only to a limited extent (e.g., length of approach segments, descent gradients and turn angles).

These are products of subjective judgments in procedure development and cartographic standards. It is incumbent upon the flight crew to apply the principles of Human Factors and professional judgment when evaluating an original or amended procedure. CARANS Part 4, Chapter 2 provides directions in that regard.

The following factors must be evaluated.

1. Practicality. The procedure should be practical. For example, segment lengths for approach and missed approach segments should be appropriate for the category of aircraft using the procedure. Procedures must not require excessive aircraft maneuvering to remain on lateral and vertical path.
2. Complexity. The procedure should be as simple as possible. It should not impose an excessive workload on the target user. Complex procedures may be developed for use under specific conditions, aircraft equipment or environment, and/or specialized training and authorizations.
3. Interpretability.
   a) The final approach course should be clearly identifiable, with the primary guidance system or NAVAID unmistakable.
   b) The procedure should clearly indicate which runway the approach serves and indicate which runway(s) circling maneuvers apply to.
   c) Fix naming must be readable and clearly understood. Fixes/waypoints with similar sounding identifiers should not be used in the same procedure.
   d) Areas not to be used for maneuvering must be clearly defined. Significant terrain features must be displayed on approach charts.
   e) Approaches to runways with significant visual illusions should be noted and corrective action suggested; i.e.:
      i) caution note;
      ii) additional equipment required:
         – PAPI/VASI;
         – electronic glide path; and
         – wind shear warnings.
4. Human memory considerations. Pilots must be able to extract information quickly and accurately during an instrument procedure. Multiple tasks complicate the memory process and tend to produce prioritization during high workload phases of flight. Workload reduction can be accomplished through methodical chart layout that encourages the pilot to periodically refer to the depicted procedure rather than trying to memorize complex maneuvers detailed in the text.

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APPENDIX 9

OBSTACLE ASSESSMENT

9.1 Verification of Minimum Obstacle Clearance (MOC)

9.1.1 Controlling obstacles in each segment must be confirmed during the initial certification and cyclic review of flight procedures. If unable to confirm that the declared controlling obstacle of the respective segment is correctly identified, the flight validation pilot then lists the following information that the designer needs to consider:

a) location;

b) Type; and

c) approximate elevation of the obstacles.

9.1.2 The flight validation pilot will place special emphasis on newly discovered obstacles. If the controlling obstacle is listed as terrain/trees or adverse assumption obstacle (e.g. vegetation tolerance, ships, tolerance for potential unreported structures as defined by the CAAP), it is not necessary to verify the actual height of the controlling obstacle, only that no higher obstacle is present in the protected airspace. If the flight validation pilot observes that the documented controlling obstacle is not present, the flight validation pilot must indicate this information in the report.

9.2 Identification of new obstacles

9.2.1 In most instances, accurate information concerning the location, description and heights of tall towers and other obstacles is available from the database and/or other government sources. When new potentially controlling obstacles not identified in the procedure package are discovered, the procedure's initial evaluation will be assessed as "failed" until the designer can analyze the impact of the obstacle on the overall procedure. Particular emphasis is given to the following obstacles which may not be populated in the database:

a) power lines;

b) man-made structures;

c) wind farms; and

d) chimneys with high velocity exhaust gases.

9.2.2 Obstacle locations must be noted with latitude/longitude or radial/bearing and distance from a known navigation aid or waypoint. If these methods are not available, an accurate description on the flight validation map may be used and a digital picture taken if possible.

9.2.3 Obstacle heights measured in-flight are not considered accurate and should not be used unless the actual height of the obstacle cannot be determined by other means. GNSS is the preferred measurement tool; however, if barometric height determination is required, accurate altimeter settings and altitude references must be used to obtain reasonable results. The flight validation report will reflect the documentation for the method of height determination including altimeter corrections applied for low temperature, mountain wave, etc. The GNSS altitude must also be noted.

9.2.4 Obstacle assessment for multiple approaches to the same runway may be completed during a single evaluation to meet periodic requirements.

9.2.5 While the challenging nature of this task is acknowledged, its basic purpose is to confirm that at no time during the approach was the aircraft ever brought into close proximity – laterally or vertically – to any obstacles. It is not intended to imply an exhaustive survey of every obstacle in the area.

9.3 Terrain Awareness Warning System (TAWS) Alerts

9.3.1 Some TAWS(s) may alert while flying over irregular or rapidly rising terrain at altitudes providing standard obstacle clearance. If TAWS alerts are received while validating a procedure, repeat the maneuver, ensuring flight at the designed true altitude using temperature compensation at the maximum design speed for the procedure.

9.3.2 If the alert is repeatable, indicate the information in the report, including sufficient details for resolution by the designer. The FVP should not hesitate to provide potential operational solutions such as speed restrictions, altitude restrictions or waypoint relocation. A TAWS alert may be generated when approaching an airport runway that is not in the TAWS database. The TAWS check should be performed with proper aircraft configuration in the respective phase of flight.

APPENDIX 10

SAMPLE VALIDATION DOCUMENTATION

<table>
<tr><th colspan="9">Flight Procedure Design Software Validation</th></tr>
<tr><td colspan="3">SOFTWARE NAME</td><td colspan="3">JFC Procedure Design Suite</td><td>Version</td><td colspan="2">1.0</td></tr>
<tr><td colspan="2">Evaluator:</td><td colspan="2">John De La Cruz</td><td colspan="2">Signature:</td><td colspan="3">(signed)</td></tr>
<tr><td colspan="3">Organization/ State:</td><td colspan="3">Nickwings AvTech Corp., Philippines</td><td>Date</td><td colspan="2">05/19/2020</td></tr>
<tr><td>Test No.</td><td>1</td><td>Title:</td><td>Circling</td><td>Objective:</td><td colspan="4">Validate construction and obstacle assessment of circling area</td></tr>
<tr><td colspan="3">Reference Doc.</td><td colspan="6">PANS-OPS, Volume II [Part I, Section 4, Chapter 7]</td></tr>
<tr><td colspan="3">Related Test Nos.</td><td colspan="6">Tests # 7 and 8</td></tr>
<tr><th colspan="9">Initial Conditions</th></tr>
<tr><td colspan="9">Application is open, and populated with database set “A1”. Procedure titled VOR/DME straight-in final Test #8 has been created and saved.</td></tr>
<tr><th>Step</th><th colspan="2">Required Action</th><th colspan="4">Expected Results</th><th>Pass</th><th>Fail</th></tr>
<tr><td>1</td><td colspan="2">CAT A area</td><td colspan="4">Application correctly constructs area</td><td>x</td><td></td></tr>
<tr><td>2</td><td colspan="2">CAT A obstacle assessment</td><td colspan="4">Application correctly assesses obstacles</td><td>x</td><td></td></tr>
<tr><td>3</td><td colspan="2">CAT B area</td><td colspan="4">Application correctly constructs area</td><td>x</td><td></td></tr>
<tr><td>4</td><td colspan="2">CAT B obstacle assessment</td><td colspan="4">Application correctly assesses obstacles</td><td>x</td><td></td></tr>
<tr><td></td><td colspan="2"></td><td colspan="4"></td><td></td><td></td></tr>
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<tr><td></td><td colspan="2"></td><td colspan="4"></td><td></td><td></td></tr>
<tr><th colspan="9">Comments</th></tr>
<tr><td colspan="9">None</td></tr>
</table>

INTENTIONALLY LEFT BLANK