



สำนักงานการบินพลเรือนแห่งประเทศไทย  
The Civil Aviation Authority of Thailand

# Manual of Standards

## Instrument Flight Procedure Design Service

CAAT-ANS-MOSIFPD

Issue: 02

Revision: 00

Date: 24 Feb 2020

Approved By

A blue ink signature of Chula Sukmanop, consisting of a large, stylized initial 'C' followed by a cursive name.

Chula Sukmanop, PhD

Director General

The Civil Aviation Authority of Thailand

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## FOREWORD

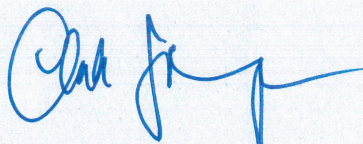
The General Director of Civil Aviation Authority of Thailand is responsible under Section 15/17 (6) of the Air Navigation Act B.E.2497 amended by the Air Navigation Act (No. 14) B.E. 2562 for issuing CAAT regulations on Air Navigation Services for Instrument Flight Procedure Design Service Standards to stipulate qualifications, rules, procedures, conditions, standards and practical guidance for the following matters to ensure conformity with current and timely International Standards.

The Manual of Standards (hereinafter ‘MOS’) is the means CAAT uses to meet its responsibilities under Section 15/17 (6) of the Air Navigation Act B.E.2497 amended by the Air Navigation Act (No. 14) B.E. 2562, CAAT regulations No.12 on Air Navigation Services for Instrument Flight Procedure Design Service Standards and CAAT rule on Manual of Standards - Instrument Flight Procedure Design Service for promulgating standards for Instrument Flight Procedure Design Service. The MOS prescribes the detailed technical material (aviation safety standards) that is determined to be necessary for the safety of air navigation.

The MOS is referenced in the particular regulation. You should refer to the applicable provisions of the Air Navigation Act B.E.2497 amended by the Air Navigation Act (No. 14) B.E. 2562 and CAAT Regulation, Requirement and Rules together with this MOS, to ascertain the requirements of, and the obligations imposed by or under the civil aviation legislation.

Readers should forward advice of errors, inconsistencies or suggestions for improvement to this manual to the Manager, Air Navigation Services Standards Department (please see in subsection 1.1.6.3).

The MOS is issued and amended under the authority of the Director General of Civil Aviation Authority of Thailand.



Chula Sukmanop, PhD

Director General

The Civil Aviation Authority of Thailand

## Record of Revision

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## Chapter 1 Introduction

### 1.1 General

#### 1.1.1 Background

This MOS is made under the Air Navigation Act B.E.2497 amended by the Air Navigation Act (No. 14) B.E. 2562. CAAT Regulation, Requirement and Rules refer to the standards and methods to be used in regulating:

- a.) the standards for compliance, including:
  - 1) The Operations Manual;
  - 2) Design Standards
  - 3) The provider's organization, facilities and equipment, training system, management system and records; and
- b.) what is required to accompany an application for an Instrument Flight Procedure Design Service Provider's (hereinafter 'IFPDSP') certificate; and
- c.) Discontinuance of the service.

#### 1.1.2 Document set

1.1.2.1 The document hierarchy consists of:

- a) The Air Navigation Act B.E.2497 amended by the Air Navigation Act (No. 14) B.E. 2562 (the Act) and the Civil Aviation Emergency Decree B.E.2558 (the Decree)<sup>1</sup>; and
- b) The Civil Aviation Authority of Thailand Regulation, Requirement and Rules<sup>2</sup> (the CAAT Regulation, Requirement and Rules); and
- c) Manual of Standards (MOS); and
- d) Advisory Circulars (ACs)

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- พระราชบัญญัติการเดินอากาศ พ.ศ. 2497 แก้ไขโดย พระราชบัญญัติการเดินอากาศ (ฉบับที่ 14) พ.ศ.2562

- พระราชกำหนดการบินพลเรือนแห่งประเทศไทย พ.ศ. 2558

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- ข้อบังคับของสำนักงานการบินพลเรือนแห่งประเทศไทย ฉบับที่ 12 ว่าด้วยมาตรฐานการบริการการเดินอากาศ ด้านการออกแบบริ้วปฏิบัติการบินด้วยเครื่องวัดประกอบการบิน

- ข้อกำหนดของสำนักงานการบินพลเรือนแห่งประเทศไทย ฉบับที่ 25 ว่าด้วยการขอและออกใบรับรองบริการการเดินอากาศ

- ประกาศสำนักงานการบินพลเรือนแห่งประเทศไทย เรื่องกำหนดนิติบุคคล อายุ และหน้าที่อื่นของผู้ได้รับใบรับรองบริการการเดินอากาศ

- ระเบียบสำนักงานการบินพลเรือนแห่งประเทศไทย ว่าด้วยการจัดทำรายงานของผู้ได้รับใบรับรองบริการการเดินอากาศ

- ระเบียบสำนักงานการบินพลเรือนแห่งประเทศไทย ว่าด้วยคู่มือมาตรฐานการให้บริการการออกแบบริ้วปฏิบัติการบินด้วยเครื่องวัดประกอบการบิน

- ระเบียบสำนักงานการบินพลเรือนแห่งประเทศไทย ว่าด้วยคู่มือการดำเนินงานด้านการออกแบบริ้วปฏิบัติการบินด้วยเครื่องวัดประกอบการบิน



- 1.1.2.2 The Decree establishes the Civil Aviation Authority of Thailand (CAAT) with functions relating to civil aviation, in particular the safety of civil aviation, and related purposes.
- 1.1.2.3 The CAAT regulation and requirement establish the regulatory framework (Regulations) within which all service providers shall operate.
- 1.1.2.4 The MOS provides standards and requirements for the design and maintenance of instrument flight procedures (IFP). This is to ensure that all published IFP intended for use by aircraft operating under instrument flight rules (IFR) in Bangkok flight information region (FIR) meet ICAO requirements for instrument flight procedures. The IFPDSP shall document internal actions (Rules) in their own operational manuals, to ensure the maintenance of and compliance with standards.
- 1.1.2.5 The IFP design organisation shall ensure that the quality and safety of the procedure design product are assured through the review, verification, coordination and validation at appropriate points in the process, so that corrections could be made at the earliest opportunity in the process.
- 1.1.2.6 In the interest of safety, the IFP design organisation shall implement the provisions in the MOS – IFP Design and PANS-OPS in a consistent manner, using processes that will minimise 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.
- 1.1.2.7 Readers should understand that in the circumstance of any perceived disparity of meaning between MOS and CAAT regulations/requirements, the primacy of intent rests with the regulations/requirements. Where there is any inconsistency between the regulations/requirements and the MOS, the regulations/requirements prevail.
- 1.1.2.8 ACs are intended to provide recommendations and guidance to illustrate a means, but not necessarily the only means of complying with the regulation and requirement. ACs may explain certain regulatory requirements by providing interpretive and explanatory materials. It is expected that service providers will document internal actions in their own operational manuals, to put into effect those, or similarly adequate, practices.

1.1.2.9 Where the IFPDSP is unable to comply with any provision in any of this MOS, the IFPDSP shall inform the CAAT within a reasonable period of time and in writing. The IFPDSP shall explain the basis for its non-compliance and propose alternative steps to ensure that an equivalent level of safety is established. The CAAT will review the IFPDSP's proposal in a timely fashion and approve the proposal, subject to such other conditions it may impose. The IFPDSP is required to follow-up diligently and thereafter report to CAAT within a reasonable period.

1.1.2.10 Where the CAAT has approved the IFPDSP's proposal in subsection 1.1.2.10, the IFPDSP shall record the approved alternative steps to be taken in the IFPDSP's operations manuals. The operations manuals shall also contain the details of and rationale for the alternative steps, and any result limitations or conditions imposed.

### **1.1.3 Editorial Practices**

To avoid any misunderstanding within the MOS, the words 'shall' as used within the requirements indicate that compliance is compulsory, while 'should' means that it is strongly advisable that an instruction is carried out; it is recommended or discretionary.

### **1.1.4 Differences between ICAO Standards and those in MOS**

Notwithstanding the above, where there is a difference between a standard prescribed in ICAO documents and the Manual of Standards (MOS), the MOS standard shall prevail.

### **1.1.5 Differences Published in AIP**

Differences from ICAO Standards, Recommended Practices and Procedures are published in AIP GEN 1.7

### **1.1.6 MOS Documentation change management**

1.1.6.1 The Air Navigation Services Standards Department (ANS) has responsibility for the technical content of this MOS.

1.1.6.2 This MOS is issued, and may only be amended, under the authority of the DGCA.

1.1.6.3 Suggested changes to this MOS may be provided to the Manager, Air Navigation Services Standards Department of CAAT by:

Email:                   ans@caat.or.th

1.1.6.4 Requests for any change to the content of this MOS may come from:

- a) technical areas within CAAT; or
- b) aviation industry service providers or operators; or
- c) Individuals or authorisation holders.

1.1.6.5 The need to change standards in this MOS may arise for any of the following reasons:

- a) to ensure safety;
- b) to ensure standardisation;
- c) to respond to changed CAAT standards;
- d) to respond to ICAO prescription;
- e) to accommodate proposed initiatives or new technologies.

1.1.6.6 CAAT may approve trials of new procedures or technologies to develop appropriate standards.

#### **1.1.7 Related document**

These standards should be read in conjunction with:

- a) Civil Aviation Authority of Thailand Regulations and Requirements;
- b) ICAO Annex 11 – Air Traffic Services;
- c) ICAO Annex 19 – Safety Management;
- d) ICAO Procedures for Air Navigation — Aircraft Operations, Doc 8168-OPS/611, Volume II — Construction of Visual and Instrument Flight Procedures
- e) ICAO Instrument Flight Procedures Construction Manual, Doc 9368-AN/911
- f) ICAO Required Navigation Performance Authorization Required Procedure Design Manual, Doc 9905-AN/471
- g) ICAO Doc 9906, Quality Assurance Manual for Flight Procedure Design
- h) ICAO Regional Supplementary Procedures (Doc 7030); and
- i) AIP-Thailand

## 1.2 Definitions and Abbreviations

### 1.2.1 Definitions

For the purpose of these manual of standards, the definition as contained in the ICAO annex and ICAO document, as amended from time to time, shall apply unless as otherwise indicated in AIP or as follow:

| Definition   | Meaning  |
|--|--|
| <b>Flight validation pilot</b>                             | A person performing flight validation who meets the competency requirements as laid down by the State.   |
| <b>Flyability</b>  | The ability to keep an aircraft within the predefined tolerances of the designed lateral and vertical flight track.  |
| <b>Instrument Flight Procedure</b>                         | A description of a series of predetermined flight manoeuvres by reference to visual guidance or flight instruments, published by electronic and/or printed means, for use by aircraft operating under Instrument Flight Rules (IFR).       |
| <b>Instrument Flight Procedure Design Service</b>          | 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.                                    |
| <b>Instrument Flight Procedure Design Service Provider</b> | A body that provides an IFPDS  |
| <b>Minimum Obstacle Clearance Altitude (MOCA)</b>          | The minimum altitude for a defined segment that provides the required obstacle clearance.  |
| <b>Minimum Sector Altitude (MSA)</b>                       | The lowest altitude which may be used which will provide a minimum clearance of 300 m (1 000 ft) above all objects located in the area contained within a sector of a circle of 46 km (25 NM) radius centred on a radio aid to navigation. |
| <b>Obstacle Assessment Surface (OAS)</b>                   | A defined surface intended for the purpose of determining those obstacles to be considered in the calculation of obstacle clearance altitude/height for a specific APV or precision approach procedure.                                    |
| <b>Obstacle Clearance</b>                                  | The lowest altitude or the lowest height above the elevation of the relevant runway threshold or the   |

| Definition   | Meaning  |
|--|--|
| Altitude (OCA) or Obstacle Clearance Height (OCH). | aerodrome elevation as applicable, used in establishing compliance with appropriate obstacle clearance criteria.   |
| Operations Manual                                  | The procedures, instructions and guidance for use by operational personnel which certificate holder shall provide to ensure compliance with regulations, standards and requirements.   |
| Point-in-space (PinS) approach                     | An approach procedure designed for helicopters only that includes both a visual and an instrument segment.   |
| Point-in-space (PinS) departure                    | A departure procedure designed for helicopters only that includes both a visual and an instrument segment.   |
| Performance-based navigation (PBN).                | Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.  |
| Procedure design tool                              | Automation system that provides calculations and/or designs and layouts in the field of procedure design.  |
| Stakeholder  | An individual or party with vested interests in an instrument procedure design.  |
| Standard instrument 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.   |
| 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 |
| Validation   | Confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled. This activity consists of ground and flight validation.   |

## 1.2.2 Abbreviations

Unless otherwise stated, abbreviations in this MOS have the meanings given in the AIP or as follows:

| Abbreviations | Full Name   |
|---------------|---|
| AIP           | Aeronautical Information Publication                            |
| AIS           | Aeronautical Information Service                                |
| APV           | Approach with Vertical Guidance                                 |
| ATM           | Air Traffic Management  |
| CAAT          | Civil Aviation Authority of Thailand                            |
| DGCA          | Director General of Civil Aviation Authority of Thailand        |
| FVP           | Flight Validation Pilot   |
| GBAS          | Ground-based augmentation system                                |
| IFPD          | Instrument Flight Procedure Design                              |
| IFPDS         | Instrument Flight Procedure Design Service                      |
| IFPDSP        | Instrument Flight Procedure Design Service Provider             |
| NCASP         | National Civil Aviation Security Programme                      |
| NCASQCP       | National Civil Aviation Security Quality Control Programme      |
| NCASTP        | National Civil Aviation Security Training Programme             |
| OJT           | On the job training   |
| PBN           | Performance Based Navigation                                    |
| PANS-OPS      | Procedures for Air Navigation — Air Operations                  |
| RNP AR APCH   | Required Navigation Performance Authorization Required Approach |

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## Chapter 2 Operations Manual

### 2.1 Operations Manual

#### 2.1.1 Requirements

2.1.1.1 An IFPDSP shall provide and keep up to date its operations manual relating to the provision of its services for the use and guidance of operations personnel.

2.1.1.2 An Operations Manual shows how and where an IFPDSP provides, or proposes to provide, instrument flight procedure design service. The ANSP shall provide, for compliance by its personnel, an operations manual or system of manuals for the services listed in its operations manual. The operations manual also serves as a reference document for CAAT with respect to the standards, conditions and level of service to be maintained for instrument flight procedure design service.

2.1.1.3 An IFPDSP shall ensure that:

- a.) The operations manual contains the instructions and information required by the operations personnel to perform their duties;
- b.) Relevant parts of the operations manual are accessible to the personnel concerned;
- c.) The operations personnel are informed of amendments to the operations manual applying to their duties in a manner that enables their application as of their entry into force.

#### 2.1.2 Standard of the Operations Manual

An IFPDSP's operations manual should follow the following structure and contain the following topics, at a minimum:



## **PART I Administrative**

### Chapter 1 Responsibility for Revision of the Operations Manual

- Describe under whom the operations manual is established
- Describe who is responsible for the technical contents

## **PART II General and Organization**

### Chapter 1 General

- Purpose of the operations manual
- Precedence of the operations manual
- Scope of the operations manual
- Functions to be performed by the service provider

### Chapter 2 Roles and Responsibilities

- Describe the roles and responsibilities of the department, section and / or position (Paragraphs for each department, section and/or position follow)

### Chapter 3 Staffing Requirements

- Describe the staffing requirements such as:
  - Number of personnel per procedures, or
  - Number of procedures which can be designed by a designer
- Define hierarchy – e.g. supervisor, chief designer, senior designer, designer, trainee designer (depending on each organization)

### Chapter 4 Training and Qualification

- Provisions concerning training and qualification of personnel
- Appointment of special position (e.g. chief, supervisor etc.)
- Describe types of training and its contents, duration, interval (frequency)

Chapter 5 Facility and Resources

- Define the facilities and resources to be utilized to perform the task such as: Building, office, table and other equipment, Software and design tool, Aircraft and on-board equipment

Chapter 6 Agreements with Other Organizations

- Define the procedures and/or rules to establish agreements with other organizations, including procurement of service and/or goods (Reference to some other document is acceptable)

Chapter 7 Compliance

- Define the processes to comply with regulations and verification (Reference to some other document is acceptable)
- Define how to demonstrate the compliance

Chapter 8 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 9 Services to be provided

- Define the services (and/or product) to be provided by the organization such as:

Initial design

Continuous maintenance

Periodic review

Documentation process

Validation process

- Define the types of flight validation to be provided by the organization such as:

Validation of newly designed flight procedures

Periodic validation (with its interval for each type of flight procedures)

Validation upon amendment of flight procedures

Other validation conducted for special needs

- Define the criteria how to determine the necessity of these type of service
- Describe the criteria how to determine the necessity of simulator evaluation

### **PART III Flight Procedure Design Process**

#### Chapter 1 Design Process

- Define the process to be followed

#### Chapter 2 Acquisition of Data/Information

- Define types of data/information required for the design of instrument flight procedures, how to acquire such data/information, and from whom/where

#### Chapter 3 Consultation with Stakeholders

- Identify stakeholders
- Describe on which matters consultation with stakeholders are needed, with whom, when and how

#### Chapter 4 Environmental Consideration

- Describe what should be considered upon the design of flight procedures

#### Chapter 5 Documentation

- Describe how to record the activities and how to maintain documents
- Define the period of maintenance of record

### Chapter 6 Format

- Provide format (template) for design documents to record:
  - Rationale for the design
  - Controlling obstacle
  - Summary of calculation process
- Provide format (template) for flight validation report to record

### Chapter 7 Validation

- Describe who validates the procedures and how
- Define the process to be followed
- Determine items (charts, aeronautical data, obstacle, flyability, Nav-aid/lighting) to be validated for each type of validation
- Tolerance
- Define the type of result (pass, pass on condition, fail)
- Actions to be taken for failed procedure

### Chapter 8 Preparation of Publication

- Define the types of material to be submitted to AIS

## **PART IV Management System**

### Chapter 1 Management System

- Provide reference to organization's quality manual
- Provide statement on the resolution of quality – related issues.

### Chapter 2 Oversight by Regulator

- Describe how to manage the oversight by the CAAT.

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## Chapter 3 General Provision for Instrument Flight Procedure Design

### 3.1 General

**3.1.1** IFPDSP shall design, validate, certify, and maintain an instrument flight procedure in accordance with the provisions of this Manual.

**3.1.2** IFPDSP shall design, validate, certify, and maintain an instrument flight procedure only the types of instrument flight procedure that is authorized in the certificate.

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## Chapter 4 Human Resource Management

### 4.1 Administration

#### 4.1.1 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.

#### 4.1.2 Approvals

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.



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## Chapter 5 Personnel

### 5.1 Qualification of Designers

#### 5.1.1 Grades of Instrument Flight Procedure Designer

The grades established for Instrument Flight Procedure Designer are:

- a.) Chief Designer;
- b.) Qualified Designer;
- c.) Unqualified Designer.

#### 5.1.2 Chief Designer

5.1.2.1 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 in accordance with ICAO standards.

5.1.2.2 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 PANS-OPS procedure design course or an advanced course on PANS-OPS procedure design in accordance with ICAO standards within the previous two years.

#### 5.1.3 Qualified Designer

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

- a.) satisfactory completion of an PANS-OPS procedure design course in accordance with ICAO standards; and
- b.) satisfactory completion of a course of On-the-job training (OJT) in procedure design as detailed in the IFPDSP's operations manual; and
- c.) required minimum experience in accordance with paragraph 5.1.6; and
- d.) a written approval by the Chief Designer as specified in Chapter 4.

#### 5.1.4 Unqualified Designer

5.1.4.1 IFPDSP shall not allow any person who is not qualified under paragraph 5.1.1 to:

- a.) design a procedure for which a Certificate of Approval, unless under direct supervision; or
- b.) verify (check) a procedure for which a Certificate of Approval.

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

#### 5.1.5 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.

#### 5.1.6 Minimum Experience

5.1.6.1 Minimum design experience is required for each type of procedure to be designed.

5.1.6.2 The minimum experience required is three designs, checked and approved by a Chief Designer, and completed within any twelve consecutive months.

5.1.6.3 In case IFPDSP cannot comply with 5.1.6.2, the provider may request an exemption from the DGCA.

#### 5.1.7 Recency

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

## Chapter 6 Training and Checking Programme

### 6.1 Requirements

The training program for procedure design personnel shall follow the competency framework established in ICAO Quality Assurance Manual for Flight Procedure Design, Doc 9906-AN/472, Volume 2 — Flight Procedure Designer Training (Development of a Flight Procedure Designer Training Programme).

### 6.2 Training Phases

6.2.1 The training of procedure designers can be divided into the following phases:

- a.) Ab initio training;
- b.) Initial training;
- c.) On-the-job training (OJT);
- d.) Advanced training;
- e.) Refresher training; and
- f.) Recurrent training;
- g.) Flight procedure design software training

#### 6.2.2 Ab initio training

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 6.2.3). 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.

#### 6.2.3 Initial training

6.2.3.1 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.

6.2.3.2 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.

#### **6.2.4 On-the-job training (OJT)**

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

#### **6.2.5 Advanced training**

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.

#### **6.2.6 Recurrent training**

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. At the minimum, the recurrent training should be conducted every two years.

#### **6.2.7 Refresher training**

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

#### **6.2.8 Flight procedure design software training**

In case a flight procedure design software is used by the IFPDSP, sufficient training shall be provided to its staff.

## Chapter 7 Facilities and Equipment

### 7.1 Resource requirements

#### 7.1.1 IFPDSP shall—

- 7.1.1.1 have available equipment that is appropriate for the design, design verification, certification, validation, and maintenance of the types of instrument flight procedure that are specified in the IFPDSP's exposition; and
- 7.1.1.2 have 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 validation, and maintenance of the instrument flight procedures certified by, and maintained by, the IFPDSP's organisation; and
- 7.1.1.3 hold or have 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, certification, flight validation, and maintenance of the types of instrument flight procedure that are specified in the IFPDSP's exposition.

#### 7.1.2 Equipment and Tools

##### 7.1.2.1 An IFPDSP shall establish a procedure for ensuring that

- a.) all equipment referred to in paragraph 7.1.1.1 are properly maintained; and
- b.) all tools used for the design, design verification and maintenance of instrument flight procedures are validated, as prescribed in ICAO Quality Assurance Manual for Flight Procedure Design, Doc 9906-AN/472, Volume 3 — Flight Procedure Design Software Validation

##### 7.1.3 IFPDSP shall establish a procedure for ensuring that—

- 7.1.3.1 personnel have access to the data referred to in paragraph 7.1.1.2 for the types of instrument flight procedure specified in the IFPDSP's exposition; and

7.1.3.2 the data referred to in paragraph 7.1.1.2 is current, traceable, and meets the required level of verifiable accuracy for the design, design verification, flight validation, and maintenance of instrument flight procedures specified in the IFPDSP's exposition.

7.1.4 IFPDSP shall establish a procedure for controlling all documentation required by paragraph 7.1.1.3 to ensure that—

- a.) the documentation is reviewed and authorised by an appropriate person before issue and use; and
- b.) current issues of relevant documentation are available to personnel at every location if they need access to the documentation; and
- c.) every obsolete document is promptly removed from every point of issue and use; and
- d.) a change to documentation is reviewed and authorised by an appropriate person before issue and use; and
- e.) the current version of every item of documentation can be identified to prevent the use of superseded material.

## Chapter 8 Management System

### 8.1 Management System

**8.1.1** An IFPDSP shall establish and maintain a management system for instrument flight procedures design in accordance with ICAO Doc 9906 Vol. 1 ‘Flight Procedure Design Quality Assurance System’.

#### 8.1.2 Data Acquisition

The flight procedure design process starts with the verification of input data in coordination with affected stakeholders. The following aspects should be addressed:

- a.) aerodrome, navigation aids, obstacles and terrain coordinates, and elevation data based on trustworthy sources;
- b.) airspace data and associated requirements;
- c.) user requirements, i.e. airspace users and air traffic service provider;
- d.) airport infrastructure and equipment;
- e.) environmental considerations; and
- f.) any other information as potentially specified by the competent authority

#### 8.1.3 Formal arrangements

An IFPDSP shall ensure the necessary formal arrangements with:

- a.) aeronautical data sources;
- b.) other service providers;
- c.) aerodrome operators; and
- d.) aircraft operators.



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## Chapter 9 Contingency Plan

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## Chapter 10 Security Program

### 10.1 Introduction

This Chapter sets out the standards for a security program.

### 10.2 Security Measures

An IFPDSP shall establish and maintain security measures, and procedures to be followed for the purposes of:

- a.) Preventing intentional and unintentional damage to any personnel, facility or equipment used by the IFPDSP in providing the service;
- b.) Responding to a threat of intentional damage to any system, equipment, software or data; and
- c.) Preventing unauthorized people from having access to any facility, system, equipment, software or data used by the IFPDSP in providing the service.

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## Chapter 11 Documentation and Records

### 11.1 Reference Material

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

- a.) The CAAT Manual of Standards (MOS) IFPD;
- b.) ICAO Procedures for Air Navigation — Aircraft 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 Required Navigation Performance Authorization Required Procedure Design Manual, Doc 9905;
- e.) ICAO Quality Assurance Manual for Flight Procedure Design, Doc 9906-AN/472, Volume 1 — Flight Procedure Design Quality Assurance System;
- f.) ICAO Quality Assurance Manual for Flight Procedure Design, Doc 9906-AN/472, Volume 2 — Flight Procedure Designer Training (Development of a Flight Procedure Designer Training Programme);
- g.) ICAO Quality Assurance Manual for Flight Procedure Design, Doc 9906-AN/472, Volume 3 — Flight Procedure Design Software Validation;
- h.) ICAO Quality Assurance Manual for Flight Procedure Design, Doc 9906-AN/472, Volume 5 — Validation of Instrument Flight Procedures;
- i.) ICAO Quality Assurance Manual for Flight Procedure Design, Doc 9906-AN/472, Volume 6 — Flight Validation Pilot Training and Evaluation (Development of a Flight Validation Pilot Training Programme)
- j.) ICAO Performance Based Navigation (PBN) Manual, Doc 9613-AN/937.

## 11.2 Document Control System

11.2.1 An IFPDSP shall have in place document and data control processes that control the authorisation, publication, distribution, and amendment of all documentation issued or required by IFPDSP.

11.2.2 These processes shall ensure that:

- a.) documents are authorised 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.

## 11.3 Records

11.3.1 An IFPDSP shall 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 paragraph 4.1.1).

11.3.2 An IFPDSP shall facilitate records for inspections and audits carried out by CAAT

11.3.3 Records relating to procedure designs shall 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.

11.3.4 Staff records shall be retained during the time that staff are employed.

## Chapter 12 Procedure Design Administration

### 12.1 General

#### 12.1.1 Classification of Procedures

Instrument Flight Procedures are classified as one of the following types:

- a.) Non-precision Approach (Conventional);
- b.) Non-precision Approach (Performance-Based);
- c.) Non-precision Approach (SBAS NPA);
- d.) Approach with Vertical Guidance (Baro-VNAV);
- e.) Approach with Vertical Guidance (SBAS APV I);
- f.) Precision Approach (Conventional);
- g.) Precision Approach (GBAS);
- h.) Precision Approach (SBAS Cat I);
- i.) Departure (Conventional)
- j.) Departure (Performance-Based);
- k.) Arrival (Conventional)
- l.) Arrival (Performance-Based);
- m.) Required Navigation Performance Authorization Required Approach (RNP AR APCH);
- n.) Helicopter Approach — (Conventional)
- o.) Helicopter Approach — (Performance-Based)
- p.) Helicopter Departure — (Performance-Based)



### 12.1.2 Validation

All designs are to be validated in accordance with the standards in Chapter 13.

### 12.1.3 Publication

12.1.3.1 For a procedure which is to be published in the AIP, the IFPDSP shall forward to the AIS:

- a.) A Certificate of Design signed by the Chief Designer stating that the design has been completed in accordance with The Civil Aviation Authority of Thailand Regulation, Requirement and Rules, and,
- b.) A copy of the design.

12.1.3.2 Notice of withdrawal. An IFPDSP:

- a.) who, for paragraph 12.1.3.1 forwards to the AIS and DGCA a certificate of design, or a copy of a design, for a type of instrument flight procedure; and
- b.) who subsequently withdraws the IFP design in compliance with maintenance requirements under paragraph 12.1.3.1a;

shall, as soon as possible after the withdrawal, give written notice to the AIS and DGCA that the IFP design is withdrawn.

12.1.3.3 As soon as possible after receiving a notice mentioned in paragraph 12.1.3.2, the AIS shall ensure that a notice of the withdrawal of the IFP design is published in the AIP or a NOTAM.

### 12.1.4 Maintenance

12.1.4.1 Maintenance of an Instrument Flight Procedure includes:

- a.) general text and data amendments;
- b.) redesign to conform with changes to design standards;
- c.) provision of advice regarding obstructions in the vicinity of the aerodrome or procedure;
- d.) redesign or amendment required as a result of changes to critical obstacles; changes as directed by DGCA;

12.1.4.2 Maintenance of a type of instrument flight procedure requires that, if written notification about an aerodrome is received from DGCA, the following procedures shall be followed:

- a.) withdrawal of the IFP design for the aerodrome; and
- b.) written notification to the aerodrome operator that, in accordance with the maintenance requirements of this paragraph, the IFP design has been withdrawn because the aerodrome was not a certified aerodrome or a registered aerodrome.

12.1.4.3 At intervals not exceeding five years, an IFPDSP shall conduct a periodic review of a procedure.

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## Chapter 13 Validation

### 13.1 General

#### 13.1.1 The Need for Validation

- a.) The purpose of validation is to obtain a qualitative assessment of the procedure design including obstacle, terrain and navigation data, and provide an assessment of the flyability of the procedure.
- b.) Validation is the final quality assurance step in the procedure design process for instrument flight procedures (IFP) and is essential before the procedure design documentation is issued as part of the integrated aeronautical information package.

#### 13.1.2 The validation process

- a.) The full validation process includes ground validation and flight validation.
- b.) It encompasses a systematic review of the steps and calculations involved in the procedure design as well as the impact of the procedure on flight operations. It shall be performed by persons trained in flight procedure design and with appropriate knowledge of flight validation issues.
- c.) Ground validation shall consist of an independent IFP design review by another Qualified designer and preflight validation. Flight validation consists of evaluation flown in an aircraft. The IFP validation process shall be carried out as part of the initial IFP design as well as for any amendment to an existing IFP.
- d.) If the IFPDSP can verify, through 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.
- e.) Flight validation is required under the following conditions:
  - the flyability of a procedure cannot be determined by other means;
  - the procedure requires mitigation for deviations from design criteria;
  - the accuracy and/or integrity of obstacle and terrain data cannot be determined by other means;
  - new procedures differ significantly from existing procedures; and
  - for helicopter PinS procedures.
- The sufficient communication and navigation signal coverage cannot be determined by other means.

## 13.2 Ground Validation

### 13.2.1 The Need for Ground Validation

When designing an instrument flight procedure, ground validation shall always be undertaken.

### 13.2.2 Standards

- a.) Ground validation is a review of the entire instrument flight procedure package by a Qualified Designer(s) with appropriate knowledge of flight validation issues.
- b.) Ground validation 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.
- c.) Issues identified in the ground validation should be addressed prior to any flight validation.
- d.) The ground validation will also determine if flight validation is needed for modifications and amendments to previously published procedures.
- e.) Guidance material for ground validation can be found in ICAO Quality Assurance Manual for Flight Procedure Design, Doc 9906-AN/472, Volume 5 — Validation of Instrument Flight Procedures;

## 13.3 Flight Validation

### 13.3.1 Objective of the flight validation.

13.3.1.1 The objectives of the flight validation of instrument flight procedures are to:

- 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 flyability to determine that the procedure can be safely flown; and
- e.) evaluate the charting, required infrastructure, visibility and other operational factors.

- 13.3.1.2 The procedure designer shall be the originator of all data applicable to conducting a flight validation provided to the flight validation or flight inspection operations activity. The procedure designer should be prepared to provide briefings to the flight validation or flight inspection crews in those cases where flight procedures have unique application or special features.
- 13.3.1.3 The procedure designer may participate in the validation flight to assist in its evaluation and obtain direct knowledge of issues related to the flight procedure's design from the flight validation pilot.
- 13.3.1.4 Guidance material for flight validation can be found in ICAO Quality Assurance Manual for Flight Procedure Design, Doc 9906-AN/472, Volume 5 — Validation of Instrument Flight Procedures;

### **13.4 Qualification of Flight Validation Pilot (FVP)**

The person who performs as a flight validation pilot shall have the following qualifications:

- a.) holds a Commercial Pilot License (CPL) with Instrument Rating (IR) at the minimum.
- b.) has the experience equivalent to the holder of Airline Transport Pilot License – Aeroplane (ATPL) with a minimum of 1,500 flight hours as a pilot.
- c.) has completed a Flight Validation Pilot Course in accordance with ICAO standards.

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## Chapter 14 Design Standards

### 14.1 General

#### 14.1.1 Procedure Identification

Instrument flight procedure charts shall be identified in accordance with ICAO Annex 4 requirements.

#### 14.1.2 Design Criteria

14.1.2.1 An IFPDSP shall design instrument flight procedures in accordance with ICAO Procedures for Air Navigation — Aircraft Operations, Doc 8168-OPS/611, Volume II — Construction of Visual and Instrument Flight Procedures.

14.1.2.2 For Required Navigation Performance Authorization Required (RNP AR) procedures, an IFPDSP shall comply with ICAO Required Navigation Performance Authorization Required Procedure Design Manual, Doc 9905-AN/471.



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