



ICAO | UNITING AVIATION

CELEBRATING 70 YEARS OF
THE CHICAGO CONVENTION

70



Workshop on quality assurance for the implementation of an instrument flight procedure

29 March -2 April 2021





ICAO

UNITING AVIATION

CELEBRATING 70 YEARS OF
THE CHICAGO CONVENTION

70



Flight Procedure Designer Training

Doc. 9906, Vol. 2





1. Regulatory framework
2. General
3. Competency-based training and assessment
4. Designing curriculum
5. Instructor competencies
6. Validation and post-training evaluation



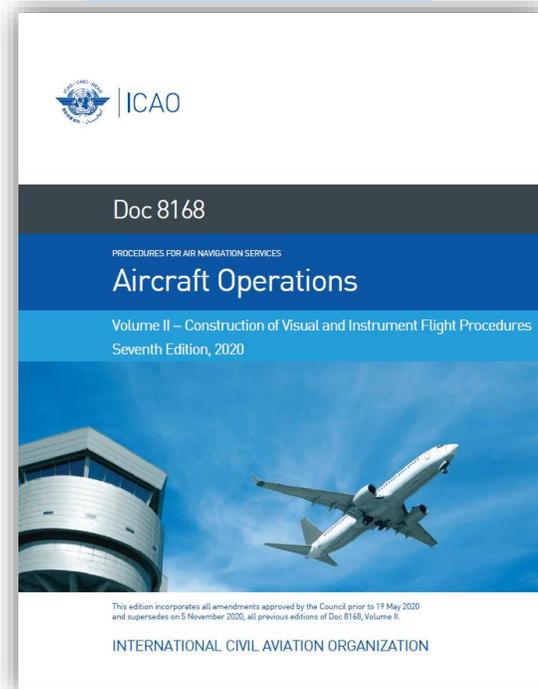
Regulatory Framework

African Flight Procedure Programme (AFPP)

Doc. 9906 V.2



Doc. 8168 V.2



Construction of Visual and Instrument Flight Procedures

Doc. 9868



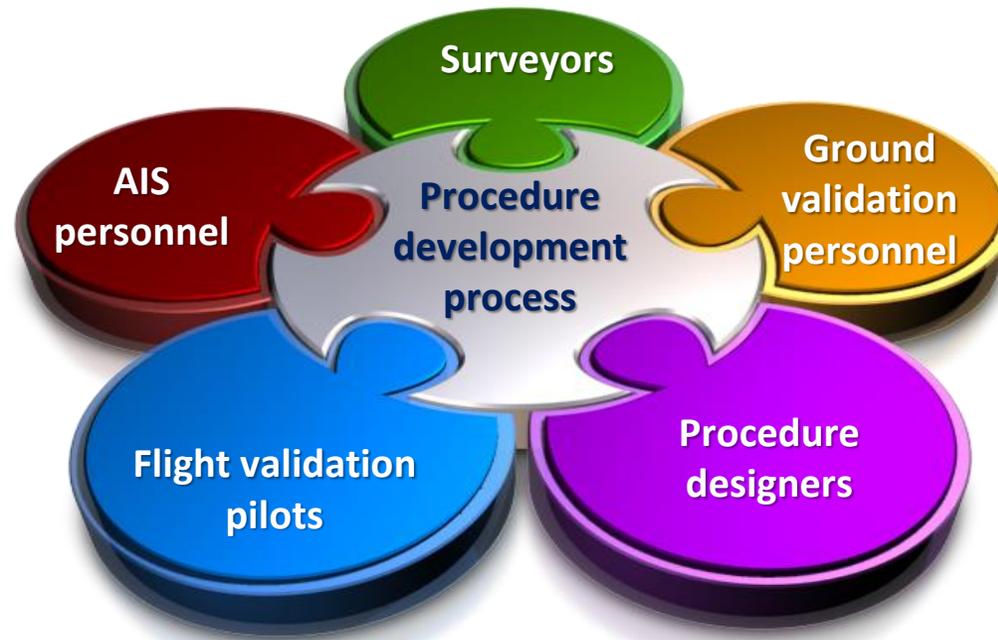
Training



❑ Procedure design is critical due to :

- ☞ Increasing complexity;
- ☞ Increased importance of data integrity, especially for modern area navigation (RNAV) and satellite-based navigation;
- ☞ Introduction of new avionics.

□ Input from a variety of personnel is involve in flight procedure development process :



➤ *All play a key role in the development of a quality flight procedure*



- ❑ The activities of flight procedure designers are considered critical to the safety of aviation;

- ❑ Direct **consequences** for the users can arise from :
 - ☞ **Provision of erroneous**
 - ☞ **Incomplete or badly designed flight procedures and associated minima.**



- ❑ Direct consequences for the **users** can arise from :
 - ☞ Provision of erroneous, ;
 - ☞ Incomplete or badly designed flight procedures and associated minima.

- ❑ To ensure quality, **competency-based training and assessment** is essential to all **contributors** to the flight procedure development process (as indicated in the DOC 8168 vol II, Part I section 2 Chapter 4, 4.7).

Training

- ❑ Training is one of the most important elements of quality assurance.

- ❑ Each State shall:
 - **Establish standards** for the required competency level for flight procedure design.

 - **Ensure** that flight procedure **designers** have **acquired and maintain this competency level** through training, supervised on-the-job training (OJT), recurrent training and refresher training.





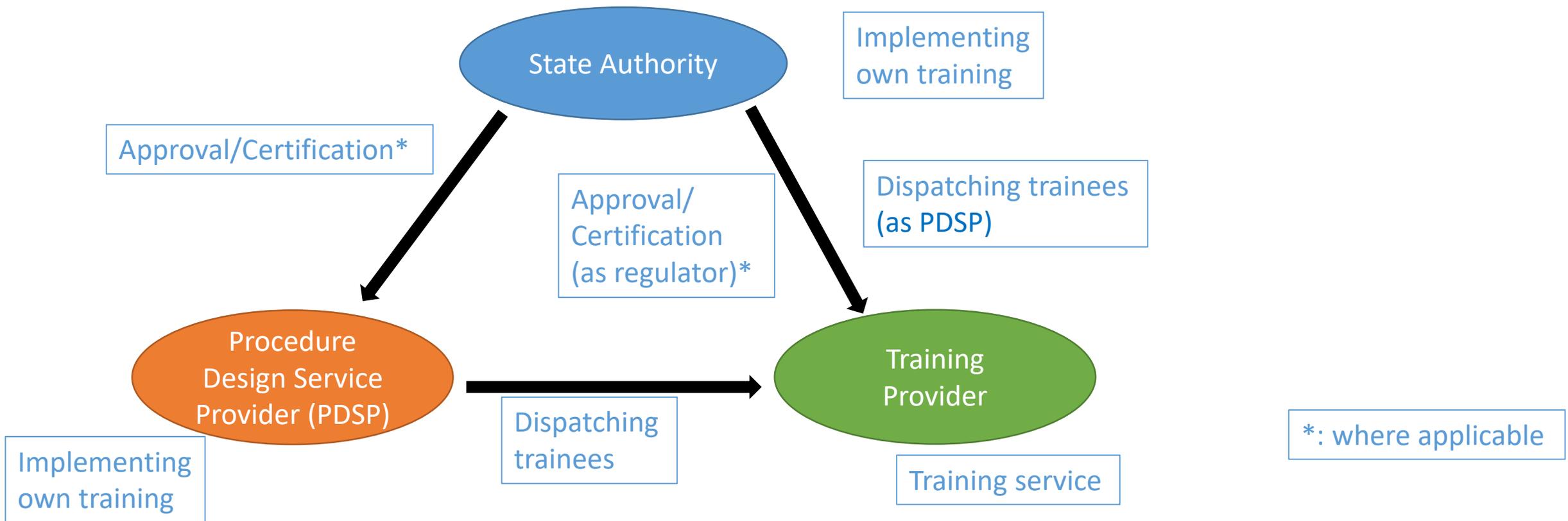
Tools

- ❑ Automated tools have the potential to:
 - ☞ greatly reduce errors
 - ☞ save time
 - ☞ provide for standardized application of criteria

- ❑ The use of automated tools does not waive the requirement for the designer to meet the competency standards

The designer is ultimately responsible for the validity of the procedure design regardless whether it is produced manually or by software

Target audience of the manual :





Competency-based training and assessment

African Flight Procedure Programme (AFPP)

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

- ➔ The justification of a training need through a systematic analysis and the identification of indicators for evaluation;
- ➔ The use of a job and task analysis to determine performance standards, the conditions under which the job is carried out, the criticality of tasks, and the inventory of skills, knowledge and attitudes;
- ➔ The identification of the characteristics of the trainee population;
- ➔ The derivation of training objectives from the task analysis and their formulation in an observable and measurable fashion;



Competency-based training and assessment

African Flight Procedure Programme (AFPP)

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

- ➔ The development of criterion-referenced, valid, reliable and performance-oriented tests;
- ➔ The development of a curriculum based on adult learning principles, with a view to achieving an optimal path to the attainment of competencies;
- ➔ The development of material-dependent training; and
- ➔ the use of a continuous evaluation process to ensure the effectiveness of training and its relevance to line operations.



Competency-based training and assessment

African Flight Procedure Programme (AFPP)

- ❑ A detailed description of the ICAO course development methodology, a competency-based approach to training and assessment, and an example of an instructional system design (ISD) methodology can be found in the Procedures for Air Navigation — Training (PANS-TRG, Doc 9868), Attachment to Chapter 2.
- ❑ According to PANS-TRG, the course development methodology comprises nine phases which can be subdivided in three broad categories of analysis, design and production, and evaluation.





Competency-based training and assessment

African Flight Procedure Programme (AFPP)

Category	Phases	Outputs
Analysis	Phase 1 – Preliminary study	Training proposals, their justification and proposed course of action.
	Phase 2 – Job analysis	Task description and performance standards.
	Phase 3 – Population analysis	Trainees’ characteristics and their existing skills and knowledge.
Design and Production	Phase 4 – Design of curriculum	Training objectives, mastery tests and sequence of modules.
	Phase 5 – Design of modules	Mode of delivery, training techniques and media, draft training material.
	Phase 6 – Production	Production of all trainee materials.
Evaluation	Phase 7 – Validation and revision	Try-out of course and revision as required.
	Phase 8 – Implementation	Human resources trained.
	Phase 9 – Post-training evaluation	Evaluation of training effectiveness; plans for remedial action.



Competency-based training and assessment

Competency framework

African Flight Procedure Programme (AFPP)

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

- ☞ Design departure procedure
- ☞ Design en-route procedure
- ☞ Design arrival route procedure
- ☞ Design approach procedure
- ☞ Design reversal and holding procedures
- ☞ Review instrument flight procedures.



Competency-based training and assessment

African Flight Procedure Programme (AFPP)

Example

X	Competency Unit			
X.X	Competency Element			
	X.X.X	Performance Criteria		
			<i>In accordance with: PANS-OPS, Doc 8168, Volume II (5th edition) Part-Section- Chapter</i>	<i>Annexes Annex 4, 10th Edition, Amendment 53 Annex 14, Volume I, 4th Edition, Amendment 6 Annex 15, 12th Edition, Amendment 33</i>
1	Design departure procedure			
	1.1	Design straight departure non-RNAV procedure		
	1.1.1	Collect, validate and incorporate electronic/paper data for straight departure non-RNAV procedure	I-3-1	AN 15, Ch. 2, App. 7, App. 8 AN 14, Ch. 2, Ch. 4
	1.1.2	Apply criteria for straight departure non-RNAV procedure	I-3-1	
	1.1.3	Establish Minimum Sector Altitudes (MSA)	I-4-8	
	1.1.4	Document and store straight departure non-RNAV procedure	I-3-1	AN 15, Ch. 3
	1.1.5	Ground verify and validate straight departure non-RNAV procedure	I-2-4, I-3-1	AN 15, Ch. 3, Doc 9906, Vol. 5
	1.1.6	Promulgate straight departure non-RNAV procedure	I-3-5	AN 4, Ch. 2, Ch. 9, App. 6 AN 15, Ch. 6, App. 4
	1.1.7	Maintain straight departure non-RNAV procedure	I-3-1	AN 15, Ch. 3, Ch. 5



Competency-based training and assessment

SKAs

African Flight Procedure Programme (AFPP)

- In order to perform tasks, a combination of adequate skills, knowledge and attitudes (SKAs) is required.
- *A skill is the ability to perform an activity that contributes to the effective completion of a task.*
- *Knowledge is specific information required for the trainee to develop the skills and attitudes for the effective accomplishment of tasks.*
- *Attitude is the person's mental state that influences behaviour, choices and expressed opinions.*



Training phases

Ab initio training

- Procedure designers can be recruited from different domains (ATM, AIS, engineer, technician, pilots, just to name a few)
- 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.
- 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



Training phases

Initial training

- 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 programme.
- 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.



Training phases

On-the-job training (OJT)

- ❑ On-the-job training cannot be considered a specific training course in the formal sense, but 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.

Training phases

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.





Training phases

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.



Training phases

Refresher training

- The purpose of refresher training is to strengthen skills and knowledge that have weakened through disuse and the passage of time;
- 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.



□ The steps to carry out curriculum development are to:

- ☞ State the aim of the training;
- ☞ Derive terminal and enabling objectives from the competency framework identified in chapter 2;
- ☞ Design a competency-based mastery test for each terminal objective;
- ☞ Ensure that all skills, knowledge and attitude required for each enabling objective are covered;
- ☞ Sequence terminal and enabling objectives; and
- ☞ Group objectives into modules.

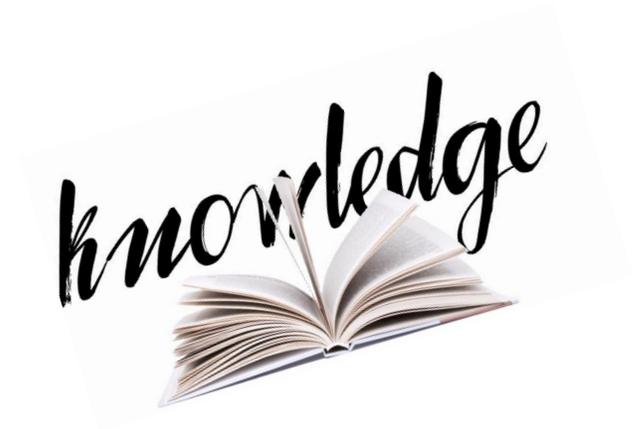


Instructor competencies

- ❑ In competency-based programmes, instructor competencies are made explicit, and **instructors** have to **demonstrate their instructional skills and their knowledge** in subject matter expertise and training course content.
- ❑ Instructors must also meet all competency standards listed in the competency framework developed for flight procedure designers.
- ❑ The instructor must be able to provide rationales for the criteria provided in ICAO manuals.
- ❑ Furthermore, an appropriate level of **experience in the practical** field of flight procedure design is desirable.

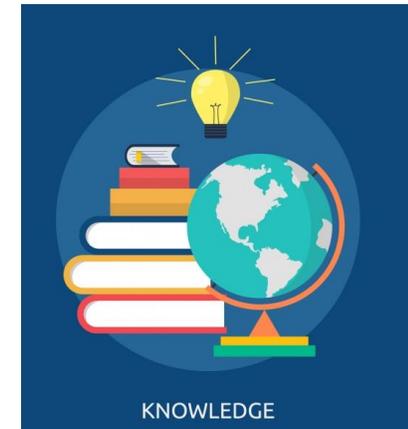
□ The instructor must have appropriate knowledge of the following fields:

- a) Techniques of applied instruction;
- b) Assessment of trainee performance;
- c) The learning process;
- d) Elements of effective teaching;
- e) Trainee evaluation and testing, training and learning theories;



□ The instructor must have appropriate knowledge of the following fields:

- f) Training programme development;
- g) Lesson planning;
- h) Classroom instructional techniques;
- i) Use of training aids; and
- j) Analysis and correction of trainee errors.





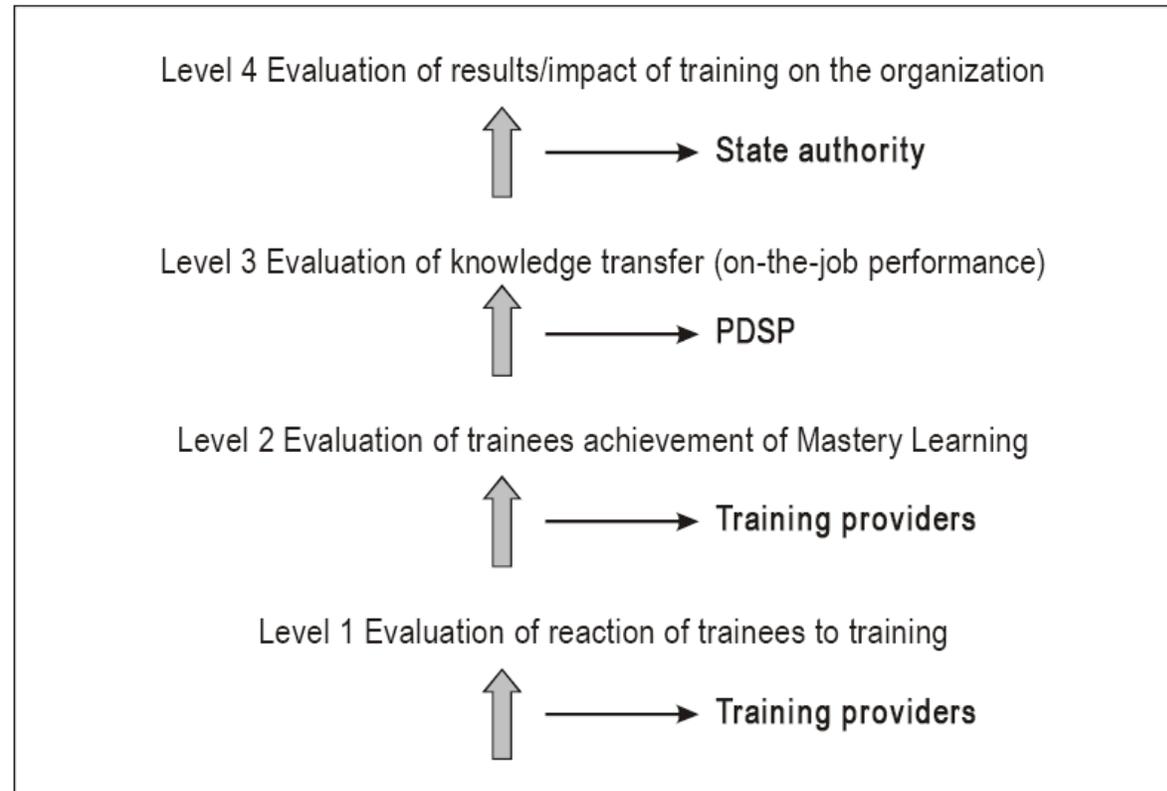
Validation and post-training evaluation

- ❑ Each training objective has a meaningful goal or performance output identified in the competency framework.
- ❑ Consequently, evaluations focus on how well terminal objectives are met and how their achievement will impact performance on the job.
- ❑ In order to properly **evaluate** how flight **procedure designer** training impacts PDSPs, State authorities and training providers, a **four-level evaluation model** is used (Kirkpatrick's Model of Evaluation).
- ❑ This model considers **trainee reaction, mastery learning, job performance and organizational impact**.



Validation and post-training evaluation

Four levels of evaluation





Validation and post-training evaluation

- ❑ Each level is assessed in sequential order, providing essential feedback on specific aspects linking training and performance outcomes.
- ❑ The evaluations in Levels 1 and 2 provide immediate feedback on the design, development and administration of all courses.
- ❑ Level 3 provides critical feedback to training providers regarding on-the-job performance of trainees who have successfully completed an approved course.
- ❑ Level 4 is the highest level of evaluation; it requires a direct line of communication between all parties involved with flight procedure training



Questions:

Dieudonné KASSA KASSA
dieudkasskass@gmail.com