

# United Kingdom Overseas Territories Aviation Circular

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## Competency Based Training and Assessment

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### GENERAL

Overseas Territories Aviation Circulars are issued to provide advice, guidance and information on standards, practices and procedures necessary to support Overseas Territory Aviation Requirements. They are not in themselves law but may amplify a provision of the Air Navigation (Overseas Territories) Order or provide practical guidance on meeting a requirement contained in the Overseas Territories Aviation Requirements.

### PURPOSE

This OTAC is provided to assist in implementing Competency-Based Training and Assessment (CBTA) and explain the main elements that need to be in place for this to take place.

This document is intended as an overview, there is more detailed information about how this applies to different disciplines in the following documents:

- ICAO doc 10056 – Manual on Air Traffic Controller Competency-Based Training and Assessment
- ICAO doc 10057 – Manual on Air Traffic Safety Electronics Personnel Competency-Based Training and Assessment
- ICAO doc 10070 – Manual on the competencies of civil aviation safety inspectors
- ICAO doc 10098 – Manual on Competency-Based Training and Assessment for aircraft maintenance personnel
- ICAO doc 10147 – Guidance on a Competency-Based approach to Dangerous Goods Training and Assessment
- ICAO doc 9868 – Training procedures for Air Navigation Services
- IATA Dangerous Goods Regulations 63<sup>rd</sup> Edition- Appendix H

- ICAO Doc 9906 – Quality Assurance Manual for Flight Procedure Design
- ICAO Doc 7192 – Air Traffic Safety Electronic Personnel
- ICAO Doc 9906 – Quality Assurance Manual for Instrument Flight Procedure Design
- ICAO Doc 8071 – Manual on Testing on Radio Navigation Aid (all volumes)

## RELATED REQUIREMENTS

This Circular relates to OTAR Part 66 – Aircraft Maintenance Personnel Licensing and Authorisation; OTAR Part 65 - Air Traffic Service Personnel Licences, Ratings and Training Organisation Approval; OTAR Part 92 Carriage of Dangerous Goods; OTAR Part 171 – Aeronautical Telecommunication Services; OTAR Part 172 – Air Traffic Service Organisation Requirements; and OTAR Part 176 – Instrument Flight Procedure Approval.

## CHANGE INFORMATION

First issue.

## ENQUIRIES

Enquiries regarding the content of this Circular should be addressed to Air Safety Support International at the address on the ASSI website [www.airsafety.aero](http://www.airsafety.aero) or to the appropriate Overseas Territory Aviation Authority.

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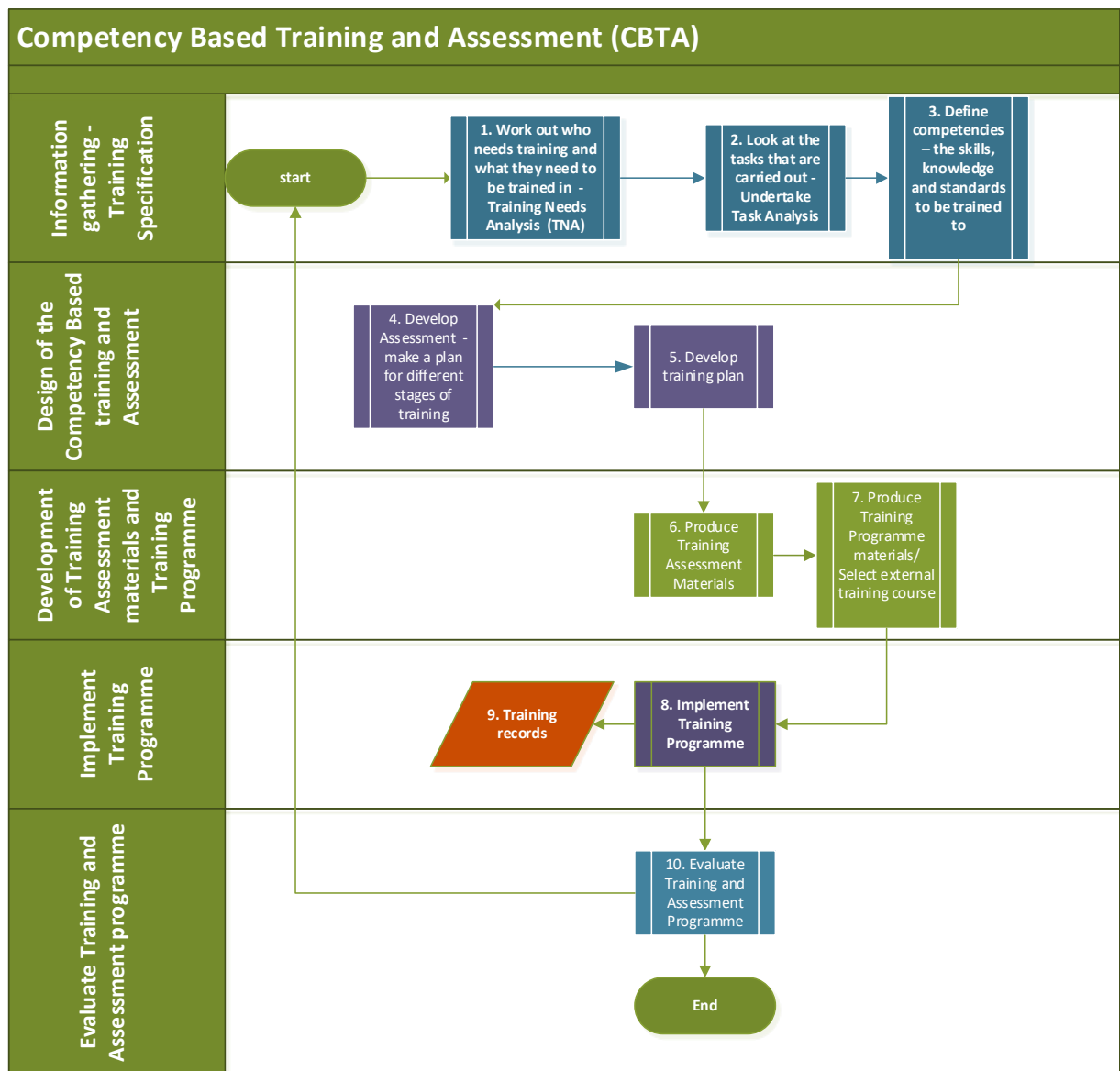
## 1. Competency Based Training and Assessment (CBTA)

The aim of Competency-Based Training and Assessment is to ensure that there is a workforce who can perform their tasks for their role to an agreed standard.

The advantages of CBTA are:

- The training is focussed on the activities that an individual needs to carry out in their role.
- Training is conducted to meet a specific level of proficiency. The most appropriate method of training is selected. Because of this, the training is an efficient use of time and resources.
- Refresher training can be targeted.
- Reliable and valid assessment tools are established.

The workflow below shows the process of developing and implementing a CBTA programme. Each of the steps has further explanation in the sections following.

**Diagram 1a- Workflow showing CBTA process**

There may be slight variations to this approach according to the discipline.

**Appendix 1** shows the approach for CBTA for Flight Procedure Design.

### 1.1 Training Needs Analysis (TNA)

This is the process of defining the scope of the training using information to determine:

- Who needs training – numbers of people and their roles.
- Level of current knowledge and experience.
- Areas of training to be covered.
- What sort of training is required – refresher/initial.
- Timescales.
- Resources – internal training or use of an external organisation.
- Budget.

- Consideration should be given to organisational, regulatory and operational needs – i.e. what requirements need to be met.

If you are looking at refresher training, you may wish to consider the following when carrying out TNA:

- Is this a frequent or infrequent task – if infrequent, will knowledge and skills be up to date?
- When was training last completed?
- Output from internal and external audits identifying training needs.
- Reports – internal and Mandatory Occurrence Reports (MORs) identifying areas where training may be needed.
- Quality control checks.
- Feedback from Supervisors and trainees.
- Updates in regulatory, organisational or operational requirements.

## 1.2 Task Analysis

Identify the tasks that occur within the organisation in the discipline being trained and from this, work out what Knowledge, Skills and Attitude (KSA) are required for the task to be completed successfully.

It is important to focus on tasks rather than job roles so that all elements of the process are analysed. A good way to define the tasks is to follow a process through from start to finish and see who is involved and what they have need to do.

A task is likely to have a number of subtasks to it as shown in the example below.

<b>Task</b>	<b>Subtasks</b>	<b>Knowledge</b>	<b>Skills</b>	<b>Attitude</b>
Main task 1	Subtask 1	Knowledge description	Skill description	Attitude description
	Subtask 2	Knowledge description	Skill description	Attitude description
	Subtask 3	Knowledge description	Skill description	Attitude description
Main task 2	Subtask 1	Knowledge description	Skill description	Attitude description
	Subtask 2	Knowledge description	Skill description	Attitude description

An example for Dangerous Goods Training, is table H.5.1.C in IATA Dangerous Goods Training Competency and Assessment, Appendix H.

**Appendix 2** shows a sample task for Dangerous Goods.

## 1.3 Define Competencies

In ICAO Doc 9868 Third Edition, 2020 Training Procedures for Air Navigation Services, a competency is defined as:

*'A competency is a dimension of human performance that is used to reliably predict successful performance on the job. It is manifested and observed through behaviours that mobilize the relevant knowledge, skills and attitudes to carry out activities or tasks under specified conditions.'*

See **Appendix 3** for further definitions on Competency and other related terms from ICAO Doc 9906 – Quality Assurance Manual for Flight Procedure Design.

In other words, a competency must describe the skills, knowledge and attitude/behaviours required to complete a task or collection of tasks to a desired standard. Competencies are definable and have observable behaviours against which an individual can be assessed.

When defining a competency, identification of the skills, knowledge and attitude or behaviours are key.

Once you have your task list, these can be grouped together as competencies where there is synergy.

When setting the standard for that competency consider things like, does the individual need to do this task in an unsupervised situation or simply have a basic level of knowledge or skill?

This enables a competency to be written in a way that ensures they can be trained for, observed and assessed consistently in a wide variety of work contexts for a given aviation profession or role.

### 1.3.1 Elements of a Competency – Knowledge (K), Skills (S), Attitude/Behaviour (A)

**Knowledge** – this is the building block of a competency – what information does this competency require for the individual to perform effectively. This can be in the form of technical knowledge, or knowledge of procedures for example. Knowledge is generally gained through experience or education and is the theoretical or practical understanding of a subject. It may be that the knowledge is where to find the information for example, regarding the Technical Instructions for Dangerous Goods, you need to know how to use them and how to look up information but not memorise all of the contents.

**Skills** – this is the practical application of knowledge. A skill is an ability to perform an activity or an action effectively. These are developed over time and with practice.

**Attitudes/Behaviours**– this is the way in which the individual carries out the activity.

Examples of KSA for personnel relating to Dangerous Goods is given below taken from ICAO Doc 10147 Guidance on a Competency-Based approach to Dangerous Goods training and assessment:

- |           |   |
|-----------|---|
| Knowledge | — The nine classes of dangerous goods.<br>— Information required on the dangerous goods transport document.<br>— Components of an acceptance check.   |
| Skills    | — How to determine if the substance/material is dangerous goods<br>— How to complete the dangerous goods documentation.<br>— How to check a package (e.g.: can it be accepted for transport?) |
| Attitude  | — Being motivated to ensure safety and to comply with applicable regulations.<br>— Wanting to adhere to regulations in asking relevant and effective questions.                               |

- Appreciating feedback from team members (e.g.: adapts when faced with a situation where no guidance or procedure exists).

Detailed information on Knowledge, Skills and Attitude can be found in Chapter 1.6 of ICAO Doc 10056 – Manual on Air Traffic Controller Competency based training and Assessment.

IATA Dangerous Goods Regulations 63<sup>rd</sup> Edition, Appendix H clarifies Knowledge, Skills and Attitudes in Section H.1.2.

ICAO Doc 9906 – Quality Assurance Manual for Flight Procedure Design, Volume 2, section 2.3 provides information on the competency framework for procedure designers.

## 1.4 Develop Assessment Plan

Developing an Assessment Plan is part of the design stage. At this stage it is important to identify how individuals will be assessed to evaluate their competence. Some things to consider are:

- At what stages during the training will assessments be required?
- Types of assessment – formative (during the training) and summative (final assessments).
- Who will be making the assessments?
- Pass marks.
- How many observations/assessments need to be completed for each trainee.

### 1.4.1 Assessment methods

#### Principles of Assessment

- There needs to be clear performance criteria (competencies) against which the learner is evaluated.
- The integrated performance is being observed (i.e. not just one facet of the task).
- The individual is assessed on more than one occasion.
- The assessor is trained and provides valid and reliable assessment.

It is important to be aware of any regulatory requirements for confirmation that competency has been achieved.

#### Assessment types

- Practical assessment – assessing observable behaviours in a simulated or operational environment to verify the integrated performance of competencies.
  - Practical assessments may be formative or summative.
    - Formative assessments provide initial assessments and assessments during the learning programme and are an opportunity for feedback and for learning as well as how they are progressing to achieving full competence.



- Summative assessments provide the assessor the ability to gather evidence for final assessment.
- Oral and written examinations can form part of the summative assessments.

### Assessment documentation

This should include an evidence guide for consistency for assessors and link back to the competencies.

Competency	Description	Observable behaviour	Acceptable evidence	Assessment
Competency 1	Competency description 1	OB 1	E1	
		OB2 etc	E2	
Competency 2	Competency description 2	OB 1	E1	
		OB2 etc	E2	
Competency 3	Competency description 3	OB 1	E1	
		OB2 etc	E2	

## 1.5 Develop a Training Plan

This activity is also part of the design stage. The Training Plan will outline all of the elements that need to be completed. Things to include are:

- Structure of the training including all training elements – inclusion of classroom courses, virtual classrooms, On-the-Job Training (OJT), shadowing, practical exercises, eLearning.
- Training Syllabus outlining the areas of training and modules.
- Delivery sequence.
- Schedule for training.

At this stage, you may decide that you do not have the resources to train the formal elements of the programme within your organisation and need to use an external provider. This may mean a training provider adapting training for your organisation or you having to use an open training course. If an external provider is used for the classroom training there will still be practical training that needs to take place within your organisation and the assessment of individuals will also still be required.

## 1.6 Develop Assessment Materials

Those that are carrying out the assessments will need standardised tools to use for the process so that a consistent outcome can be achieved, regardless of who carries out the assessment.

Once the tools have been created – such as checklists, oral and written examinations and guidance materials, those who are the assessors will need training on the tools.

**Appendix 4** shows the different considerations when designing assessments. The example is drawn from Flight Procedure Design but can be applied wider.

## 1.7 Produce a Training Programme and materials

This will cover all of training materials not just for classroom training for any practical elements of the training. Typically, these will be:

- Training notes
- Student Handbooks
- Case studies, presentations
- Materials for self-study
- OJT support materials
- Practical exercises
- Examinations

## 1.8 Carry out the training

Training should be carried out as per the training plan and in the order of training identified so that the building blocks of learning are followed.

## 1.9 Maintain Training records

Throughout the process, good records should be maintained for both individuals and also of the materials and results.

## 1.10 Evaluate your Competency-Based Training and Assessment

In order to strive for continuous improvement, evaluation of the processes and results should be undertaken. This is particularly useful to feed into refresher training and to improve initial training. In order to carry out an evaluation, consider the following:

- Course results
- Instructor and trainee feedback
- Audits reports
- Quality Management information

## 2. Regulatory Oversight

Your regulator will want to see that you have followed a process to carry out Competency Based Training and Assessment and will be interested in the continual improvement of your programmes. Maintaining good records of the process and for individuals are therefore an important element of this approach.

## Appendix 1

### Approach to designing CBTA training

The following table is taken from ICAO Document 9906 – Quality Assurance Manual for Flight procedure Design, Volume 2, section 2.2 and it defines the approach to CBTA as a nine phase process.

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.

## Appendix 2

### Sample task list for Dangerous Goods Training

List is taken from ICAO DOC 10147 – Chapter 5.

#### Tasks

1. Classifying dangerous goods
  - 1.1 Evaluate substance or article against classification criteria
  - 1.2 Determine dangerous goods description
  - 1.3 Review special provisions
2. Preparing dangerous goods shipment
  - 2.1 Assess packing options including quantity limitations
  - 2.2 Apply packing requirements
  - 2.3 Apply marks and labels
  - 2.4 Assess use of overpack
  - 2.5 Prepare documentation
3. Processing/accepting cargo
  - 3.1 Review documentation
  - 3.2 Review package(s)
  - 3.3 Complete acceptance procedures
  - 3.4 Process/accept cargo other than dangerous goods
4. Managing cargo pre-loading
  - 4.1 Plan loading
  - 4.2 Prepare load for aircraft
  - 4.3 Issue NOTOC
5. Accepting passenger and crew baggage
  - 5.1 Process baggage
  - 5.2 Accept baggage
6. Transporting cargo/baggage
  - 6.1 Load aircraft
  - 6.2 Manage dangerous goods pre- and during flight
  - 6.3 Unload aircraft
7. Collecting safety data
  - 7.1 Report dangerous goods accidents
  - 7.2 Report dangerous goods incidents
  - 7.3 Report undeclared/misdeclared dangerous goods
  - 7.4 Report dangerous goods occurrences

## Appendix 3

### Competency Definitions and other related elements from ICAO Doc 9906, Volume 2, Quality Assurance Manual for Flight Procedure Design

#### Definitions:

##### Competency

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

##### Competency-based training and assessment

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

##### Competency element

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

##### Competency framework

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

##### Competency unit

A discrete function consisting of a number of competency elements.

#### Section 2.2

##### 2.2 COMPETENCY-BASED APPROACH TO TRAINING AND ASSESSMENT

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

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

- a) the justification of a training need through a systematic analysis and the identification of indicators for evaluation;
- b) the use of a job and task analysis to determine performance standards, the conditions under which the job is carried out, the criticality of tasks, and the inventory of skills, knowledge and attitudes;
- c) the identification of the characteristics of the trainee population;
- d) the derivation of training objectives from the task analysis and their formulation in an observable and measurable fashion;
- e) the development of criterion-referenced, valid, reliable and performance-oriented tests;
- f) the development of a curriculum based on adult learning principles, with a view to achieving an optimal path to the attainment of competencies;
- g) the development of material-dependent training; and
- h) the use of a continuous evaluation process to ensure the effectiveness of training and its relevance to line operations.

## Appendix 4

### Examples of Test Selection for Instrument Flight Procedure Designers taken from ICAO Doc 9906, Volume 2, Quality Assurance Manual for Flight Procedure Design

#### Attachment B to Chapter 3

#### Test Selection Criteria

TYPE OF TEST	ADVANTAGE(S)	DISADVANTAGE(S)	SKAs TESTED	EXAMPLES
<b>Simulation</b> (a) Real performance in simulated situation	<ul style="list-style-type: none"> <li>- Reduces consequence(s) of mistakes</li> <li>- Can create realistic dangerous situations</li> <li>- Reduces stress on trainees</li> </ul>	<ul style="list-style-type: none"> <li>- Scoring may be subjective (biased) if the scoring key is not explicit enough</li> </ul>	All SKAs (application and transfer of learnt skills to novel situations)	<ul style="list-style-type: none"> <li>- Design straight departure non-RNAV procedure</li> <li>- Design omnidirectional departure RNAV procedure</li> </ul>
(b) Simulated performance in simulated situation	<ul style="list-style-type: none"> <li>- Can create realistic portable and dangerous situation</li> <li>- No risk attendant on mistake</li> <li>- Little stress on trainees</li> </ul>	<ul style="list-style-type: none"> <li>- Further removed from real conditions (raises issue of validity)</li> </ul>	All SKAs (Except physical skills)	<ul style="list-style-type: none"> <li>- Case studies (varying degrees of complexity)</li> <li>- Identify best practices for an en-route procedure design</li> <li>- Recognize appropriate instruments for the design of VOR or NDB FAF procedure</li> </ul>
<b>Objective-Type</b> (a) Alternate response (binary choice)	<ul style="list-style-type: none"> <li>- Easy to construct</li> <li>- Permits coverage of many points (wide coverage)</li> <li>- Efficient (easy to take and score)</li> </ul>	<ul style="list-style-type: none"> <li>- Possibility of guessing the answer (reliability?)</li> <li>- Memorization of unrelated facts is encouraged</li> <li>- Cannot tell whether trainee has learnt or not</li> </ul>	Knowledge Discrimination Classifying	True/False Test <ul style="list-style-type: none"> <li>- Sequence of design preparation</li> <li>- Meaning of technical terms</li> </ul>
(b) Multiple choice	<ul style="list-style-type: none"> <li>- Can measure trainee's ability to make judgements of predetermined exactness</li> <li>- Easy to score and comparatively free from guessing</li> </ul>	<ul style="list-style-type: none"> <li>- Susceptible to clues (within construction of item, item choices)</li> <li>- Time-consuming and somewhat difficult to construct</li> </ul>	Problem solving Classifying Discrimination Knowledge	<ul style="list-style-type: none"> <li>- Choosing a particular procedure design based on a given problem situation among several alternatives</li> <li>- Recognize the proper criteria for RNAV/RNP standard instrument arrival procedure among a list provided.</li> </ul>
(c) Matching	<ul style="list-style-type: none"> <li>- Measures ability to recognize relationships and make associations</li> <li>- Economical</li> <li>- Requires less construction time than multiple choice items of equal quality</li> </ul>	<ul style="list-style-type: none"> <li>- Inferior to multiple choice in measuring fine discrimination understanding and judgement</li> <li>- Can provide clues, especially if the choice is limited to the number of items to be matched</li> </ul>	Knowledge Discrimination Classifying	<ul style="list-style-type: none"> <li>- Diagrams and specific measurements</li> <li>- Technical terms and their meanings</li> <li>- Sequencing order of specific design procedures</li> <li>- Sample design procedures requesting appropriate labels and terminology</li> </ul>
<b>Open Question</b>	<ul style="list-style-type: none"> <li>- Sharp and accurate evaluation</li> <li>- No introduction of erroneous items that can be then reminded by the trainees (as in, for example, multiple choice)</li> <li>- Easy to implement</li> </ul>	<ul style="list-style-type: none"> <li>- Scoring may be subjective</li> <li>- Time-consuming for correction</li> </ul>	Comprehension versus memorization	<ul style="list-style-type: none"> <li>- Modeling sophisticated obstacles as Hangar or Hill or railroad for CRM OCH calculation (in that case a figure is often provided)</li> </ul>
<b>Open question with short answer</b>	<ul style="list-style-type: none"> <li>- Sharp evaluation</li> <li>- Easy scoring</li> <li>- Particularly adapted when numerical answers are expected</li> </ul>	<ul style="list-style-type: none"> <li>- Not all items can be tested in this way</li> </ul>	Knowledge Discrimination	<ul style="list-style-type: none"> <li>- On an IAC indicate the item corresponding to the identification of procedures</li> </ul>

TYPE OF TEST	ADVANTAGE(S)	DISADVANTAGE(S)	SKAs TESTED	EXAMPLES
<b>Oral question</b>	<ul style="list-style-type: none"> <li>- Evaluation by « saying » versus « writing »</li> <li>- Direct contact with the assessor who can reword the question to really test the knowledge</li> </ul>	<ul style="list-style-type: none"> <li>- Often stressful</li> <li>- Scoring may be subjective</li> </ul>	Knowledge Rapidity Ability to express, to present	<ul style="list-style-type: none"> <li>- Using an IAC displayed, the trainee is questioned on the feasibility of the procedure if aircraft are coming from specific directions and why. Or application of specific criteria and why.</li> </ul>
<b>Project/thesis redaction and presentation (often in a team)</b>	<ul style="list-style-type: none"> <li>- Evaluation by saying and writing</li> <li>- Simulate real case</li> <li>- Develop team-player mindset</li> </ul>	<ul style="list-style-type: none"> <li>- Time-consuming for the realization by the trainee</li> <li>- Time-consuming for the assessor(s)</li> <li>- Scoring may be subjective</li> <li>- When it is a team project, sometimes difficult to score the trainee individually</li> </ul>	Comprehension Process Link between all the different types of knowledge taught. Ability to take decisions and make choices regarding the hypothesis and to discuss and promote them. Synthesis ability Oral expression	<ul style="list-style-type: none"> <li>- Design an RNP 0.3 procedure on a specific environment.</li> </ul>