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<p><b>Document No: TCAA/QSP/SR/AC/ANS - 22</b></p>	<p style="text-align: center;"><b>Title: Training Programme for Instrument Flight Procedure Design staff</b></p>	<p style="text-align: right;"><b>Page 1 of 12</b></p>

## 1.0 PURPOSE

- 1.1. This Advisory Circular (AC) is issued to provide general information and guidance on training of all personnel engaged in the design, review or amendment of visual and instrument flight procedures
- 1.2. Under Regulation 18(c) of the Civil Aviation (Certification of Air Navigation Service Providers) Regulations 2017, an Air Navigation Services Provider (ANSP) shall not engage personnel in the design or publishing of visual and instrument flight procedures for use in designated airspaces and aerodromes unless they have completed approved training
- 1.3. Guidance to personnel involved in the construction of procedures is contained in TCAA/QSP/SR/AC/ANS-06. Construction of Visual and Instrument Flight Procedures

## 2.0 REFERENCES.

- 2.1 Tanzania Civil Aviation (Construction of Visual and Instrument Flight Procedures) Regulations, 2017.
- 2.2 Doc 8168 - OPS/611 Aircraft Operations Volume II;
- 2.3 Doc 9274 - AN/904 Manual on the Use of the Collision Risk Model (CRM) for ILS operations;
- 2.4 Doc 9368 - AN/911 Instrument Flight Procedure Construction Manual;
- 2.5 Doc 9906 - AN/472 Quality Assurance Manual for Flight Procedure Design;
- 2.6 Doc 8697 - Aeronautical Chart Manual;
- 2.7 Doc 9674 - AN/946 World Geodetic System 1984 (WGS-84) Manual;
- 2.8 Doc 9163 Performance Based Navigation;
- 2.9 Doc 8071 - ICAO Manual on Testing of Radio Navigation Aids;
- 2.10 ICAO; Manual on Airspace Planning Methodology for the Determination of Separation Minima Doc 9689;
- 2.11 ICAO, Global Navigation Satellite System (GNSS) Manual, Doc 9849.

## 3.0 GUIDANCE AND PROCEDURES

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### **3.1 General**

- 3.1.1** Approaches and departures are the most critical phases of flight considering that the aircraft is operated in close proximity to obstacles at low speeds and in some cases in adverse weather conditions. The need to develop procedures to facilitate a safe transfer of flight from en-route to landing and departure to en-route cannot be overemphasized.
- 3.1.2** The Authority is hereby recommending a systematic approach in the provision of training to personnel engaged in procedure design in order to ensure flight safety and uniformity in both design and approval of the procedures.
- 3.1.3** It is essential that procedure design be carried out by a team rather than a single person. A team approach is critical in ensuring that all points of view and assumptions are taken into consideration as well as to ensure quality.

### **3.2 Categories of personnel to be trained**

The following categories of personnel are covered by this circular

- a) Flight procedure designers
- b) Cartographers
- c) competent pilot

### **3.3 Approved training organizations**

An ANSP shall train flight procedure design to the training organizations which approved by Authority.

### **3.4 Requirements for training**

#### **3.4.1 General**

- 3.4.1.1** The ANSP must establish and comply with its own scheme for training and qualification of its procedure designers in accordance with the provided guidelines for establishing a training scheme for both flight procedure designers.

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**3.4.1.2** The ANSP should ensure that flight procedure designers have acquired and maintain this competency level through training and supervised on-the-job training (OJT).

**3.4.1.3** Training for flight procedure design should at least include an initial training and recurrent training at periodic intervals.

**3.4.1.4** The initial training shall ensure that the flight procedure designer is able to demonstrate a basic level of competency.

**3.4.1.5** Recurrent training should ensure that the flight procedure designer is able to demonstrate a basic level of competency that includes at least the following elements:

- a) knowledge about updates in ICAO provisions and other provisions pertaining to procedure design; and
- b) maintenance and enhancement of knowledge and skills in the design of procedures.

**3.4.1.6** The ANSP should ensure that flight procedure designers have undergone an adequate, supervised OJT.

**3.4.1.7** Competency of the flight procedure designer shall be evaluated by the Authority at regular intervals.

### **3.4.2 Training Programme goal**

Once the trainee has completed the training programme, he or she will be able to design five separate segments of instrument approach procedures. Such segments should include the arrival, initial, intermediate, final and missed approach segments. In addition, an area for circling the aerodrome under visual conditions should be considered.

The design of the segments will include IFR procedures, more specifically non-precision approach procedures, precision approach procedures, standard instrument arrivals (STAR), standard instrument departures (SID), using conventional means of navigation and RNAV information (VOR/DME, DME/DME,

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GNSS), RNP procedures and APV procedures, in accordance with standards specified in PANS-OPS (Doc 8168), Doc 9905 for RNP AR procedures, or any other applicable criteria.

### 3.4.3 Training programme duration

ANSPs are expected to design a training programme suitable for them and in accordance to their expectations. The guidance given in this section takes approximately fifteen months. The developed or designed training programme shall be approved by the Authority before implementation.

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

### 3.4.4 Training Programme Steps

#### 3.4.4.1 *Ab initio training*

- a) Before conducting initial training, the skills and knowledge of the trainees are assessed. Procedure designers can be recruited from different domains (ATM, AIS, CNS engineer, technician, pilots) therefore their skills and knowledge vary, and ab initio training may be necessary to meet the entry level required in the different domains to be able to successfully complete initial training (see 3.4.4.2)
- b) Ab-initio training may be necessary to meet the entry level required in the different domains to be able to successfully complete initial training. 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.
- c) The purpose of ab initio training is to harmonize trainees' entry skills and knowledge before they start initial training.
- d) The venue of the course can be either at the training provider or at the Procedure Design Service Providers (PDSPs) for a duration of one week depending on the entry level required. The course topics to be covered are: Mathematics, System units, Basics of navigation, Basics of avionics, Altimetry, Cartography, scale, WGS-84 system, projection and Computer science.

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#### 3.4.4.2 **Initial training**

- a) Initial training is the first phase of training where actual procedure design topics and criteria (Doc 8168) are covered. The purpose of initial training is to provide basic skills and knowledge to procedure designers who have been recently recruited or designated as designers.
- b) The venue of the course can be either at the training provider or at the Procedure Design Service Providers (PDSPs) for a duration of six weeks.
- c) The goal of the training is to enable the trainee design non-RNAV PA and NPA approach procedures and non-RNAV arrival and departure procedures.
- d) 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.
- e) Programme Description:- A six-week course provided in procedure design criteria NPA, PA, departure and arrival procedures for conventional means of navigation, finishing with a two-week practical work training period very close to “on-the-job” work. During the first four weeks of initial training in PANS-OPS, lectures and practical exercises should be programmed to enable the trainees to acquire the knowledge and skills necessary to apply criteria for the design of the IFR non-RNAV procedures. During the last two weeks, the trainees will work in groups of two to perform the connection between STAR and approaches, then to design one NPA and one PA and one SID procedure. Then they will have to write the associated report and produce the corresponding instrument approach charts, SID and STAR charts. Part of the training should emphasize the attitude of the procedure designers as team players and their skill at communicating and presenting their work.
- f) Training Modules: The training shall be able to cover the following modules:
  - i) Module 1: Design Non RNAV NPA
  - ii) Module 2: Design Non RNAV Arrival
  - iii) Module 3: Design Non RNAV PA
  - iv) Module 4: Design Non RNAV Departure
- g) Additional units:
  - i) Annex 14 surfaces
  - ii) Pilot point of view: flight simulation
- h) Assessment: Progress test and mastery tests administered as planned in the course module plan.

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- i) Expected level: In accordance with the competency standards set in the terminal objectives for initial training.

#### 3.4.4.3 ***On-the-job training (Initial)***

On-the-job training is an essential phase in a training programme. Its purpose is to reinforce formal training and support the achievement of competency standards. The following guidelines shall apply.

- a) The training shall be held on site or at the PDSP, tutored by a qualified procedure designer or instructor in procedure design designated by the Authority. The duration of the OJT shall be fifteen weeks with a goal of improving the knowledge and skill on design of non-RNAV PA and NPA approach procedures and non-RNAV arrival and departure procedures in accordance with standards established in competency framework using the means available within the workplace.
- b) Programme Description:
  - i) Under the supervision of an OJT instructor, the trainee will design one NPA and PA procedure taking into account constraints such as noise abatement, airspace management and the airline's request.
  - ii) The trainee should collect the data, design the selected procedures with the tools/means available at the local procedure design unit, and acquire the employing organization's method to integrate his/her work in the quality process, validation process and archiving process specific to the company/organization.
  - iii) As part of his/her OJT, the trainee can technically handle some issues related to continuous maintenance of SID and STAR.
  - iv) Where the programme is done at the PDSP the use of local data (data originating from the trainees' organization) is highly encouraged.
- c) Competency elements: Design non-RNAV SID, STAR, NPA, and PA.
- d) Additional units:
  - i) Use of the specific tools such as excel sheet, software, geodetic calculator.
  - ii) Use of the regulation documents, official websites dedicated to the activities.
- e) Assessment: Ongoing assessment against performance criteria for each competency element as work is carried out.
- f) Expected level: Non-RNAV NPA and PA can be designed for selected procedures in accordance with the terminal objective.

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#### 3.4.4.4 **Advanced Training I**

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.

- a) The venue of the course can be either at the training provider or at the Procedure Design Service Providers (PDSPs) for a duration of three weeks. The goal shall be that given a more constrained environment the trainee shall be able to design procedures involving advanced criteria for departures and approach procedures in accordance with competency standards.
- b) Programme Description:  
During the first week of training, instructional events such as lectures and practical exercises will provide skill and knowledge. During the last two weeks, the trainees will work in teams of two to design procedures on an airport with an obstacle-rich environment and/or operational constraints. Sharing of experience with other procedure designers will be encouraged in order to facilitate learning.
- c) Training Modules: The training shall be able to cover the following modules;
  - i) Module 1: Departure for parallel runway
  - ii) Module 2: NPA in obstacle-rich environment
  - iii) Module 3: Non-standard ILS approaches
- d) The following additional units shall also be covered:
  - i) Noise abatement
  - ii) Airspace management
  - iii) Aeronautical study
- e) Assessment: Progress test and mastery tests administered as planned in course module plan.
- f) Expected level: Advanced criteria and design process for non-RNAV SID NPA and PA must be acquired in accordance with the standard specified in terminal objectives for this course.

#### 3.4.4.5 **On the Job Training – Advanced I**

- a) The training shall be held on site or at the PDSP, tutored by a qualified procedure designer or instructor in procedure design designated by the Authority. The

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duration shall be twelve weeks with a goal of designing Non-RNAV SID and STAR for selected procedures in accordance with competency standards.

- b) Programme Description:
- i) Under the supervision of an OJT instructor, the trainee will design a selected STAR and SID omnidirectional departure and arrival among the procedures to be reviewed.
  - ii) The trainee will participate with the OJT instructor in meetings and studies to be aware of and to take into account the constraints related to noise abatement, airspace management and airlines' requests.
  - iii) The trainee should collect the data and design the selected procedures taking into account the constraints expressed.
  - iv) Comply with the quality process, validation process and archiving process specific to the company/organization.
  - v) In the meantime, the trainee can technically deal with issues related to continuous maintenance of PA and NPA even in an obstacle-rich environment or constraining airspace.
- c) Units of competency: Design non-RNAV SID/STAR omnidirectional departure and arrival.
- d) Additional units:
- i) Noise abatement
  - ii) Airspace management
  - iii) Aeronautical study
- e) Assessment: Ongoing assessment against performance criteria for each competency element as work is carried out.

#### 3.4.4.6 **Advanced Training II**

- a) The location of the training shall be at the training provider for a period of three weeks with a goal of being able to design RNAV and RNP SID STAR NPA and Design RNAV (VOR/DME, DME/DME and GNSS) and RNP NPA SID and STAR.
- b) Programme Description:  
This course will be three weeks long and will consist of instructional events such as lectures, practical exercises and practical work conducted in teams of two. The flyability and efficiency of the RNAV/RNP procedure will be highlighted.



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- c) Training Modules: The training shall be able to cover the following modules
  - i) Module 1: Design RNAV NPA based on sensor VOR/DME, DME/DME, GNSS
  - ii) Module 2: Design RNAV terminal procedures (based on sensor)
  - iii) Module 3: Design RNP procedures
  
- d) Additional units:
  - i) GNSS concept (ABAS, SBAS, GBAS)
  - ii) Information about the existing or ongoing system, time schedule
  - iii) Airworthiness information
  - iv) Pilot point of view: Flight simulation of the designed procedure in a flight simulator
  - v) CDA (Continuous Descent Approach).
  
- e) Assessment: Progress test and mastery tests administered as planned in course module plan.

#### 3.4.4.7 ***On the Job Training – Advanced II***

- a) The location of the training shall be on site or at the PDSP, tutored by a qualified procedure designer or an instructor in procedure design designated by the Authority.
  
- b) The duration shall be for twenty weeks with a period of one week at the mid-point to attend the GBAS and APV Baro-VNAV, SBAS training course.
  
- c) The goal of the training shall be to enable the trainee to design different types of RNAV/RNP approaches and arrivals/ departures. Through this training, they will improve, practice and gain confidence in the application of RNAV procedure criteria.
  
- d) Programme Description:
  - i) Under the supervision of an OJT instructor, the trainee will design a selected RNAV NPA, PA and APV approaches, SID and STAR among the procedures to be reviewed, or propose the study of the improvement of the airspace management by implementation of an RNAV/RNP procedure.
  - ii) The trainee should collect all the information by contacting and meeting with the ATC, airlines and airport authorities to define the present difficulties

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analyse the issues and propose assumptions for enhancement of efficiency in the airspace management.

- iii) The trainee should collect the data, design the selected procedures with the tools/means available at the local procedure design unit, present the solutions, and amendments if necessary, and integrate the work in the quality process, validation process and archiving process specific to the company/organization.
- iv) In the meantime, the trainee can technically deal with issues related to continuous maintenance of NPA SID and STAR.
- e) Units of competency: Design RNAV SID STAR NPA.
- f) Additional units: Airspace management.
- g) Assessment: Ongoing assessment against performance criteria for each competency element as work is carried out.

#### 3.4.4.8 **Advanced Training III**

- a) The location of the training shall be at the training provider for a period of one week in the middle of the previous on-the-job training with a goal of enabling the trainee to design GBAS, APV Baro-VNAV, APV SBAS procedure.
- b) Programme Description: This course will be one week long and will consist of instructional events such as lectures, practical exercises and practical work conducted in teams of two.
- c) Training Modules: The training shall be able to cover the following modules
  - i) Design APV SBAS final and missed approach segment
  - ii) Design APV Baro-VNAV final and missed approach segment
  - iii) Design GBAS final and missed approach segment
- d) Additional units:
  - i) Airworthiness information
  - ii) VNAV avionic information
  - iii) Pilot point of view: Flight simulation in a flight simulator of the designed procedure

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- e) Assessment: Progress test and mastery tests administered as planned in course module plan.

#### 3.4.4.9 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. The ANSP is required to plan accordingly regular recurrent training so as to ensure that the procedure designers remain current.

- a) The goal of the programme shall be to maintain competency standards for newly developed procedure design features.
- b) Programme Description:  
Update knowledge according to each PANS-OPS (Doc 8168) amendment by following a seminar/course/workshop and by meeting procedure designers and sharing experiences.

#### 3.4.4.10 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 the ANSP identify skills and knowledge that have weakened with time and that refresher training be planned accordingly. Refresher courses may range from in-house to fully fledged training in specialized training organizations.

- a) The primary goal shall be to maintain and upgrade skills and knowledge in accordance with competency framework.
- b) Programme Description:  
Update knowledge and strengthen skill after a long period of non-application of specific criteria.

### 3.5 Training records

**3.5.1** The ANSP shall ensure that training records, including OJT records are properly kept for inspection by the CAA as may be required.

**3.5.2** The training records shall include certificates, OJT tasks performed and any other documents related to training and approval of jobs performed.

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### **3.6 Requirement for approved curriculum**

**3.6.1** The ANSP shall develop training curricula for all types of training as required by this circular.

**3.6.2** The curricula shall be approved by the Authority.



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**Tanzania Civil Aviation Authority**