GHANA CIVIL AVIATION
(AIR NAVIGATION SERVICES)
DIRECTIVES

PART 38 – FLIGHT PROCEDURE DESIGN (FPD)

NOVEMBER, 2018

GCAA

INTRODUCTION

Part 38 prescribes the requirements for the design, continuous maintenance and periodic review of Flight Procedures.

Ghana Civil Aviation Authority (GCAA) is the designated Air Navigation Service Provider with the responsibility for, amongst others, providing Visual and Instrument Flight Procedures Design services. The Authority shall follow an instrument flight procedure process that encompasses acquisition of data, design and promulgation of procedures. The Authority shall ensure that the quality and safety of the procedure design product are assured through review, verification, coordination and validation of the procedure at appropriate points in the process.

The Authority shall ensure that the units of measurements, as specified in Part 22 of Ghana Civil Aviation (ANS) Directives are used in the design of Flight Procedures.

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38.1 DEFINITIONS

When the following terms are used in these Directives they have the following meanings:

Aerodrome operating minima. The limits of usability of an aerodrome for:

a) take-off, expressed in terms of runway visual range and or visibility and, if necessary, cloud conditions;
b) landing in precision approach and landing operations, expressed in terms of visibility and or runway visual range and decision altitude or height (DA/H) as appropriate to the category of the operation;
c) landing in approach and landing operations with vertical guidance, expressed in terms of visibility and/or runway visual range and decision altitude or height (DA/H); and
d) landing in non-precision approach and landing operations, expressed in terms of visibility and/or runway visual range, minimum descent altitude or height (MDA/H) and, if necessary, cloud conditions.

Aerodrome reference point. The certificated geographical location of an aerodrome

Aeronautical chart. A representation of a portion of the Earth, its culture and relief, specifically certificated to meet the requirements of air navigation.

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

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

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

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

Aeronautical Information Service (AIS). A service established within the defined area of coverage responsible for the provision of aeronautical data and aeronautical information necessary for the

safety, regularity and efficiency of air navigation.

AIP Amendment. Permanent change to information contained in the AIP;

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

Air Navigation Services (ANS). The following services provided for air navigation:

a) Air Traffic Services/ Air Traffic Management (ATS/ATM);
b) Flight Procedure Design (FPD) services;
c) Communication, Navigation and Surveillance (CNS);
d) Aeronautical Information Services/Aeronautical Information Management (AIS/AIM);
e) Aeronautical Cartographic Services;
f) Aeronautical Telecommunication Services; or
g) Aeronautical Search and Rescue.

Air Navigation Services Provider. An independent entity established for the purpose of providing one or more of the air navigation services as defined in these Directives.

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

Arrival routes. Routes identified in an instrument approach procedure by which aircraft may proceed from the en-route phase of flight to an initial approach fix.

Authority. Authority means Ghana Civil Aviation Authority (GCAA);

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

Flight procedure design. The complete package that includes all the considerations that went into the development of an instrument flight procedure.

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.

Instrument approach procedure. A series of predetermined manoeuvres 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 flight procedure process. the overarching process from data origination to the publication of an instrument flight procedure

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

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

Integrity classification (aeronautical data). Classification based upon the potential risk resulting from the use of corrupted data. Aeronautical data is classified as:

a) routine data: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;

b) essential data: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and

c) critical data: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

Missed approach procedure. That procedure to be followed if the approach cannot be continued.

Nautical mile (NM). The length equal to 1 852 metres exactly.

Navigation specification. A set of aircraft and flight crew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specifications:

RNAV specification. A navigation specification based on area navigation that does not include the requirement for on-board performance monitoring and alerting, certificated by the prefix RNAV;

RNP specification. A navigation specification based on area navigation that includes the requirement for on-board performance monitoring and alerting, certificated by the prefix RNP;

a) RNAV specification. A navigation specification based on area navigation that does not include the requirement for on-board performance monitoring and alerting, certificated by the prefix RNAV;

b) RNP specification. A navigation specification based on area navigation that includes the requirement for on-board performance monitoring and alerting, certificated by the prefix RNP;

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that—

a) are located on an area intended for the surface movement of aircraft; or

b) extend above a defined surface intended to protect aircraft in flight; or

c) stand outside those defined surfaces and that have been assessed as being a hazard to air navigation;

Obstacle clearance altitude (OCA) or obstacle clearance height (OCH). 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.

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

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation;

Operations manual. A manual prepared by a service provider or a person applying for approval

Performance Based Navigation. Area navigation based on performance requirements for aircraft operating along an Air Traffic Service route, on an instrument approach procedure or in a certificated airspace;

Precision approach procedure. an instrument approach procedure utilizing azimuth and glide path information provided by an Instrument landing system or precision approach radar.

Quality. A degree to which a set of inherent characteristics fulfils requirements.

Quality assurance. Part of quality management focused on providing confidence that quality requirements will be fulfilled.

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

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

Quality system. The organizational structure, procedures, processes and resources needed to implement quality management.

Reliability. The probability that the service will perform its function or functions without failure for a specified period.

Resolution. A number of units or digits to which a measured or calculated value is expressed and used.

Terrain. The surface of the Earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles.

Transition altitude. The altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes.

Visual approach procedure. A series of predetermined manoeuvres by visual reference, 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, a go-around procedure can be carried out.

Waypoint. 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 meaning a waypoint which requires turn anticipation to allow tangential interception of the next segment of a route or procedure, or

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

38.2 APPLICABILITY

These Directives shall apply to: -

(a) a person providing a Flight Procedure Design Service within control areas and at aerodromes for civil aviation purposes.

(b) the design, validation, operation, continuous maintenance and periodic review of visual and instrument flight procedures.

38.3 INSTRUMENT FLIGHT PROCEDURE DESIGN (IFPD) ORGANIZATION

(1) The PANS-OPS Unit shall maintain an appropriate instrument design office to enable the IFP designer to carry on design work in IFP in accordance with the requirements set out in this Directive.

(2) The Authority shall ensure that the designs of instrument flight procedures are in accordance with:

(a) applicable standards set out or referred to in PANS-OPS, ICAO Doc 8168, Vol I & II, and or

(b) applicable standards as set out in this Directive.

(3) The PANS-OPS Unit shall make provisions for person(s) trained in IFP design to check and verify independently the plans of each instrument flight procedure designed.

(4) The PANS-OPS Unit shall develop and maintain an operations manual which shall serve to demonstrate how the PANS-OPS Unit will comply with the requirements set out in this Directive.

(5) The contents of the operations manual shall include but not be limited to the following:

(a) a table of contents based on the items in the manual, indicating the page number on which each item begins;

(b) a description of the designer's organizational structure and a statement setting out the functions that the designer performs, or proposes to perform.

(c) a description of the chain of command established, or proposed to be established, by the designer and a statement of the duties and responsibilities of any supervisory positions within the organizational structure;

(d) a statement showing how the designer determines the number of operational staff required including the number of operational supervisory staff;

(e) a list of the design services that the designer provides, or proposes to provide;

(f) a statement, for each design service, that identifies the location from where the service is provided, or proposed to be provided;

(g) a statement of the responsibilities and functions for each position;

(h) a description of the arrangements made or proposed to be made by the designer to ensure that it has, and will continue to receive, the information necessary for providing the service;

(i) a description of the arrangements made or proposed to be made by the designer to ensure that it has, and will continue to be able to provide, information in connection with its design services to another person whose functions reasonably require that

information;

(j) a description of the designer's record keeping system;

(k) a statement detailing any agreement entered into by the designer in relation to the provision of a design service provided by another party;

(l) a copy of the document that sets out the designer's safety management system;

(m) a description of the processes and documentation used to present to staff the relevant standards, rules and procedures contained in documents associated with PANS-OPS, this Directives, ICAO Doc 9905 if applicable, and any of the designer's site-specific instructions for the provision of design services;

(n) a description of the processes and documentation used to provide operational instructions to staff;

(o) a description of the procedures to be followed to ensure all operational staff are familiar with any operational changes that have been issued since they last performed operational duties;

(p) a description of the designer's training and checking program;

(q) a description of the procedures to be used in commissioning new facilities, equipment and services;

(r) a description of the format(s) that will be used for the issue of completed designs for publication;

(s) a description of the procedures to be used to ensure that all equipment, including software is operated in accordance with the manufacturer's operating instructions and manuals;

(t) the safety management system of the certified designer;

(u) a description of the procedures to be used to conduct environmental assessments; and

(v) the procedures to be followed for revising the operations manual.

(6) The PANS-OPS Unit shall:

(a) keep the operations manual in a readily accessible form;

(b) ensure that the IFP designer has ready access to the operations manual; and

(c) amend the operations manual whenever necessary to keep its content up to date.

(7) The PANS-OPS Unit shall submit a copy of the most current operations manual to Authority for approval.

(8) The PANS-OPS Unit shall provide and maintain facilities for the design work on IFP as follows:

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

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

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

(9) If an aeronautical database and aeronautical data is required for designing an instrument flight procedure, the PANS-OPS Unit shall ensure the integrity of the database and the data. The data used shall be current, traceable, and meets the required level of verifiable accuracy for the design.

(10) The PANS-OPS Unit shall establish and put into effect, a system for controlling documents and records relating to the IFP on which the designer carries on design work, including the policies and procedures for making, amending, preserving and disposing of those documents and records.

(11) The PANS-OPS Unit shall, at the Authority's request, make the documents and records, or copies of them or extracts from them, available for inspection.

38.4 IFP DESIGNER QUALIFICATIONS AND TRAINING

(1) The Authority shall ensure that a person designing or amending a flight instrument procedure demonstrates required competency level for flight procedure design. IFP designers shall acquire and maintain this competency level through training and supervised on-the-job training (OJT).

(2) The training for IFP designers shall include an initial training and recurrent training at periodic intervals.

(3) The Authority shall ensure that the IFP designer is able to demonstrate a basic level of competency through initial training that includes at least the following elements:

(a) knowledge of information contained in PANS-OPS and other related ICAO provisions relevant to the State;

(b) skills in the design of procedures; and

(c) demonstration of competency as outlined in the competency framework for flight procedures design as outlined in ICAO Doc 9906 — Quality Assurance Manual for Flight Procedure Design, Volume 2 — Flight Procedure Designer Training, Table 2-1.

(4) The Authority shall ensure that the IFP designer is able to demonstrate a basic level of competency through recurrent training that includes at least the following elements:

(a) knowledge about updates in ICAO provisions and other provisions pertaining to procedure design; and

(b) maintenance and enhancement of knowledge and skills in the design of procedures.

(5) The PANS-OPS Unit shall maintain training records for their IFP designers.

38.5 GRADES OF INSTRUMENT FLIGHT PROCEDURE DESIGNER

The following grades are established for designated design organizations:

(a) Chief Designer;

(b) Qualified Designer;

(c) Unqualified Designer.

38.5.1 CHIEF DESIGNER

(1) The minimum standard for the qualifications and experience of a Chief Designer is:

(a) the qualification and experience requirements of a Qualified Designer;

(b) appropriate experience in the design of the type of procedures to be designed under an Instrument Flight Procedure Design Certificate; and

(c) satisfactory completion of an advanced course in PANS-OPS procedure design.

(2) The minimum standard of recent experience for appointment as a Chief Designer is:

(a) relevant design experience within the previous one year; or

(b) satisfactory completion of an approved PANS-OPS procedures design course or an advanced course in PANS-OPS procedure design within the previous two years.

38.5.2 QUALIFIED DESIGNER

The minimum standard for the qualifications and experience of a Qualified Designer is:

(a) satisfactory completion of an approved PANS-OPS procedures design course; and

(b) satisfactory completion of a course of in-service training in procedures design as detailed in the designer's operations manual; and

(c) required minimum experience in accordance with subsection 38.5.6; and

(d) a written approval by the Chief Designer as specified in Section 38.11.

38.5.3 UNQUALIFIED PERSONS

(1) Personnel who are not qualified under section 38.5 must not:

(a) design a procedure for which a Certificate of Approval is required the Authority except under direct supervision; or

(b) verify (check) a procedure for which a Certificate of Approval is required by the Authority.

(2) Direct supervision means supervision by a qualified designer who is engaged on a full-time basis in the same premises.

38.5.4 SUPERVISORS

The minimum standard for the qualifications and experience of persons responsible for the supervision of other design staff is:

(a) Qualified Designer; and

(b) substantial experience in the design of instrument flight procedures.

38.5.5 MINIMUM EXPERIENCE

(1) Minimum design experience is required for each type of procedure to be designed.

(2) The minimum experience required is three designs, checked and approved by a Chief Designer, and completed within any six consecutive months.

38.5.6 RECENCY

A person shall not design (except under direct supervision) or verify a procedure, unless he has designed, checked or been directly involved in the detailed review of a procedure of the same type within the previous year.

38.6 PROCEDURE DESIGN INFORMATION ACQUISITION

(1) The PANS-OPS Unit shall ensure that the survey and subsequent IFP design activities are controlled and monitored by a person(s) trained in procedure design.

(2) In the obstacle survey for procedure design, the IFP designer shall consider that:

(a) all obstacles be accounted for. Items, such as trees and heights of tall buildings shall be accounted for either by physical examination of the site or by addition of a suitable margin above terrain contours; and

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

(3) The procedure design information shall be coordinated with all relevant stakeholders. As input for the procedure design process the following aspects shall be assessed:

(a) airport, navigation aid, obstacle, terrain coordinate and elevation data, based on verified surveys and complying with Part 14 of the Ghana Civil Aviation (Aerodrome) Directives and Parts 15, 23 and 24 of the Ghana Civil Aviation (ANS) Directives;

(b) airspace requirements;

(c) user requirements – the needs of Air Traffic Service provider and operators who will use this procedure;

(d) airport infrastructure such as runway classification, lighting, communications, runway markings, and availability of local altimeter setting;

(e) environmental considerations; and

(f) any other potential issue associated with the procedure.

38.7 IFP DESIGN CRITERIA

(1) Procedures shall be designed in accordance with the PANS-OPS criteria prescribed in ICAO Doc 8168, Vol I & II. Coordination with all concerned parties shall continue throughout the procedure design and validation process to ensure that the procedure meets the needs of the user and the community.

(2) Each new or revised procedure shall be verified by a qualified procedure designer other than the one who designed the procedure, to ensure compliance with applicable criteria.

(3) Published procedures shall be subject to periodic review to ensure that they continue to comply with changing criteria, and continue to meet user requirements. The maximum interval for this review is five (5) years.

(4) The documentation provided by the IFP designer is divided into three categories and includes:

(a) documentation required for publication in the AIP in accordance with Parts 15 and 21 of the Ghana Civil Aviation (ANS) Directives;

(b) documentation required to maintain transparency concerning the details and assumptions used by the IFP designer, which shall include supporting information or data used in the design, such as:

(i) controlling obstacle for each segment of the procedure;

(ii) effect of environmental considerations on the design of the procedure;

(iii) infrastructure assessment;

(iv) airspace constraints;

(v) for modifications or amendments to existing procedures, the reasons for any changes;

(vi) for any deviation from existing standards, the reasons for such a deviation and details of the mitigations applied to assure continued safe operations; and

(vii) the results of the final verification for accuracy and completeness (quality assurance checks) prior to validation and then prior to publication.

(c) additional documentation required to facilitate ground and flight validation of the procedure.

(5) All calculations and results of calculations shall be presented in a manner that enables the reader to follow and trace the logic and resultant output. A record of all calculations shall be kept in order to prove compliance with or variation from, the standard criteria. Formulae used during calculation shall be the standard formulae as stated in the PANS-OPS. Units of measurement and conversion factors between such units shall be in accordance with Parts 21 and 22 of the Ghana Civil Aviation (ANS) Directives.

(6) Rounding of results shall follow the standard guidelines in the PANS-OPS. Rounding shall only be made at the publication stage to facilitate usable figures on maps and charts. Where rounding is required at earlier stages rounding shall be made to the pessimistic consideration.

(7) All documentation shall undergo a final verification for accuracy and completeness prior to validation and publication.

(8) All documentation shall be retained to assist in recreating the procedure in the future in the case of incidents and for periodic review and maintenance. The periodic retention shall not be less than the operational lifetime of the procedure.

38.8 INSTRUMENT FLIGHT PROCEDURE DESIGN VALIDATION

(1) Validation shall consist of ground validation and flight validation.

(2) Ground validation shall always be undertaken.

(3) When ground validation can verify 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.

(4) Ground validation shall review the entire instrument flight procedure package by a person(s) trained in procedure design and with appropriate knowledge of flight validation issues.

(5) The ground validation shall be conducted to determine if flight validation is needed for modifications and amendments to previously published procedures.

(6) Flight validation of IFP when required shall be carried out as part of the initial record and shall be included as part of the periodic quality assurance programme. It shall be accomplished by a qualified and experienced Flight Validation Pilot (FVP).

(7) The flight validation of IFP shall:

(a) provide assurance that adequate obstacle clearance has been provided;
(b) verify that the navigation data to be published, as well as that used in the design of the procedure, is correct;

(c) verify that all required infrastructure, such as runway markings, lighting, and communications and navigation sources, are in place and operative;

(d) conduct an assessment of fly ability to determine that the procedure can be safely flown; and

(e) evaluate the charting, required infrastructure, visibility and other operational factors.

(8) The PANS-OPS Unit shall conduct flight validation in accordance with the requirements of ICAO Doc 9906, Volume 5 — Validation of IFP and IS: 38.8.8.

38.8.1 Flight Validation Pilot (FVP) Qualification

(1) The qualifications for FVP shall include:

(a) All the experience requirements for the Airline Transport Pilot Licence (ATPL) in the relevant category of aircraft (e.g. aeroplane or helicopter) as defined in Part 2 of the Ghana Civil Aviation (Flight Standards) Directives.

(b) the licence held by the FVP shall be for the aircraft category (e.g. aeroplane or helicopter) appropriate for the procedure to be validated and current command instrument rating, endorsed for the type of procedure under validation;

(c) relevant experience in multi-engine IFR procedures ;

(d) completion of a procedure flight validation flight within the previous year.

(2) Helicopter procedures are to be validated by pilots who, in addition to the above qualifications, are familiar with helicopter procedure design and operations.

(3) Should the validation pilot not be qualified as pilot-in-command of a helicopter, aircraft or flight simulator to be used for a validation flight, another pilot may be assigned to be the pilot in command provided that the validation pilot occupies a seat in the cockpit and directs the conduct of the validation.

(4) In order to adequately validate instrument procedures, FVPs training shall include the following:

(a) Standards, procedures and guidance pertinent to AIS, including Part 15 of the Ghana Civil Aviation (ANS) Directives;

(b) Standards, procedures and guidance pertinent to flight inspection,

including Part 23 of the Ghana Civil Aviation (ANS) Directives and ICAO Doc 8071 — Manual;

(c) Standards, procedures and guidance pertinent to aerodromes, including Part 14 of the Ghana Civil Aviation (Aerodrome) Directives, ICAO Doc 9157 — Airport Services Manual and ICAO Doc 9157 — Aerodrome Design Manual;

(d) Standards, procedures and guidance pertinent to charting and aviation publications including Annex 4 and ICAO Doc 8697 — Aeronautical Chart Manual;

(e) performance-based navigation (PBN) and conventional instrument procedure construction such as standard instrument departures or standard instrument arrivals (SIDs/STARs) and holding or reversal procedures, including the PANS-OPS;

(f) the PBN concept including the ICAO Doc 9613 — Performance-based Navigation (PBN) Manual;

(g) the basic concept of and differences between flight validation and flight inspection;

(h) ARINC 424 coding;

(i) Human Factors;

(j) different types of aircraft operations and aircraft performance (i.e. limitations and equipment);

(k) obstacle assessment methodology;

(l) safety assessment process;

(m) geodesy, including ICAO Doc 9906, Volume 2, paragraph 3.3.3.8; and

(n) comprehensive understanding of ICAO Doc 9906, Volume 5.

(5) The IFP designer shall be the originator of all data applicable to conduct a flight validation provided to the flight inspection operations activity.

38.9 DESIGN APPROVAL AND PUBLICATION

(1) The PANS-OPS Unit shall submit IFP designs/charts to the Authority for approval after independent verification by a certified designer.

(2) The PANS-OPS Unit shall provide IFP designs/charts to the Aeronautical Information Service (AIS) office for publication in the AIP.

(3) The IFP design shall be accompanied by a narrative, which describes the procedure in textual format.

(4) The intended effective date for operational use of the IFP design shall be included in the document narrative.

(5) The designs/charts published in the AIP shall be produced in accordance with the provisions contained in the documents listed below:

(a) ICAO Annex 4 — Aeronautical Charts

(b) ICAO Doc 8168 — Procedures for Air Navigation Services — Aircraft Operations, Volumes I and II (PANS-OPS);

(c) ICAO Doc 8697; and

(d) Parts 15 and 21 of the Ghana Civil Aviation (ANS) Directives.

(6) The aeronautical charts included in the AIP shall be kept up-to-date by means of replacement sheets where necessary. Significant amendments or revisions in the IFP shall be clearly indicated in the revised charts.

38.10 PROCEDURE DESIGN AUTOMATION

(1) The Authority shall ensure that the software packages used in the design of procedures have been validated.

(2) Validation of the software shall be in accordance with the requirements of ICAO Doc 9906, Volume 3 — Flight Procedure Design Software Validation.

38.11 ADMINISTRATION

38.11.1 STAFF RECORDS

The Chief Designer shall maintain a register of:

(a) personnel qualifications and courses attended;

(b) staff training;

(c) proficiency checks conducted;

(d) staff approvals;

(e) staff recency.

38.11.2 APPROVAL OF DESIGN STAFF

The Chief Designer shall provide each staff member engaged in instrument flight procedure design as a Qualified Designer with a written statement specifying:

(a) that the person is a Qualified Designer; and

(b) the types of procedure that the person is approved to design; and

(c) any limitations or supervision requirements that apply; and

(d) any approval to supervise other design staff.

38.12 DOCUMENTATION AND REFERENCE MATERIAL

38.12.1 REFERENCE MATERIAL

The following documents, as applicable, are required for the design of instrument flight procedures and management of the design process:

(a) The Ghana Civil Aviation (ANS) Directives Part 38;

(b) ICAO Procedures for Air Navigation — Air Operations, Doc 8168-OPS/611, Volume II — Construction of Visual and Instrument Flight Procedures;

(c) ICAO Instrument Flight Procedures Construction Manual, Doc 9368-AN/911;

(d) ICAO Template Manual for Holding, Reversal and Racetrack Procedures, Doc 9371-AN/912/2;

(e) ICAO Required Navigation Performance Authorization Required Procedure Design Manual, Doc 9905-AN/471;

(f) ICAO Quality Assurance Manual for Flight Procedures Design, Doc 9906-AN/472, Volume 1 — Flight Procedures Design Quality Assurance System;

(g) ICAO Quality Assurance Manual for Flight Procedures Design, Doc 9906-AN/472, Volume 2 — Flight Procedure Designer Training (Development of a Flight Procedures Designer Training Programme);

(h) ICAO Quality Assurance Manual for Flight Procedures Design, Doc 9906-AN/472, Volume 3 — Flight Procedure Design Software Validation;

(i) ICAO Quality Assurance Manual for Flight Procedures Design, Doc 9906, Volume 5 — Validation of Instrument Flight Procedures;

(j) ICAO Performance Based Navigation (PBN) Manual, Doc 9613-AN/937.

38.12.2 DOCUMENT AND RECORD CONTROL SYSTEM

(1) Document and data control processes are those that control the authorization, publication, distribution, and amendment of all documentation issued or required by designated designers.

(2) These processes must ensure that:

(a) documents are authorized by the Chief Designer or a designated person;

(b) the currency of documentation can be readily determined;

(c) documents are available at locations where needed by staff;

(d) only current versions of documents are available;

(e) A master copy of all documentation is securely held; and

(f) all documents that are related to and referenced in the Operations Manual are indexed in the Operations Manual.

38.12.3 RECORDS

(1) A designated designer must maintain the following records:

(a) all certificates, correspondence, data, calculations, worksheets, drawings, charts and other information pertaining to the design of a procedure;

(b) staff records (see subsection 38.11.1).

(2) Records must be made available for audit or inspections by the Authority.

(3) Records relating to procedure designs must be retained for the period that a procedure is available for use and for a period of two years after a procedure ceases to be available or is withdrawn.

(4) Staff records must be retained during the time that staff are employed.

38.13 SAFETY MANAGEMENT SYSTEM

38.13.1 REQUIREMENT

The PANS-OPS Unit shall establish and maintain a Safety Management System (SMS) in accordance with the following provisions.

38.13.2 SAFETY MANAGEMENT SYSTEM

(1) A Safety Management System shall define the policies, processes, and practices for managing the safety of all procedure design work.

(2) A Safety Management System that meets the following criteria is to be issued under the authority of the Chief Designer.

(3) The Safety Management System shall:

(a) be a comprehensive and valid statement of the safety situation that applies in actual operations;

(b) define the organization's safety objectives;

(c) present the safety situation in respect to compliance with all relevant GCAA, ICAO, internal, and other safety related standards and Directives;

(d) define the safety accountabilities of all personnel;

(e) be kept under review for effectiveness by all personnel;

(f) include arrangements to encourage staff to identify safety hazards or concerns and suggest methods for enhancement of safety;

(g) establish procedures for the communication and processing of safety concerns within the organization;

(h) be available to, and complied with, by all personnel of the organization;

(i) contain a safety hazard or risk analysis and risk control or mitigation assessment in accordance with an established methodology endorsed by GCAA;

(j) include a quality management system based on those elements of ISO 9001 relevant to instrument flight procedure design;

(k) be documented in a manner that is readily available to all staff.

PART 38 – IMPLEMENTING STANDARDS

For ease of reference, the number assigned to each implementing standard corresponds to its associated regulation. For example, IS 38.2.1 would reflect a standard required in subsection 38.2.1

GCAA

IS: 38.8 (8) FLIGHT VALIDATION

1.1 GENERAL

1.1.1 OVERVIEW

1.1.1.1 Flight validation is required for:

(a) instrument approach procedures;

(b) revised instrument approach procedures where the final course has been re-aligned by 3° or more.

1.1.1.2 Validation of an instrument flight procedure comprises:

(a) a review of the draft procedures from an operational perspective conducted by the validation pilot; and

(b) a validation flight check.

1.1.1.3 The process of instrument approach procedure design focuses on those controlling obstacles that affect the procedure. This focus is facilitated through the use of various obstacle and terrain databases. The purpose of flight validation is to verify database information, to check all obstacles (including the identification of any unforeseen obstacles) that affect the safety of the procedure, and to assess the 'flyability' of the procedure.

1.1.2 MAPS AND CHARTS

1.1.2.1 Validation flights shall carry maps and charts that meet the following requirements:

(a) An appropriate topographical map of at least 1:250,000 scale or larger scale. (A scale of 1:100,000 may be necessary in areas of precipitous terrain and when checking circling, final and missed approach segments.) The map shall be marked by the procedure designer with:

(i) final segment splay/s;

(ii) missed approach segment splay/s;

(iii) circling area for the appropriate categories or category groups; and

(iv) controlling obstacles for each segment, MSA and holding pattern.

1.1.3 WEATHER

1.1.3.1 Validation flights must be undertaken in daylight hours and in VMC. The ceiling should be above the initial approach altitude (preferably above the 25 NM MSA).

1.1.4 RESPONSIBILITIES

1.1.4.1 The Chief Designer is responsible for the organisation of flight validation activities.

1.1.4.2 The procedure design flight validation crew member is responsible for the planning of validation flights.

1.1.5 AIRCRAFT

1.1.5.1 The standard for the type of aircraft to be used for flight validation of a design is an aircraft that has performance capabilities appropriate to the type and design of the procedure.

1.1.5.2 The aircraft shall be of a configuration that permits good visibility and adequate cabin dimensions permitting maps and other documents to be readily referred to in flight.

1.1.5.3 The type of aircraft is to be approved by the Authority's validation pilot.

1.1.5.4 An aircraft flight simulator, approved by the Authority's validation pilot may be used to verify database information and flyability of the procedure.

1.1.6 CREW

1.1.6.1 The minimum crew is a pilot and a procedure designer.

1.1.62 Only persons involved in the validation procedure being conducted in an aircraft shall be carried in the aircraft.

1.1.7 CONDUCT OF OPERATIONS

1.1.7.1 Judgment shall be applied when planning the validation flight to minimise the time spent on task. Efficiently linked segments and avoiding those areas where obstacles will have no effect on the procedure will help to achieve this objective.

1.1.7.2 Crew responsibilities:

(a) the pilot shall fly the aircraft;

(b) the procedure designer shall:

(i) visually navigate the aircraft; and

(ii) direct the pilot by providing tracks and altitudes to fly; and

(iii) note any differences to the pre-determined list of obstacles;

(c) both crew members shall be responsible for lookout;

(d) when flying the segments of the procedure, the aircraft shall be configured to emulate the highest category aircraft for which the procedures are planned—this will be particularly important when the length of a particular segment is short;

(e) when checking individual obstacles, the highest practical speed, commensurate with fuel reserves shall be used;

(f) during the validation process, gear shall be up and any lights that increase the visibility of the aircraft shall be turned on.

1.1.8 ENVIRONMENT

1.1.8.1 Prior to conducting validation of a procedure in a populated or environmentally sensitive area, the procedure designer shall:

(a) discuss with the validation pilot any options for reducing the environmental impact of the flight.

(b) as appropriate, advise the aerodrome operator, ATC, the appropriate office of the Authority, and any other affected persons, of the details of the proposed operation, including advice that low-level flying will be required.

(c) advise the Authority's Corporate Communication office in sufficient time to permit a press release to be issued.

1.1.9. VALIDATION OF THE PROCEDURE

1.1.9.1 The actual sequence of checks is not mandated in this document, as each situation will suggest the most economical way of arranging the elements of the task.

1.1.9.2 The specified altitude(s) for the validation of an instrument approach segment is or are equal to the published segment minimum altitude(s) minus the Minimum Obstacle Clearance (MOC) applicable to the segment.

1.1.9.3 Each controlling obstacle and or procedure segment must be checked at a specified altitude(s) to validate the obstacle data used and to determine whether there are any unforeseen obstacles extending above the specified altitude. Such a case would indicate that the unforeseen obstacle is higher than the controlling obstacle and that it may affect the procedure. If such an unforeseen obstacle is observed, its location and observed height AMSL must be recorded for subsequent detailed analysis by the procedure designer.

1.1.10 25 AND 10 NM MINIMUM SECTOR ALTITUDE

1.1.10.1 Each 25 NM sector, or the 25 NM circle, and the 10 NM circle must be checked at their specified altitudes. 25 NM and 10 NM MSAs include obstacles out to 30 NM and 15 NM respectively from the navigation aid or ARP upon which the MSA is based. Checks must include the controlling obstacle in addition to other obviously high terrain or obstacles. Where the sector/circle does not exhibit greatly differing terrain elevations, judgment may be exercised regarding the tracks flown to provide a full coverage of the area.

1.1.11 TERMINAL ARRIVAL ALTITUDE (TAA)

1.1.11.1 Each Terminal Arrival Altitude (TAA) sector must be checked at its specified altitude. TAAs include obstacles out to 30 NM from the initial approach fix upon which the TAA is based. Checks must include the controlling obstacle in addition to other obviously high terrain or obstacles. Where adjacent TAAs do not have greatly differing terrain elevations, judgement may be exercised regarding the tracks flown to provide a full coverage of the area.

Note: This paragraph is included in anticipation of Terminal Arrival Altitudes being included in the next amendment to PANS-OPS.

1.1.12 DME/GPS ARRIVAL PROCEDURES

1.1.12.1 Controlling obstacles will be determined by the procedure designer for each segment within each sector of the arrival procedure. These obstacles must be checked at the specified altitude. Additionally, each step in the final and intermediate segments must be flown at the OIS altitude. Each step must be flown around the radius of the step plus 1 NM, between the lateral limits of the sector splay. The controlling obstacles for these steps can be checked during the process of flying the steps.

1.1.13 CIRCLING AREA

1.1.13.1 The circling area must be checked by flying around the lateral limit of the circling area for the lowest supported aircraft category or group (usually CAT A/B) at the specified altitude for that category and looking in towards the airfield. In this manner, both the controlling obstacle and any unforeseen obstacles will be seen in the one action.

1.1.13.2 The same procedure is then used to check obstacles in the circling area for the next highest supported aircraft category or group (CAT C/D). By conducting the inner check first, obstacles that may affect all categories can be readily identified.

1.1.13.3 Circling area checks are not conducted in those areas designated 'No Circling'.

1.1.14 FINAL AND INTERMEDIATE SEGMENTS

1.1.14.1 The final and, where implemented, the intermediate segment, shall be checked as follows:

(a) fly from overhead the MAPT at the specified altitude for the final segment, at 90° to the final track, to the limit of the splay;

(b) turn to fly away from the airfield along the lateral edge of the splay at the final specified altitude to abeam the step down fix (if implemented) or abeam the FAF:

(i) abeam the step down fix, climb to the specified altitude for the next section of the final segment;

(ii) terminate abeam the FAF unless an intermediate segment is implemented, in which case continue along the lateral limit of the intermediate segment at the intermediate specified altitude until abeam the IF and terminate at that point;

(iii) during this process look across the splay to identify the controlling obstacle and any unforeseen obstacles;

(c) conduct the same process on the opposite side of the splay, but looking in the opposite direction;

(d) if the terrain and visibility are such that an unobstructed view can be had from one side of the splay to the other, the procedure outlined above can be shortened by flying along the centre-line of the splay at the appropriate specified altitude.

1.1.15 MISSED APPROACH SEGMENT

1.1.15.1 The missed approach segment shall be checked in accordance with the following:

(a) position the aircraft at the start of climb point, determined in accordance with Figure 1-1, at the specified level;

(b) fly the aircraft along the missed approach track, climbing at a rate that equates to the missed approach design gradient, until in the final phase of the missed approach.

1.1.15.2 For environments with numerous obstacles, the missed approach segment should be checked by flying the missed approach splays in a similar manner to that specified for the final and intermediate segments, but climbing along the lateral edge of the splay, in accordance with the missed approach design gradient, until in the final phase of the missed approach.

1.1.15.3 The validation start of climb must be determined in accordance with Figure 1-1

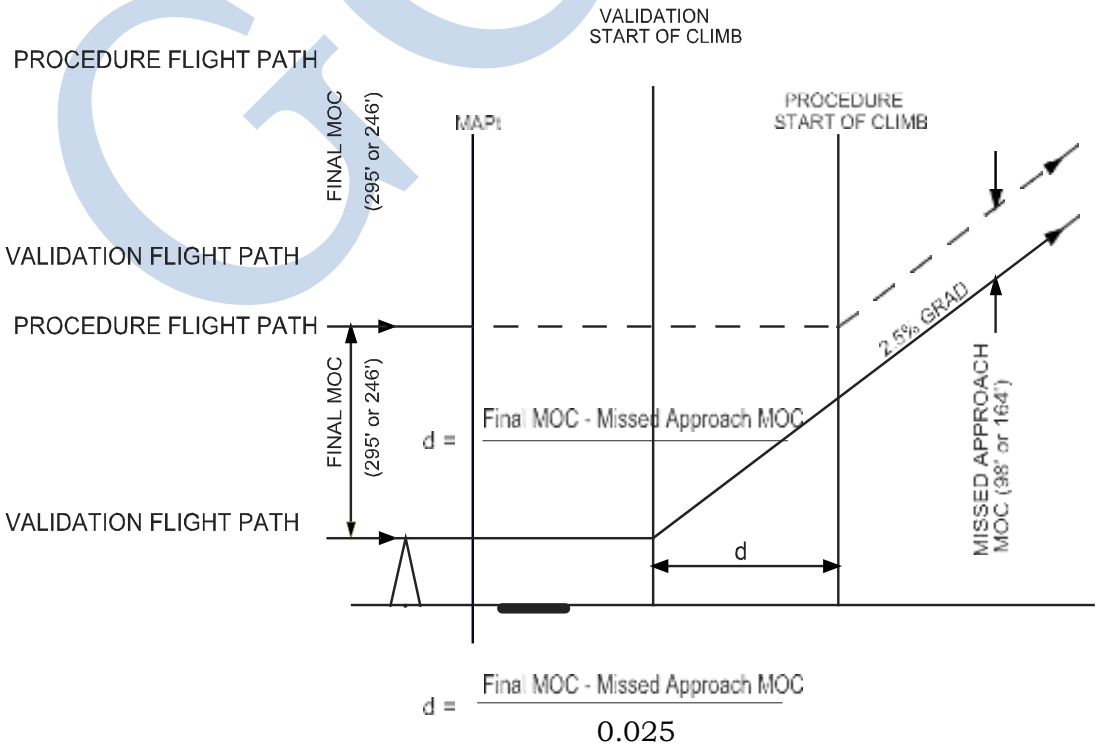

Figure 1-1: Validation start of climb

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1.1.16 THE FINAL AND MISSED APPROACH SEGMENTS

1.1.16.1 Figure 1-2 shows a method for linking the checks of the final and missed approach segments.

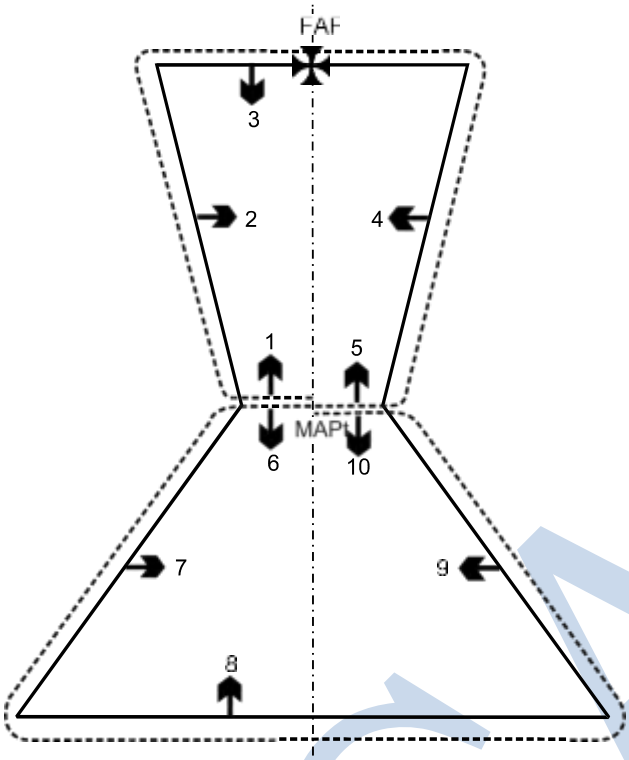

Figure 1-2: Final and missed approach segments

1.1.17 HOLDING AND INITIAL SEGMENTS

1.1.17.1 The controlling obstacles for the holding and initial segments must be checked at their specified altitude and any unforeseen obstacles identified. These checks may be combined with the checks of the DME or GPS Arrival Procedure.

1.1.18 'FLYABILITY' CHECK

1.1.18.1 The complete design, as proposed for publication, shall be checked for operational acceptability. This check should be flown at the maximum segment speeds for the fastest category of aircraft served by the procedure. The check includes:

(a) lead radials;

(b) outbound tracks (highest use category);

(c) outbound timing (highest use category);

(d) descent gradients;

(e) bank angle for turn onto final during base turns;

(f) runway alignment and distance from runway at the minima;

(g) descent gradient from the minima for a straight-in approach;

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(h) the missed approach; and

(i) acceptability of initial and intermediate segment lengths for GPS approaches.

1.1.19 FLIGHT SAFETY

1.1.19.1 Some of these checks will be conducted close to obstacles and in close proximity to airfields, therefore a visual-and-listening watch by all crewmembers is essential. In particular, the following points should be noted:

(a) pay particular attention to airspeed during manoeuvres with high angles of bank;

(b) be vigilant for inconspicuous towers and power transmission lines. Some towers are painted in low-contrast colours;

(c) be alert for birds, particularly near bushfire smoke and over mountainous areas or inland water bodies.

1.1.20 TRAFFIC

1.1.20.1 Give priority to other traffic when validation requirements conflict with existing traffic patterns.

1.1.21 ENVIRONMENTAL ISSUES

1.1.21.1 Try to:

(a) avoid flight over built-up areas, concentrations of animals, or other noise-sensitive areas;

(b) avoid repetitious flight over the same area or areas, and

(c) minimise high RPM noise.

1.1.22 REPORTING

1.1.22.1 A flight validation report form, prepared for the applicable aerodrome, must be attached as part of the validation flight request package. The standard report format is shown in 1.2 below.

1.1.22.2 Following completion of the validation flight:

(a) the pilot must complete the validation report; and

(b) the procedure designer must process the report form and complete the follow-up action.

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1.2 SAMPLE FLIGHT VALIDATION REPORT

1.2.1 FLIGHT VALIDATION REPORT – AIRPORT NAME, STATE

Complete this report to record the results of the flight validation. Those segments that do not apply should be so annotated.

COMMON SEGMENTS

SEGMENT	COMMENT	NEED for CHANGE E (Essential) D
Circling		
25/10NM MSA		

APPROACH PROCEDURE (NAME)

SEGMENT	COMMENT	NEED for CHANGE E (Essential) D
Initial		
Intermediate		
Final		
Missed Approach		
Holding		

APPROACH PROCEDURE (NAME)

SEGMENT	COMMENT	NEED for CHANGE E (Essential) D
Initial		
Final		
Missed Approach		
Holding		

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DME or GPS ARRIVAL (SECTOR A)

SEGMENT	COMMENT	NEED for CHANGE E (Essential) D
Initial		
Intermediate		
Final		
Missed Approach		

Any previously unidentified obstacles that may affect the procedure can be listed in the table below.

PREVIOUSLY UNIDENTIFIED OBSTACLES			
DESCRIPTION	APPROXIMATE ELEVATION	LOCATION	OWNER (if known)

CERTIFICATION

1. The specified altitudes of the above instrument procedures have been checked and the procedures are acceptable subject to the above-mentioned changes (if any) being incorporated.
2. The specified altitudes of the GPS Arrival Sector A have been checked and the procedure is acceptable subject to the above-mentioned changes (if any) being incorporated.
3. The aerodrome is currently certified/registered/other.
4. The WDIs are suitable for straight-in approaches to runways ..... and unsuitable for straight-in approaches to runways ..... . The suitable WDIs are/are not illuminated.
5. The approach procedures were/were not found to be operationally suitable for straight-in minima.

(Signature of validation pilot)