ICAO

Doc 10098

Manual on Competency-based Training and Assessment for Aircraft Maintenance Personnel

First Edition, 2021

Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION

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AMENDMENTS

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RECORD OF AMENDMENTS AND CORRIGENDA

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FOREWORD

Current industry trends indicate a significant increase in the worldwide fleet, while a large number of current aircraft maintenance personnel (AMP) is due to retire from the industry, leading to a shortage of AMP in the coming years. The shortage of AMP would result in a significant increase in demand for training.

In 2020, procedures on a new approach for the implementation of competency-based training and assessment for AMP were included as Part III of the *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868). These procedures provide States, approved maintenance organizations (AMOs) and aviation training organizations (ATOs) with guidance on how to structure their approach to training and assessment of AMP. The procedures provide a flexible framework that stakeholders can adapt to their local operational contexts and requirements.

AMP can have varying degrees of educational background, which can range from the self-taught individual to the holder of a university engineering degree. However, irrespective of educational background, all AMP must demonstrate a high level of technical competency and understanding of regulatory compliance. Often, meeting these high standards requires comprehensive training that provides the necessary knowledge, skills and attitudes for assuming the responsibility for aircraft maintenance.

This manual provides guidance on a new approach of applying competency-based training and assessment to aircraft maintenance personnel in accordance with Part III of the *PANS-TRG* (Doc 9868). This manual was developed by the Competency-Based Training and Assessment Task Force, with contribution from subject matter experts on maintenance personnel.

Throughout this manual, for the phrase “aircraft maintenance (technician/engineer/mechanic),” the terms in brackets are given as acceptable additions to the title of the licence. Each State is expected to use its preferred term. For the purpose of this manual and as a matter of convenience, the acronym AMP is used to refer to aircraft maintenance (technician/engineer/mechanic) personnel.

Comments on this manual, particularly with regard to its application and usefulness, would be appreciated from States and ICAO Technical Co-operation Field Missions. These will be taken into consideration in the preparation of subsequent editions. Comments concerning this manual should be addressed to:

The Secretary General
International Civil Aviation Organization
999 Robert-Bourassa Boulevard
Montréal, Québec H3C 5H7
Canada

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GLOSSARY

DEFINITIONS

When the following terms are used in this document, they have the following meanings:

Adapted competency model. A group of competencies with their associated description and performance criteria adapted from an ICAO competency framework that an organization uses to develop competency-based training and assessment for a given role.

Approved training organization. An organization approved by and operating under the supervision of a Contracting State in accordance with the requirements of Annex 1 to perform approved training.

Approved maintenance organization. An organization approved by a Contracting State, in accordance with the requirements of Annex 8, Part II, Chapter 6 — Maintenance Organization Approval, to perform maintenance of aircraft, engine, propeller or parts thereof and operating under supervision approved by that State.

Note.— Nothing in this definition is intended to preclude that the organization and its supervision be approved by more than one State.

Assessment (evidence) guide. A guide that provides detailed information in the form of evidence that an instructor or an evaluator can use to determine whether a candidate meets the requirements of the competency standard.

Note.— For the purpose of this manual, the evaluator as used in the definition of Assessment (evidence) guide should be understood to include assessor. Additionally, "tolerances" used as example in this manual should be considered as knowledge level, skill level, etc.

Assessment plan. The document that details the assessment events, tools (Assessment (evidence) guide, competency checklist, competency assessment form, etc…) and competency standards that will be used to determine if competency has been achieved.

Note.— For the purpose of this manual, this definition is intended for the AMP CBTA Course Development.

Basic training. Training which is generic in nature but essential in the role of particular activities.

Note.— For the purpose of this manual, basic training may be referred to as initial training or fundamental training.

Certification authorization. An authorization that an approved maintenance organization grants to an individual to perform maintenance certifications or issue certificates of release to service or both on behalf of the organization:

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

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 standard. A level of performance that is defined as acceptable when assessing whether or not competency has been achieved.

Conditions. Anything that may qualify a specific environment in which performance will be demonstrated.

Differences training. The training required to cover the knowledge, skills and or attitude gap between two similar courses or body of learning subjects.

Dispatch deviation procedures guide. Manual to identify any procedure to dispatch an aircraft with allowable systems/components inoperative or missing.

Note.— Large aircraft manufacturers may choose to produce operating and maintenance procedures in documents such as dispatch deviation procedure guides, for use by operators.

Error. An action or inaction by an operational person that leads to deviations from organizational or the operational person's intentions or expectations.

*Note — See Chapter 1 of Annex 19 —*Safety Management *for a description of operational personnel.*

Error management. The process of detecting errors and responding to them with countermeasures that reduce or eliminate the consequences of errors and mitigate the probability of further errors or undesired states.

Note.— See Part II, Section 1, Chapter 6 of the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868) and Circular 314 —* Threat and Error Management (TEM) in Air Traffic Control *for a description of undesired states.*

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

ICAO competency framework. A competency framework, developed by ICAO, is a selected group of competencies for a given aviation discipline. Each competency has an associated description and observable behaviours.

Instructions for continuing airworthiness. A set of descriptive data, maintenance planning and accomplishment instructions, developed by a design approval holder in accordance with the certification basis for the aeronautical product. The ICAs provide air operators with the necessary information to develop their own maintenance programme and also for approved maintenance organizations to establish the accomplishment instructions.

Note.— The design approval holder must follow mandatory requirements regarding: the timeliness and completeness of the ICA's development, the changes to ICA as well as the ICA availability to users required to follow any of the terms of those ICA (e.g. aircraft owner, operator etc.).

Instructional systems design. A formal process for designing training which includes analysis, design and production, and evaluation.

Learning management system. A system designed to fulfil the following training processes:

a) courseware control;

b) documentation and record keeping;

c) student and instructor performance monitoring;

d) course progression tracking;

e) standardization of delivery; and

f) data analysis.

Note.— LMS is most frequently known today as a software application for computers which can effectively accomplish all these processes.

Licensing Authority. The Authority designated by a Contracting State as responsible for the licensing of personnel.

Note.— In the provisions of Annex 1 — Personnel Licensing*, the Licensing Authority is deemed to have been given the following responsibilities by the Contracting State:*

a) assessment of an applicant's qualifications to hold a licence or rating;

b) issue and endorsement of licences and ratings;

c) designation and authorization of approved persons;

d) approval of training courses;

e) approval of the use of flight simulation training devices and authorization for their use in gaining the experience or in demonstrating the skill required for the issue of a licence or rating; and

f) validation of licences issued by other Contracting States.

Maintenance. The performance of tasks on an aircraft, engine, propeller or associated part required to ensure the continuing airworthiness of an aircraft, engine, propeller or associated part including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair

Maintenance organization's procedures manual. A document endorsed by the head of the maintenance organization which details the maintenance organization's structure and management responsibilities, scope of work, description of facilities, maintenance procedures and quality assurance or inspection systems.

Maintenance records. Records that set out the details of the maintenance carried out on an aircraft, engine, propeller or associated part.

Maintenance release. A document which contains a certification confirming that the maintenance work to which it relates has been completed in a satisfactory manner in accordance with appropriate airworthiness requirements.

Major modification. In respect of an aeronautical product for which a type certificate has been issued, a change in the type design that has an appreciable effect, or other than a negligible effect, on the mass and balance limits, structural strength, engine operation, flight characteristics, reliability, operational characteristics, or other characteristics or qualities affecting the airworthiness or environmental characteristics of an aeronautical product.

Major repair. Any repair of an aeronautical product that might appreciably affect the structural strength, performance, engine, operation flight characteristics or other qualities affecting airworthiness or environmental characteristics.

Minimum equipment list. A list which provides for the operation of aircraft, subject to specified conditions, with particular equipment inoperative, prepared by an operator in conformity with, or more restrictive than, the MMEL established for the aircraft type.

Minor modification. A modification other than a major modification.

Minor repair. A repair other than a major repair.

Modification. A change to the type design of an aircraft, engine or propeller.

Note.— A modification may also include the embodiment of the modification which is a maintenance task subject to a maintenance release. Further guidance on aircraft maintenance, modification and repair is contained in the Airworthiness Manual *(Doc 9760).*

Non–type and non–licences certification authorization training. Maintenance trainings that are non-type-specific or non-licence-specific conducted to permit persons to perform specified maintenance activities.

Observable behaviour. A single role-related behaviour that can be observed and may or may not be measurable.

Performance criteria. Statements used to assess whether the required levels of performance have been achieved for a competency. A performance criterion consists of an observable behaviour, condition(s) and a competency standard.

Rating. An authorization entered on or associated with a licence and forming part thereof, stating special conditions, privileges or limitations pertaining to such licence.

Repair. The restoration of an aircraft, engine, propeller or associated part to an airworthy condition in accordance with the appropriate airworthiness requirements, after it has been damaged or subjected to wear.

Standard practices manual. Manual establishing standard practices to be applied by aircraft and component maintenance personnel for the proper handling (identification, application, working procedures, use of tools, and quality standards) of standard aeronautical hardware.

Threat. Events or errors that occur beyond the influence of an operational person, increase operational complexity and must be managed to maintain the margin of safety.

Note.— See Chapter 1 of Annex 19 — Safety Management *for a description of operational personnel.*

Training for a particular maintenance rating. Training aimed at developing the set of particular competencies required to perform maintenance tasks on a type of equipment and in specific environments.

Note.— Such types of equipment include, but are not limited to:

a) a specific aircraft or a broad category of aircraft;

b) an airframe or aircraft structure;

c) engines;

d) aircraft systems or components; and

e) avionic systems or components.

Training gap analysis. The analysis of the difference between KSA (Knowledge, Skills and Attitude) that the student(s) require and KSA the student(s) possess.

Training needs analysis. The analysis of the students against the competency definitions of their job to determine the precise objectives (knowledge, skills, attitudes) to be trained to carry out that job.

Training objective. A clear statement that is comprised of three parts, i.e. the desired performance or what the trainee is expected to be able to do at the end of training (or at the end of particular stages of training), the performance standard that must be attained to confirm the trainee's level of competence, and the conditions under which the trainee will demonstrate competence.

ABBREVIATIONS

ADDIE	Analyse, design, develop, implement and evaluate
AMP	Aircraft maintenance personnel
AMO	Approved maintenance organization
ATO	Approved training organization
CAA	Civil aviation authority
CBTA	Competency-based training and assessment
DDPG	Dispatch deviation procedures guide
ICA	Instructions for continuing airworthiness
ISD	Instructional systems design
KSA	Knowledge, skills and attitudes
LMS	Learning management system
MEL	Minimum equipment list
MOPM	Maintenance organization's procedures manual
OB	Observable behaviour
SARPs	Standards and Recommended Practices
TNA	Training needs analysis

PUBLICATIONS

(referred to in this manual)

Annexes

Annex 1 — *Personnel Licensing*

Annex 6 — *Operation of Aircraft*
Part I — *International Commercial Air Transport — Aeroplanes*
Part II — *International General Aviation — Aeroplanes*
Part III — *International Operations — Helicopters*

Annex 8 — *Airworthiness of Aircraft*

Annex 19 — *Safety Management*

Procedures for Air Navigation Services (PANS)

Procedures for Air Navigation Services — Training (PANS-TRG) (Doc 9868)

Manuals

Manual of Procedures for Establishment and Management of a State's Personnel Licensing System (Doc 9379)

Airworthiness Manual (Doc 9760)

Safety Management Manual (SMM) (Doc 9859)

Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335)

Safety Oversight Manual (Doc 9734), Part A — *The Establishment and Management of a State Safety Oversight System*

Manual on the Approval of Training Organizations (Doc 9841)

TRAINAIR PLUS — Training Development Guide — Competency-based Training Methodology (Doc 9941)

Training Instructors Guide – Competency-based course delivery (Doc 10097)

ICAO Training Needs Analysis (TNA) Methodology and Website Tool User Guidance

Others

Competency-Based Education in Aviation: Exploring Alternate Training Pathways by Suzanne K. Kearns, Timothy J. Mavin and Steven Hodge.
Guidelines and Recommendations on Training Needs Analysis (GR1002) by European Aviation Maintenance Training Committee

Guidance Material and Best Practices for the Implementation of Competency-Based Training in Maintenance by International Air Transport Association

Chapter 1

INTRODUCTION

1.1 BACKGROUND

1.1.1 Current industry trends indicate an expected increase in air traffic and a significant increase in worldwide fleet. This projected growth has led to predictions of adequate aircraft maintenance personnel (AMP) support. The exact timing of the projected growth will depend on factors such as economic development. In addition, with a large number of current AMP due to retire from the industry, both issues would lead to a shortage of AMP during the coming years. This shortage would result in a significant increased demand for the training of new AMP.

1.1.2 In addition, the retirement of legacy aircraft and replacement of fleet with aircraft equipped with new technologies will also generate additional or different training requirements for new and existing AMP.

1.1.3 The aviation industry is becoming more globalized and, with the outsourcing of maintenance, there is a need for the AMP competency to be harmonized to enable the global transferability of AMP. To ensure the quality of maintenance and the safe operation of aircraft, the aviation industry has to find solutions to these additional training demands and requirements while ensuring acceptable competency standards for all AMP.

1.1.4 Competency-based training and assessment (CBTA) is a method to provide an acceptable competency standard for AMP.

Historical and contemporary training programmes

1.1.5 Early aircraft were mostly made up of a structure, control mechanism and engines. Therefore, maintenance training programmes primarily focused on mechanical systems. As aircraft become increasingly sophisticated, increased levels of specialization are required, concentrating on airframes, engines, electrical, instruments and avionics. As a result, the training of AMP is a specialized trade with a high demand for practical skills and comprehensive knowledge of complex systems.

1.1.6 Currently, contemporary training of AMP requires instructor-led, classroom-based theory, where students specialize in a particular area of aircraft maintenance engineering (e.g. mechanical stream or avionics stream). The duration of this theory-based training varies depending on the specialization. After completing the theoretical training, a student often begins a traineeship or apprenticeship that includes further technical and practical experience either in a workshop or on the aircraft to gain the required practical experience. In addition, a student's specific practical experience on particular aircraft subsections (generally split into chapters of a manual), such as airframes, structures, hydraulics, engines and avionics, is recorded. To be licensed by a Licensing Authority, an AMP must demonstrate appropriate experience on particular aircraft systems via an experience record or display acceptable competency through successful completion of appropriate assessments, which may include oral, written and practical applications.

1.1.7 However, there are limits with this training approach, as students only need to demonstrate generic skills on different aircraft types, which may be insufficient for more complex aircraft or new technologies that require specific skills.

Training methods available and used today

1.1.8 Some alternative maintenance training methods available today include the use of simulation. Similar to pilots, AMP now uses e-learning, part-task trainers and full fidelity simulation to practice specific training activities that were traditionally done on an operating aircraft. Similar to training environments of other aviation professions, instructional methods and technology are changing professional practice. However, the traditional regulatory structure on training is time-regulated, syllabus and task-oriented, where students must physically demonstrate generic skills on each aircraft type.

1.1.9 Training through simulation and other teaching technologies are recognized for CBTA; however, this approach is not widely used in aviation today.

The goal of competency-based training and assessment

1.1.10 CBTA for aircraft maintenance professionals stems from pilot training. The objective of this training method is to move away from time-regulated training towards competency-regulated training to focus on students achieving competency rather than on the completion of a prescribed number of hours of training.

1.1.11 Aircraft manufacturers issue standard practices manuals to describe methods, tools, equipment and standards for maintenance tasks. In a recent study, it was determined that, regardless of aircraft type, maintenance practice on modern aircraft requires a set of generic competencies. The goal of the CBTA process is to align maintenance training with predetermined standards, identified through task analysis. Additionally, it is to provide a competent workforce for personnel working in aircraft maintenance, including those with certification privileges.

1.1.12 CBTA is an option and an alternative to traditional training and does not affect existing licensing and approval processes prescribed in Annex 1 — *Personnel Licensing*. While each approach is different, a course may adopt either approach or a blended approach.

Competencies needed for aircraft and component maintenance

1.1.13 As aircraft and component maintenance significantly impact flight safety and airworthiness, the competencies of the personnel involved should be properly defined, established, assessed, maintained and subjected to regulation and surveillance by the civil aviation authority (CAA).

1.1.14 While aircraft and component maintenance are diverse, maintenance organizations may either cover a broad scope of maintenance activities or be specialized. In either case, the maintenance organizations need to be approved by the CAA for the scope of maintenance performed. As the scope of maintenance varies between organizations, competency requirements for the personnel employed differ accordingly. Part of the approval process conducted by CAAs for maintenance organizations assures that the competency of the AMP meets the requirements of the scope of that area of maintenance for which the approval is sought.

1.1.15 Despite the variation in competency requirements between maintenance organizations, workplaces and tasks, some competencies remain common to a wide range of activities. These competencies are standard competencies related to standard practices that AMP have to acquire, regardless of where they are employed. In addition to these standard practices, personnel will need to demonstrate competencies that are tailored to the equipment and types of aircraft being maintained to fulfil their maintenance tasks.

1.1.16 While a subset of standard practices, defined by many CAAs as “special practices”, may have a significant impact on the airworthiness of a product, the personnel who execute the proper performance of these special practices need to be holders of special qualifications. These qualifications could be obtained when the related competencies have been demonstrated successfully in a standard examination and assessment.

1.2 COMPETENCY

1.2.1 The CBTA is a concept and methodology that was developed during the 1950s and became a mainstream concept in the 1980s. Since then, CBTA has been applied in many different contexts and professions and, therefore, it is understandable that there are many different definitions for competency and CBTA. This section elaborates on the competency concepts as they are used in this manual.

1.2.2 Competency is a consistent dimension of human performance that is used to reliably predict successful performance on the job. Competency can be observed through behaviours that require the use of relevant knowledge, skills and attitudes (KSA) to carry out activities or tasks under specified conditions. Competency is successfully achieved by meeting its associated standard.

1.2.3 Competencies allow for the formulation of solutions for complex and difficult situations, including those situations experienced for the first time. AMP need to be able to deal with these situations effectively while ensuring that the tasks are performed safely. For the use of this document, we define the term “competency” as the sum of KSA.

1.2.4 Knowledge is the set of facts, information acquired through experience, instruction or education. It includes:

a) specific information required for the students to develop and apply the skills and attitudes to recall facts;

b) identification of concepts and application of rules or principles; and

c) problem solving and creative thinking in the context of work.

1.2.5 There are different types of knowledge:

a) declarative (facts, raw data);

b) procedural (categorized or contextualized, application of conditional “if-then” rules);

c) strategic (synthesis, inference to guide resource allocation for decision-making, problem-solving behavioural action); and

d) adaptive (generalization, innovation, invention).

1.2.6 Skills are the abilities to perform an activity or action effectively. These are developed over time and with practice. While new complex tasks are initially seen as cognitively demanding, some of these cognitive processes become automated, requiring less skill to perform. They are often divided into three types: motor, cognitive and metacognitive skills.

a) Motor skills are an intentional movement involving a motor or muscular component, which must be learned and voluntarily produced to proficiently perform a goal-oriented task.

b) Cognitive skills are mental skills that are used in the process of acquiring knowledge. These include reasoning, perception and intuition.

c) Metacognitive skills relate to the ability of students to monitor and direct their learning processes ("thinking about thinking"); for example, planning how to approach a learning task, monitoring comprehension, and evaluating progress toward the completion of a task are metacognitive.

1.2.7 Attitude is a persistent internal mental state or disposition of a person that influences behaviour, choices and expressed opinions that can be learned. Attitudes have affective components, cognitive aspects and behavioural consequences. To demonstrate the "right" attitude, a student needs to know how to act in a context. For AMP, attitudes towards issues such as safety, adherence to regulations and standards, and working with others is a significant factor in the achievement of competency and the safety of aircraft maintenance.

1.2.8 Competency can only be observed through performance. As it is not possible to directly observe all the different skills, especially cognitive skills, which contribute to competency, they can only be inferred from observations of the AMP's performance of the task.

1.3 WHY COMPETENCY-BASED TRAINING AND ASSESSMENT?

1.3.1 In a traditional training system, the training is instructor-dependent and centred on subject contents delivered by an instructor in a specific time frame. In a CBTA system, training is student-centred and guides the performance of defined tasks.

1.3.2 The safety, quality and operational performance of approved maintenance organizations (AMOs) depends to a large degree on the competency of its personnel. Maintenance personnel are responsible for the performance and inspection of the maintenance work, as well as certification of maintenance associated with the privileges granted by their licence and or authorizations. Competency standards, therefore, play a key role in ensuring task performance, thereby upholding and potentially improving safety standards in aircraft maintenance. Poorly performed maintenance is associated with the risk of impacting airworthiness of aircraft and flight safety. Therefore, personnel involved in aircraft maintenance must be adequately trained and assessed against the established competency standards. The CBTA-focused approach would ensure training effectiveness by providing a tailored approached to an individual's training needs and therefore, positively impact AMP competency and maintenance outcomes.

1.3.3 The aviation industry is at the forefront of new technological developments, requiring personnel involved in aircraft maintenance to adapt to new methods, processes, knowledge and skills to build up the necessary competencies. Training programmes need to be updated to include new content and training methodologies. These depend on new developments in training and information dissemination and should be constantly updated to the latest technology. The CBTA approach may improve training by better capturing the changing technology requirements.

1.3.4 Currently, airworthiness regulations stipulate the licences and certification authorizations that AMP have to acquire to perform specified aircraft maintenance tasks. These regulations vary substantially from one country to another in the scope of the privileges, training, experience and examination requirements. This wide variance hampers the aircraft maintenance industry because it limits the exchange of personnel between States and the possibility to outsource maintenance work from one State to another. The CBTA programmes result in AMP that are trained and evaluated against competency standards, with records as evidence. Such records may make it easier for maintenance organizations to employ personnel from other States and organizations and facilitate harmonization.

1.3.5 Currently, the competencies and knowledge that a particular student brings into a training programme are not considered for training, planning or preparation. As a result, the course content may be a repetition of previously attended training or may be above their level of comprehension. To increase the effectiveness and efficiency of the training programmes, their current competency status must be evaluated against the competencies to be achieved. During this process, a student's training need should be identified with a focus on filling these gaps using the appropriate methodologies. Clear training objectives stating the competencies to be achieved through examination and assessment are another key element of efficient training programmes that may result in the reduction or extension in training time.

1.3.6 The CAAs require AMOs to ensure that their personnel are competent to perform their duties. Maintenance organizations need to prove how the competency of their personnel are established and assessed. In this regard, the CBTA may assist AMOs in effectively complying with these regulatory requirements. This method may also result in harmonized performance standards and improved safety standards.

1.3.7 The assessment and identification of the student's or organization's training needs are the bases of the implementation of a CBTA programme. This approach would reduce unnecessary training to save time and cost, thereby increasing training efficiency. Moreover, the continuing assessment of students may facilitate the management of the training progress, resulting in better use of training resources.

1.4 COMPETENCY-BASED APPROACH TO TRAINING AND ASSESSMENT

This manual proposes a CBTA approach by providing AMP, approved training organization (ATOs), AMOs and CAAs with guidance identifying the AMP competencies necessary for the AMP work environment. In addition, included is guidance on the assessment that is needed for the stages of AMP development. The manual also contains detailed guidance material on the design and development of an AMP training programme, and provides examples of training objectives based on the *Procedures for Air Navigations Services – Training* (PANS-TRG, Doc 9868), Part III, Appendix 2 to Chapter 1 (Guidelines for the Implementation of Competency-based Training and Assessment for AMP).

Note.— Implementation of CBTA programmes for AMP is optional.

1.5 INTENDED USERS

This manual is intended for:

a) AMOs and ATOs who are developing an entirely new training system;

b) AMOs and ATOs who already have an established training system and intend to evolve their system towards a competency-based approach; and

c) CAAs to ensure that a CBTA programme for a particular licence and certification authorization demonstrates the required set of competencies with the privileges granted.

1.6 STRUCTURE OF THIS MANUAL

1.6.1 The manual contains six chapters that elaborate on the components as they relate to particular types of training. The chapters also provide detailed examples to help the user understand the particulars of each training.

1.6.2 Chapter 1 provides an overview of the structure of the manual, regulatory requirements, and how to use the manual. It also contains general information on the principles and development of CBTA, the ICAO competency framework for AMP as well as the description of the steps to be taken to develop an AMP CBTA.

1.6.3 Chapter 2 guides the design of CBTA for organizations intending to implement a CBTA approach that is specific to their environment and requirements. It makes use of the ICAO competency framework for the AMP and the "analyse, design, develop, implement and evaluate" (ADDIE) instructional systems design (ISD) model. A few examples are provided in the attachments to enable a better understanding of the application of the guidelines for AMP contained in this manual.

1.6.4 Chapter 3 provides the guidelines for the implementation of CBTA and assessment for AMP. It describes the role of CAAs and AMOs in a CBTA environment. Attachment J to Chapter 2 includes an ICAO competency framework for AMP which is to be used by AMOs or ATOs to develop adapted competency models to suit their organizational context.

1.6.5 Chapter 4 provides guidelines to AMOs or ATOs in the preparation and provision of refresher training for AMP. The objective of refresher training is to ensure that AMP maintain competency.

1.6.6 Chapter 5 provides material on the implementation of a competency-based approach to training and assessment for personnel working in aircraft maintenance, including those with certification authorization privileges. This material is complimentary to those provided in Chapter 2. Furthermore, the content will be useful to CAAs responsible for approving the AMOs or ATOs training programmes for AMP.

1.6.7 Chapter 6 describes the responsibilities and qualification that apply to the developers, instructors and assessors in a CBTA environment and the competencies to be demonstrated in a competency-based training programme. All developers, instructors and assessors in a CBTA environment should have an understanding of the overall CBTA approach throughout the training process and the knowledge of the subject matter and training course content.

1.7 RELATIONSHIP OF THIS MANUAL TO THE PANS-TRG (DOC 9868)

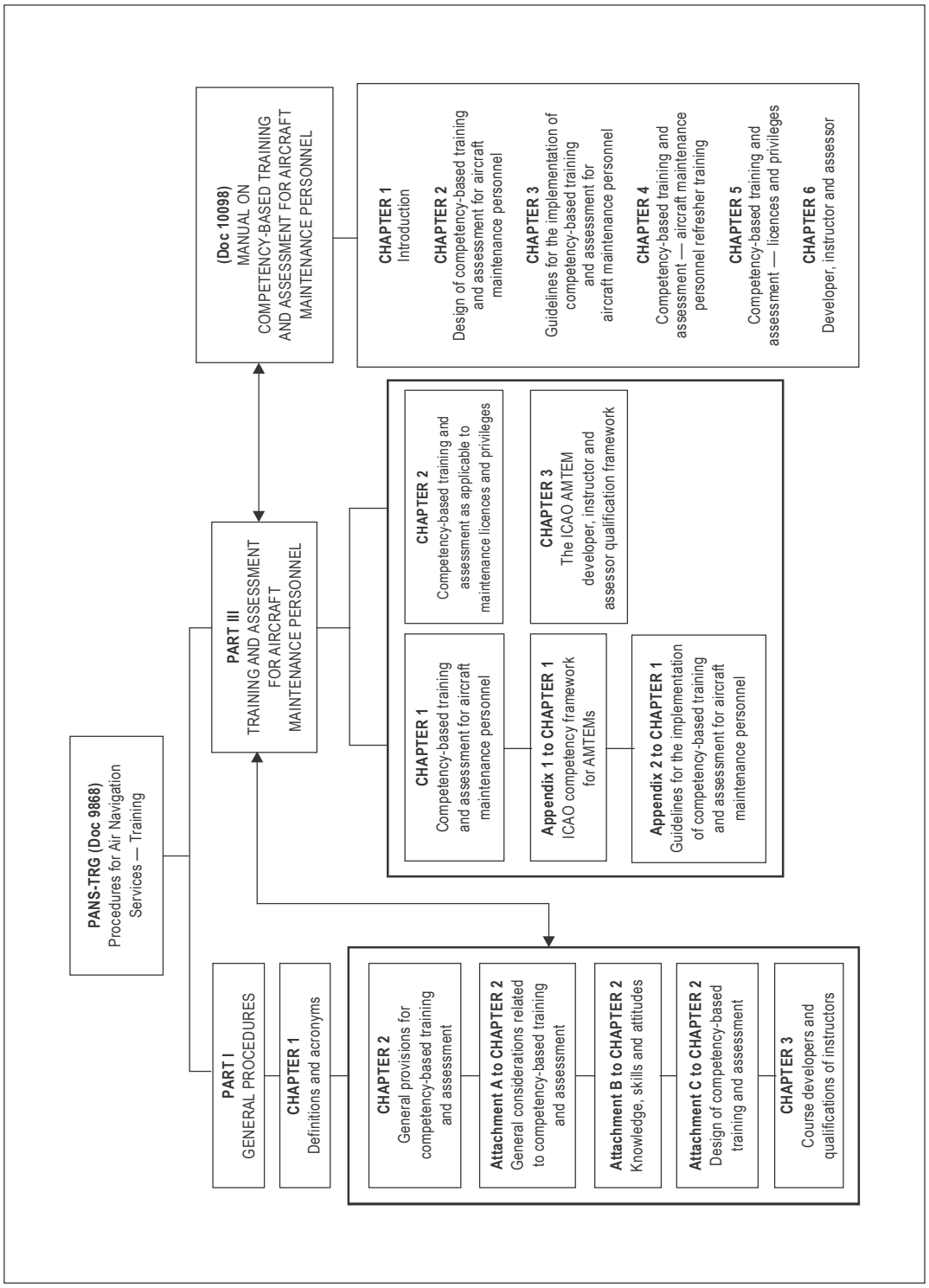

Figure 1-1. Relationship of this manual to the PANS-TRG (Doc 9868)

1.8 REGULATORY REQUIREMENTS

Note.— AMP should meet the final competency standards approved by the CAA in accordance with Annex 1 requirements.

1.8.1 The successful application of regulations and the achievement of regulatory objectives regarding the safety and efficiency of aircraft operations depend greatly on all persons involved having a full understanding of the risks and the regulations. This can only be achieved by a well-planned and well-maintained initial and recurrent training programme. As AMP play a significant role in the safe operation of an aircraft, the Annexes to the Convention on International Civil Aviation require that they be appropriately trained.

1.8.2 In Annex 1, AMP privileges that may be endorsed on an AMP licence or recorded are:

a) aircraft as entered on the licence in their entirety either specifically or under broad categories; or

b) airframes and engines and aircraft systems or components as entered on the licence either specifically or under broad categories; and/or

c) aircraft avionic systems or components as entered on the licence either specifically or under broad categories.

1.8.3 Annex 1 states that before a person can be issued with an AMP licence, there are several criteria that need to be met. These include age, knowledge, skills and experience requirements for all AMP and the specific requirements for each of the privileges. Annex 1 also provides requirements for the certification authorization of AMOs to appoint non-licensed personnel.

1.8.4 States use Annex 1 as a basis for their national regulations that are related to the licensing of AMP and Annex 6 — *Operation of Aircraft* as a basis for their national regulations that are related to the approval of operators' maintenance control arrangements for the issuance and extension of an Air Operator's Certificate.

1.8.5 The general requirement is for all AMP to demonstrate knowledge of the following subjects[1]:

Table 1-1. AMP knowledge requirements by subject

Subject	*Description*
Air law and airworthiness requirements	rules and regulations relevant to the AMP licence holder including applicable airworthiness requirements governing certification and continuing airworthiness of aircraft and approved aircraft maintenance organization and procedures.
Natural science and aircraft general knowledge	basic mathematics; units of measurement; fundamental principles and theory of physics and chemistry applicable to aircraft maintenance.

1. Annex 1, Chapter 4.

Subject	*Description*
Aircraft engineering	characteristics and applications of the materials of aircraft construction including principles of construction and functioning of aircraft structures and fastening techniques; engines and their associated systems; mechanical, fluid, electrical and electronic power sources; aircraft instrument and display systems; aircraft control systems; and airborne navigation and communication systems.
Human performance	human performance, including principles of threat and error management relevant to aircraft maintenance.
Aircraft maintenance	tasks required to ensure the continuing airworthiness of an aircraft, including methods and procedures for the overhaul, repair, inspection, replacement, modification or defect rectification of aircraft structures, components and systems following the methods prescribed in the relevant maintenance manuals and the applicable Standards of airworthiness.

1.8.6 In addition, Annex 1 states that the applicant should have completed a course of training appropriate to the privileges to be granted. Furthermore, the applicant should have experience in the inspection, servicing and maintenance of aircraft or its components as specified in Annex 1 Chapter 4.

1.8.7 Annex 1 also requires that the applicant shall have demonstrated the ability to perform those functions applicable to the privileges to be granted. Before 1998, Annex 1 categorized licences as Type 1 or Type 2, making a clear distinction between overhaul and release to service. Today, Annex 1 no longer specifies these two levels of licence, and so States are now able to define the scope of licences in a way that best suits their local needs.

1.8.8 The Standards and Recommended Practices (SARPs) concerning aeroplane maintenance are included in Annex 6, Part I — *International Commercial Air Transport — Aeroplanes*, Chapter 8 and Part III — *International Operations — Helicopters*, Chapter 6, Section II. In addition, Annex 6, Part II — *International General Aviation — Aeroplanes*. Chapter 2.6 requires that for general aviation, the person signing the maintenance release shall be qualified in accordance with Annex 1.

1.9 GENERAL INFORMATION

CBTA may be implemented by an AMO or ATO, or a combination of both. If implemented, CBTA should address as a minimum, the following:

a) conduct of a Training Needs Analysis (TNA);

b) derivation of training objectives from the TNA and their formulation in an observable and measurable fashion;

c) development of a curriculum to achieve an optimal path to the required competencies;

d) development of criterion-referenced, valid, reliable and performance-oriented assessments;

e) performance criteria to be considered by the assessor when assessing each competency and the use of an assessment (evidence) guide applicable to all competency-based assessments;

f) selection and description of the training for competency-based developers, instructors and assessors;

Note.— In addition to the above, consider the development of material-dependent training (as opposed to instructor-delivered training).

g) identification of indicators to be used to evaluate the effectiveness of training on the AMP's performance; and

h) use of a continuous evaluation process to ensure the effectiveness of training and its relevance to real-time operations.

Note.— For additional information, refer to the PANS-TRG *(Doc 9868), Part I, Chapter 2.*

1.10 DEVELOPING A COMPETENCY-BASED TRAINING AND ASSESSMENT PROGRAMME FOR AMP

1.10.1 The development of CBTA should be based on a systematic approach whereby AMP competencies and performance criteria are defined, training is based on the competencies identified, and assessments developed to determine whether these competencies have been achieved. It makes use of the ICAO competency framework for AMP and the ADDIE ISD model. The *PANS-TRG* (Doc 9868) describes procedures for the design of a CBTA programme including those for AMP. This manual builds on these procedures and provides guidance to AMOs and ATOs in the development of an AMP CBTA programme.

1.10.2 CBTA for AMP is generally delivered in several stages, as follows:

a) "basic training" that is usually undertaken only once;

b) "rating training" that is undertaken as required per rating;

c) aircraft difference training as required per rating;

d) non–type and non–licences certification authorization training (i.e. AMO); and

e) refresher training and assessment, which is undertaken multiple times to ensure that competencies are maintained.

1.10.3 Each phase of a CBTA programme, including theoretical and practical training, is to integrate the CBTA approach as necessary to ensure the required level of competency is achieved.

1.11 THE ICAO COMPETENCY FRAMEWORK

1.11.1 The ICAO competency framework supports the establishment of a systematic approach as outlined in the *PANS-TRG* (Doc 9868), Part I, Chapter 2, by providing a model that should be adapted to suit the variety of situations that exist worldwide in the AMP environment.

1.11.2 The ICAO competency framework for AMP is a generic, high-level structure that has been designed to apply to all ratings and during any phase of training and assessment. The ICAO competency framework for AMP in Attachment J to Chapter 2 consists of a select group of competencies with their associated description and observable behaviours (OBs). Organizations electing to implement CBTA for AMP should use this competency framework to develop an adapted competency model that forms the basis for the development of CBTA for AMP. The development of the adapted

competency model and the associated training and assessment must take into account the regulatory, operational, technical and organizational environment within which the AMP will perform their tasks. The assessment (evidence) guide is to be developed by AMOs or ATOs as part of the local adaptation process.

Note.— The elements of an adapted competency model are outlined in the PANS-TRG *(Doc 9868), Part I, Chapter 2, and include performance criteria for each competency.*

1.11.3 The competencies with their associated description and OBs are to be used to develop performance criteria. The definition of performance criteria is provided in the Definitions Section.

1.11.4 To develop an adapted competency model, the ICAO competency framework is used in combination with regional and national task analysis of AMP functions for each rating and a clear understanding of the local environment.

Note.— An adapted competency model is developed based on the ICAO competency framework for AMP contained in Attachment J to Chapter 2, which describes the process for developing an ICAO competency framework.

1.12 PRINCIPLES OF COMPETENCY-BASED TRAINING AND ASSESSMENT

The principles and procedures for the development and implementation of a competency-based training programme focus on training and assessing how an AMP is expected to competently perform on the job. The principles for CBTA apply to all phases of the CBTA process:

a) relevant competencies should be clearly defined for a particular role within an aviation discipline;

b) there should be a link between competencies and training, required performance on the job, and assessment;

c) competencies should be formulated in a way to ensure that they can be trained for, observed and assessed consistently in a wide variety of tasks for an aviation profession or role;

d) students should successfully demonstrate competency by meeting the required competency standard;

e) each stakeholder (student, instructor, training organization, operator, service provider and regulator) should have a common understanding of the competency standards;

f) clear performance criteria should be established for assessing competency;

g) evidence of competent performance should be valid and reliable;

h) instructors and assessors' judgements should be calibrated to achieve a high degree of reliability;

i) assessment of competencies should be based on multiple observations across multiple tasks; and

j) to be considered competent, a student should demonstrate an integrated performance of all the required competencies to a specified standard.

1.13 ASSESSMENT OF STUDENTS

1.13.1 Assessment is an integral part of the CBTA process; its purpose is to measure whether the student has achieved the training objectives and the relevant competencies. AMP assessments should provide incentive and motivation and confirm that learning and competency have been achieved. The instructor should assess if the training objectives have been met. Performance during assessments should indicate whether the instruction methods used are effective or should be improved.

1.13.2 AMP should be informed of how they will be assessed. The information should include the assessment conditions, expected performance and the required standards. AMOs, ATOs and CAAs should have processes to deal with assessment failures. AMP should be informed of the result of their assessments, and instructors should offer feedback on how to correct a mistake or unsatisfactory practical performance.

1.13.3 The assessment plan should describe the process and tools that will be used to determine how an AMP's performance compares with the performance criteria in order for the AMP to demonstrate the required competencies and to receive feedback for process improvement. Tools such as periodic training reports or checklists on achievements of performance and competencies may be useful to document this process.

1.13.4 Once an AMP has demonstrated the required performance, it is necessary to maintain this level of performance and therefore maintain competency. A refresher training plan is required to ensure that the refresher training maintains competencies. The plan may be influenced by many factors, e.g. activity exposure, technical developments and new procedures. Chapter 4 contains more information about refresher training.

1.14 EVALUATION OF COURSE

1.14.1 As part of a safety and a quality management system, a process to benchmark, maintain and improve the efficiency and quality of training is required. A continuous feedback system of gathering data from students, instructors, assessors and organizations should be implemented. The feedback system may use different methods (e.g. handwritten, electronic), and all feedback should be documented.

1.14.2 Training objectives should indicate the conditions under which AMP performance will be performed and assessed and the standard to be attained. Only the training objectives are required for basic and qualification training. For CBTA, students should meet the competency standards associated with their job description.

1.14.3 The training provider can use a variety of assessment methods. Each assessment method should be selected according to the training objective, the competency to be achieved, and its impact on safety and quality. Possible assessment methods could be:

a) open and/or multiple-choice questionnaire;

b) written and oral examination; or

c) practical assessment.

1.14.4 Where possible, CAAs, AMOs or ATOs should build an examination question repository or at least a comprehensive written list of all questions, and performance exercises should be kept updated to ensure the currency of the AMPs' knowledge and skills, in light of the rapid evolution of technology and systems.

1.14.5 The evaluation process should be acceptable to the CAA. This evaluation ensures that training:

a) and related assessment plans are relevant to the task;

b) leads students to acquire the necessary competencies in a progressive and satisfactory manner; and

c) achieves the training objectives as derived from the TNA.

1.14.6 Corrective action is to be taken if a need is indicated by the training or post-training evaluation.

Note.— Workflow 5 "Evaluate the course, including the training and assessment plans" in Section 2.10 illustrates the process that should be considered for evaluating a CBTA course.

1.15 TRAINING AND ASSESSMENT MATERIALS

1.15.1 CAAs responsible for approving AMO and ATO training programmes should ensure that the training and assessment materials meet the provisions in the *PANS-TRG* (Doc 9868), Part I, Chapter 2. This manual contains additional guidance for the development of training and assessment materials.

1.15.2 CBTA programmes for AMP are to be based on the ICAO competency framework as per Attachment J to Chapter 2, as applicable to the aircraft maintenance domain, and are to be created using the ADDIE ISD model or equivalent.

Note.— A detailed systematic guide on the design of CBTA using the ADDIE ISD model is found in the PANS-TRG *(Doc 9868), Part I, Chapter 2, Attachment C.*

1.16 STEPS TO DEVELOP AN AMP CBTA

1.16.1 There are six steps to develop an AMP CBTA which can be described by five workflows.

1.16.1.1 Step one: The development of a training specification would require a training needs analysis based on reviewing inputs such as training requests, task list, and operational, technical, regulatory and organizational documents. The review process should include the identification of the purpose of the training required and the associated operational, technical, regulatory and organizational tasks, and any other requirements. See Workflow 1 in Section 2.4 for more information.

1.16.1.2 Step two: An adapted competency model needs to be designed to include competencies, descriptions and performance criteria (comprising of OB, final competency standard and conditions) based on a review of the training specification and the ICAO competency framework for AMP. The review process should include a selection of relevant competencies, OB, determination of relevant competency standards and the conditions under which the competencies must be observed. See Workflow 2, Part 1 in Section 2.6 for more information.

1.16.1.3 Step three: An assessment plan (including interim and final competency standards, assessment list, assessment tools) and a training plan (comprising of syllabus, composition and structure, milestones, modules/training needs and course schedule) need to be designed based on a review of training specification, adapted competency model and task analysis. The review process should include determination of sub-tasks and KSA from the task list and other relevant data in the training specification and performance of a training gap analysis. It should also include developing a syllabus, milestones, interim competency standards, and the list of assessments used to collect evidence that the interim

and final competency standards have been achieved. Furthermore, it should incorporate the development of assessment tools and design of remaining elements of the training plan. See Workflow 2, Part 2 in Section 2.7 for more information.

1.16.1.4 Step four: Training and assessment materials (comprising of course schedule, training event materials, examinations, practical and other assessments) need to be developed based on a review of the adapted competency model, assessment plan, training plan. The review process should include the development of educational materials, examinations and assessments. See Workflow 3 in Section 2.8 for more information.

1.16.1.5 Step five: The course needs to be conducted according to the training and assessment plan using the adapted competency model, assessment plan, training plan, course materials, facilities and equipment, and training and assessment personnel. The course is to be delivered according to the training plan, and students' progress needs to be monitored against interim and final competency standards. Students should be provided timely and continuous feedback on performance so that deficiencies can be diagnosed and remedied promptly. Assessments need to be carried out according to the assessment plan to determine students' competency. See Workflow 4 in Section 2.9 for more information.

1.16.1.6 Step six: The course (including the training and assessment plans) needs to be evaluated based on a review of course results, students, instructors, assessors' feedback and audit reports. The review process should include analysis of results, reports and feedback so that improvement actions can be formulated. All these should be captured in the course report. See Workflow 5 in Section 2.10 for more information.

Chapter 2

DESIGN OF COMPETENCY-BASED TRAINING AND ASSESSMENT FOR AIRCRAFT MAINTENANCE PERSONNEL

2.1 GENERAL

This chapter provides guidance on the design of CBTA for organizations intending to implement the CBTA approach. It makes use of the ICAO competency framework for AMP and the ADDIE ISD model or equivalent. Some examples are provided in the appendices to enable better understanding of the application of the guidelines for AMP contained in this manual.

Note.— This chapter expands on the information contained in the PANS-TRG *(Doc 9868), Part III, Chapter 1, and should be read with Doc 9868.*

2.2 COMPONENTS OF COMPETENCY-BASED TRAINING AND ASSESSMENT

The CBTA framework consists of five components depicted in Figure 2-1 and defined in Table 2-1 providing guidelines on their development.

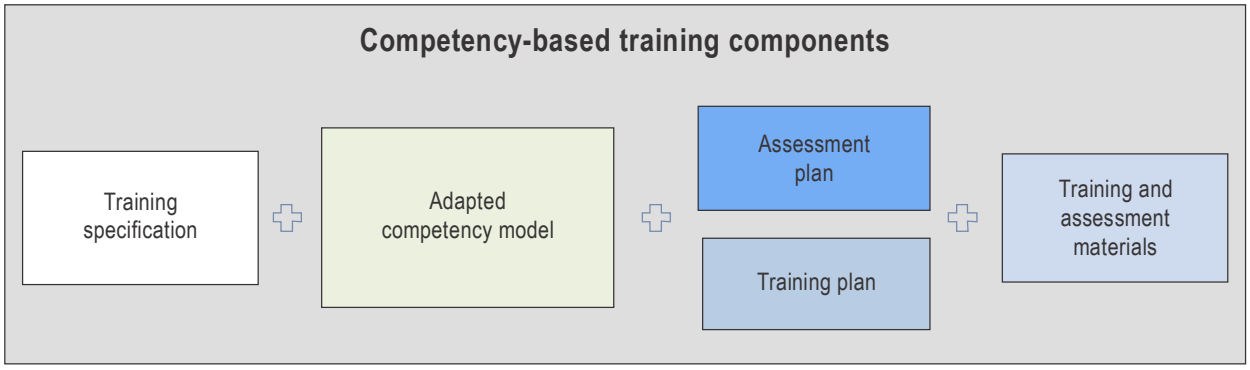

Figure 2-1. CBTA components

Table 2-1. CBTA components

CBTA components	
Training specification	The document that describes the purpose of the training, list of tasks and requirements that should be fulfilled when designing the training. The training specification is the output of the TNA.
Adapted competency model	A group of competencies with associated description and performance criteria adapted from the ICAO competency framework that an organization may use to develop CBTA for a role. The components of an adapted competency model are:
	1. *Competency* — A dimension of human performance that is used to reliably predict successful performance on the job. A competency is manifested and observed through behaviours that mobilize the relevant KSA to carry out activities or tasks under specified conditions. 2. *Performance Criteria* — Statements used to assess whether the required levels of performance have been achieved for a competency. A performance criterion consists of an OB, condition(s) and a competency standard.
Assessment plan	The document that details the assessment events and tools (Assessment (evidence) guide, competency checklist, competency assessment form) to be used in the determination of competency achieved.
Training plan	The document used for structuring, developing and delivering the training.
Training and assessment materials	All the materials used in the training and assessment following the training plan, including course programme, training notes, manuals, presentations, simulated exercises, etc.

2.3 OVERVIEW OF COMPETENCY-BASED TRAINING AND ASSESSMENT WORKFLOWS

2.3.1 The structured ADDIE ISD model or equivalent is used to design and deliver the components of CBTA. The approach consists of five workflows depicted in Figure 2-2 and further detailed in this section.

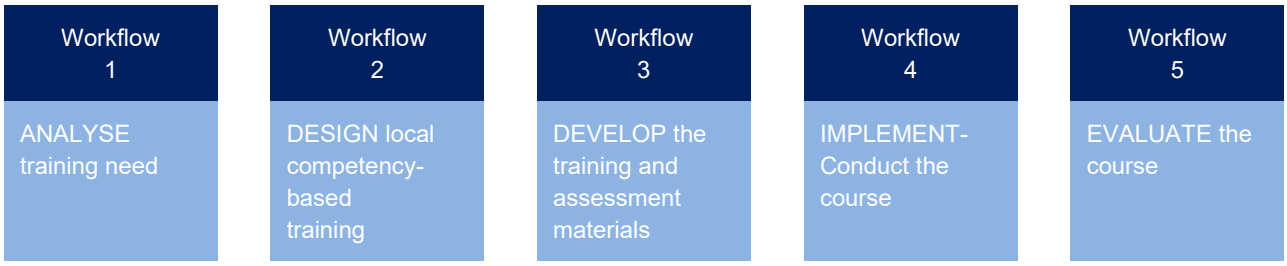

Figure 2-2. CBTA workflows

Note.— "Local competency-based training and assessment" in Workflow 2 refer to competency-based training that is relevant to the needs and requirements.

2.3.2 The workflows relate to the components of CBTA programmes presented in Figure 2-1. Workflows 1 and 2 establish the training specification, adapted competency model and training and assessment plan that will be used to develop and conduct the training course (Workflows 3 and 4). Workflow 5 reviews the effectiveness of the training and assessment conducted and recommends improvements, as appropriate.

2.3.3 Sections 2.4 to 2.7 focuses on Workflows 1 and 2. An overview of the remaining workflows is provided in Sections 2.8 to 2.10. A stepped approach is used for each workflow providing the following details:

a) inputs required;

b) process to be worked through; and

c) outputs achieved on completion of each process.

Note.— The outputs of Workflow 1 in Figure 2-3 become one of the inputs for Workflow 2 in Figures 2-4 and 2-5.

2.4 WORKFLOW 1 — ANALYSE TRAINING NEED

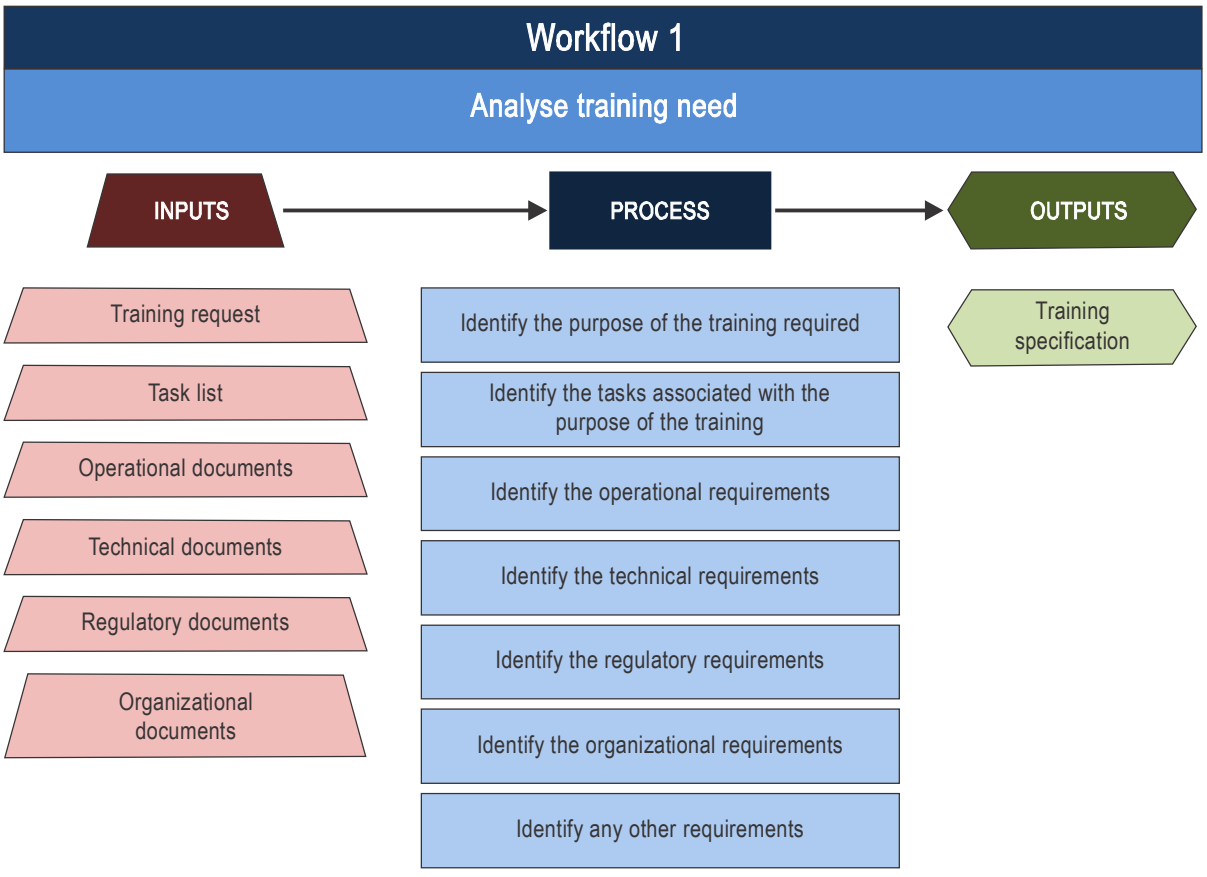

Figure 2-3. Workflow 1 — Analyse training need

2.4.1 The need to develop training may start in various ways. In most cases, the training designer typically receives a training request that provides details on the scope, content and necessity for the training.

Note.— Training specification is the output of the TNA.

2.4.2 The first step in the development of a CBTA programme is to conduct a TNA (see Figure 2-3). This step is necessary to develop a training specification that details all training requirements. During the TNA process, various aspects of the training are considered while requirements are identified and analysed for training design.

Note.— Attachment A to Chapter 2 provides an example of conducting a TNA following Workflow 1.

2.4.3 The training specification must be developed by the training designer in cooperation with relevant stakeholders such as trainers, subject matter experts, quality and compliance specialists, etc. The defined training specification should undergo an approval process at an organizational level (e.g. management and quality system approval). The training specification should be subject to review to remain updated and compliant with applicable requirements. It is recommended for organizations to have a standard format of the training specifications used for training.

2.4.4 The training specification should provide enough detail to address, at a minimum, the questions in Table 2-2.

Table 2-2. Questions associated with training specification

1. Purpose	
What is the purpose of the training?	The initial step in developing a training specification is to determine the purpose of the training. This may be taken directly from the training request; however, as there may be considerable variation in the amount of detail that is provided in a training request and the information provided may not be enough, the training designer may request additional information from the originator. A good practice is to develop and use a standard training request form to ensure the required data is complete and sufficient.
What are the categories of training?	The categories of training need to be determined to ensure the training design process can identify and address all the applicable requirements. The training categories may be: • Basic training • Rating training • Non-license certification authorizations training • Recurrent training • Differences training • Specialized training, etc.
What qualification, if any, will the students achieve on successful completion of the training?	The qualification to be achieved needs to be determined and specified in the training specification. In some instances, a formal qualification will be obtained at the end of the training (e.g. type rating). In other instances, this is not the case (e.g. after routine refresher training).

2. Tasks	
What are the tasks associated with the purpose of the training?	To define the training specification, it is necessary to identify the tasks associated with the purpose of the training. This task list may be extracted from a completed job and task analysis, job descriptions or may be extracted from the documents and manuals that list various roles and responsibilities in the maintenance environment. In some instances, this task list may need to be developed.
3. Operational requirements	
Which operational procedures will be applied?	The development process of the training specification is to identify and consider relevant operational procedures applicable to the ATO and AMO. Operational procedures may be generic or task-specific. The relevant operational requirements will be identified based on the tasks list applicable to the training request (e.g. use of tooling, engine run operations).
In what operational environment will the training take place?	The training design process is to identify and describe the appropriate environment where the training will take place: e.g. in an ATO or AMO, classroom, workshop, flight line or a simulated environment, virtual or augmented reality, real operational environment, etc. The determination of the training environment needs to take into consideration existing rules and regulations as well as organizational requirements applicable to the training being developed.
Which safety aspects must be addressed for ensuring successful delivery of the training?	For the development of the training specification, safety aspects are to be identified and included (e.g. incident and accident emergency response, aircraft system failure, all-weather operations etc.).
What is the working environment?	The training environment should take into consideration the typical elements of the work environment such as environmental conditions, human factors, safety, policies, etc. This will assist the training designer in configuring the practical training and associated assessments.
4. Technical requirements	
What specific training aids (operational or simulated systems) and equipment are necessary to achieve the purpose of the training?	For the development of the training specification, the resources and the associated requirements for the training must be determined. For an accurate determination, the regulatory, operational and other applicable requirements need to be considered. These resources may include: • Tooling • Equipment • Facilities and their specific configuration (e.g. classroom, workshop) • Consumables • Software and hardware • Specific documentation • Safety equipment (i.e. personal protective equipment)

5. Regulatory requirements	
Which rules and regulations are applicable?	Regulatory requirements applicable to the relevant training must be identified, analysed and incorporated into the training specification.
What aspects of the training are affected by the regulatory requirements?	As regulatory requirements may apply to various aspects of the training, they must be thoroughly analysed and incorporated in the training specification during the training design stage to ensure compliance. Regulatory requirements may apply to the following aspects of training: • Duration (subject to student progress within a specified timeframe) • Content (e.g. subjects to be covered, course syllabus) • Assessments procedure (e.g. written exam, on-the-job assessment) • Course approval (e.g. organizational, CAAs) • Equipment specifications (e.g. simulator, tooling) • Training environment and facilities (e.g. class configuration) • Delivery methodology (e.g. on-the-job, practical, classroom, distance or E-learning) • Instructor's qualification (e.g. experience level, certification) • Records keeping (e.g. attendance register, log-book) • Student-to-instructor ratios (e.g. maximum number of students per instructor) • Admission perquisites (e.g. high school certificate, basic training) etc.
6. AMO and ATO training organizational requirements	
What are the organizational requirements that may affect training?	Organizational specific requirements that may affect the training have to be identified and considered in the training specification development process. In some instances, an organization may wish to achieve additional objectives to be emphasized during training. Such requirements may include: • Specific operational models (e.g. low-cost) • Strategic objectives (e.g. minimization of the technical delays, cost reductions, operational excellence, customer focus, improvement of aircraft reliability and availability, safety improvements, etc.). • Organizational structure, etc. • Use of software tools (e.g. maintenance management systems, etc.)
7. Training devices or simulation equipment	
What are the considerations if training devices or simulation equipment are used?	Training devices or simulation equipment may be used to follow requirements (e.g. regulatory or operational) to achieve the training outcomes. If utilized, the training specification must identify and describe the respective training devices or simulation equipment.
8. Other requirements	
What are other requirements that may affect the training?	This question captures any other requirements that may not have been covered in the previous questions, e.g. multiple languages, cultural diversity, special needs and contractual requirements (e.g. ATO contracted arrangements) etc.

Note.— Attachment B to Chapter 2 provides an example of a completed training specification.

2.5 WORKFLOW 2 — DESIGN COMPETENCY-BASED TRAINING AND ASSESSMENT

2.5.1 The purpose of Workflow 2 is to:

a) establish an adapted competency model that addresses the training specification identified in Workflow 1;

b) design an assessment plan that will be used to assess the competency of students; and

c) design the training plan that will enable the development and delivery of the training course.

2.5.2 Workflow 2 consists of two parts:

a) Part 1 deals with the design of the adapted competency model; and

b) Part 2 deals with the design of the training and assessment plans.

2.5.3 Figure 2-10 illustrates the relationship between Workflows 1 and 2.

Note.— The processes for developing the training and assessment plans are iterative. The outputs, however, are separate. Consequently, Workflow 2, Part 2 incorporates processes and outputs for the assessment and the training plans.

2.6 WORKFLOW 2, PART 1 — DESIGN THE ADAPTED COMPETENCY MODEL

2.6.1 Part 1 of Workflow 2 provides a process to design an adapted competency model. The workflow in Figure 2-4 may be used to aid the design process.

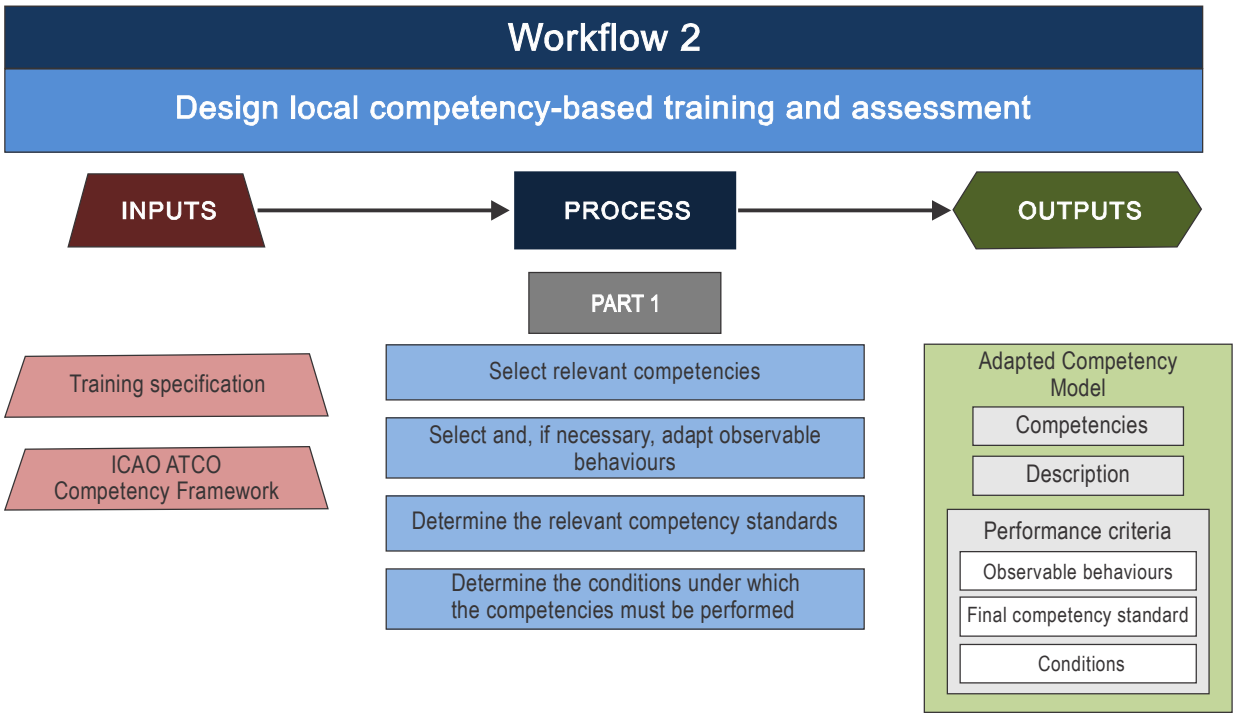

Figure 2-4. Workflow 2, Part 1 — Design the adapted competency model

Note.— Training specification is the output of the training specification from Workflow 1.

Selection of the competencies

2.6.2 The ICAO competency framework for AMP provides a set of generic competencies that are necessary to perform aircraft maintenance. Therefore, it is expected that the vast majority of adapted competency models will contain similar lists of competencies.

2.6.3 The determination of the relevant competencies to be developed for an adapted competency model should start with using the ICAO competency framework for AMP and the training specification of Workflow 1. An adapted competency model for AMP is contained in Attachment D to Chapter 2. The training specification should enable the training designer to identify the competencies required. Subject matter experts should be involved in the creation of the adapted competency models to ensure that the list of competencies are complete and accurate. Some additional competencies may be identified based on the requirements established in the TNA. The competency modelling should ensure that the final list of competencies targeted by the training is justified.

2.6.4 Where new competencies are identified, they should be defined similarly to the ICAO competency framework:

Table 2-3. Example of competency in the ICAO competency framework for AMP

Competency	Definition	OB No.	Observable Behaviours (OB)
ICAO Competency 1 APPLICATION OF PROCEDURES	Description 1 Identify and apply procedures following appropriate documents and applicable regulations using the appropriate knowledge	OB 1.1	— Identifies correct processes and procedures associated with a specific task
		OB 1.2	— Demonstrates proper use of documents
		OB 1.3	— Applies system knowledge appropriately
		OB 1.4	— Demonstrates compliance with applicable regulations
		OB 1.5	— Documents work performed or accomplished correctly

Selection and adaptation of the OBs

2.6.5 ICAO competency framework for AMP provides a comprehensive list of OBs associated with each of the competencies. The OBs that are appropriate in the local environment should be selected and, if necessary, adapted.

2.6.6 The selection of the OBs that are part of the adapted competency model should be done with consideration of the training specification requirements and consultation with subject matter experts is recommended. As a result of the review, some of these may be adapted or removed, or new OBs added to meet the training objective and specification requirements.

2.6.7 If new competencies are added to the adapted competency model, the OBs for those competencies will need to be defined. This may be achieved through various platforms (e.g. facilitated workshops, expert panels, meetings, surveys, etc.) by subject matter experts. The OBs are best defined in answer to the question: "*how would one demonstrate this competency in their job?*"

Determining competency standards

2.6.8 Competency standards applicable to OBs should be aligned with the requirements established by the training specification. They may originate from policies and procedures, rules and regulations identified and reviewed in the design of the training specification.

2.6.9 Where the competency standards are not defined in published requirements (operations manuals, regulations, etc.), they must be defined by the training designer in cooperation with the training request originator (where applicable) or subject matter experts. The competency standards may vary in some instance based on the training purpose, phase of training, level of experience and certification authorizations held by the AMP.

2.6.10 As part of the progression towards the final competency standard, it may be necessary to establish interim competency standards. These are to be aligned with the milestones concept described further in this chapter.

Determining conditions

2.6.11 The training specification completed in Workflow 1 may be used to identify some of the conditions that are specific to the AMP environment. Such conditions are related to the location, tools and system or equipment that are used and the amount of assistance a student can expect from an instructor or assessor.

2.6.12 Most of the conditions will apply generically to all the OBs that have been identified as part of the adapted competency model. However, in some instances, specific conditions (i.e. working in a confined space) may be associated with some OBs (i.e. maintain awareness of hazardous situations).

2.6.13 The conditions for the adapted competency model and the final competency standard are similar. However, different types of conditions may be considered for the final competency standard. Table 2-6 outlines how the conditions in the interim competency standards are modified, as applicable.

a) Conditions relating to context (nature and complexity of the operational and environmental context) such as:

1) operational time constraints to complete the maintenance task;

2) environmental context (different types of adverse weather, configuration of sectors); and

3) access to the particular area of the aircraft that requires work, etc.

b) Conditions relating to tools, equipment and systems such as:

1) tools, equipment and systems available under normal operating conditions (e.g. working at heights, shop environment, on the aeroplane, etc.); and

2) whether the performance takes place in a simulated or live operational environment.

c) Conditions relating to the amount of support or assistance a student can expect from the instructor or assessor.

2.6.14 During the early stages of training, students may require active coaching or teaching from the instructor. However, as the student progresses towards the final competency standard and gains more confidence in performing independently, the instructor takes on a more passive role and may only give occasional advice on improving efficiency or intervene when safety may be compromised. In some instances, conditions may arise where the student may require additional support from the instructor.

2.6.15 An example of conditions applied to all OBs in the adapted competency model is shown below:

The student will be able to demonstrate an integrated performance of all the competencies under the following conditions:

a) all maintenance environmental conditions;

b) using all the tools required by applicable maintenance data; and

c) without assistance from an instructor.

2.7 WORKFLOW 2, PART 2 — DESIGN THE TRAINING AND ASSESSMENT PLANS

2.7.1 Development of the training and assessment plans is the next stage of the CBTA design. The process for designing the training and assessment plans is covered by Part 2 of Workflow 2 and illustrated in Figure 2-5.

2.7.2 When developing the training and assessment plans, it is essential to consider:

a) principles of CBTA;

b) typical assessment methods;

c) concept of milestones; and

d) interim and final competency standards.

2.7.3 The above-listed matters are described in detail in Section 4.4 of Attachment C in the *PANS-TRG* (Doc 9868), Part I, Chapter 2 which should be read in conjunction with this section. Furthermore, the relationship between the adapted competency model and the training and assessment plans should be taken into consideration when developing the training and assessment plans (see Figure 2-5).

2.7.4 In a competency-based environment, the following principles apply:

Table 2-4. Principles of competency assessments

Principles of competency assessment	
Clear performance criteria are used to assess competency	The adapted competency model establishes these performance criteria.
An integrated performance of the competencies is observed	The student being assessed must demonstrate all applicable competencies and their seamless interaction with each other.
Multiple observations are undertaken	To determine whether a student has achieved the interim and final competency standards, multiple observations must be carried out.
Assessments are valid	All of the components that comprise the adapted competency model must be assessed. There must be sufficient evidence to ensure that the student meets the competency specified by the interim and final competency standards. The student should not be requested to provide evidence for or be assessed against activities that are outside the scope of the adapted competency model.
Assessments are reliable	All assessors should reach the same conclusion when performing an assessment. All assessors should be trained and monitored to achieve and maintain an acceptable level of inter-rater reliability.

DESIGN PROCESS FOR TRAINING AND ASSESSMENT PLANS

2.7.5 The process of designing the training and assessment plans are described in Workflow 2, Part 2, Figure 2-5 below.

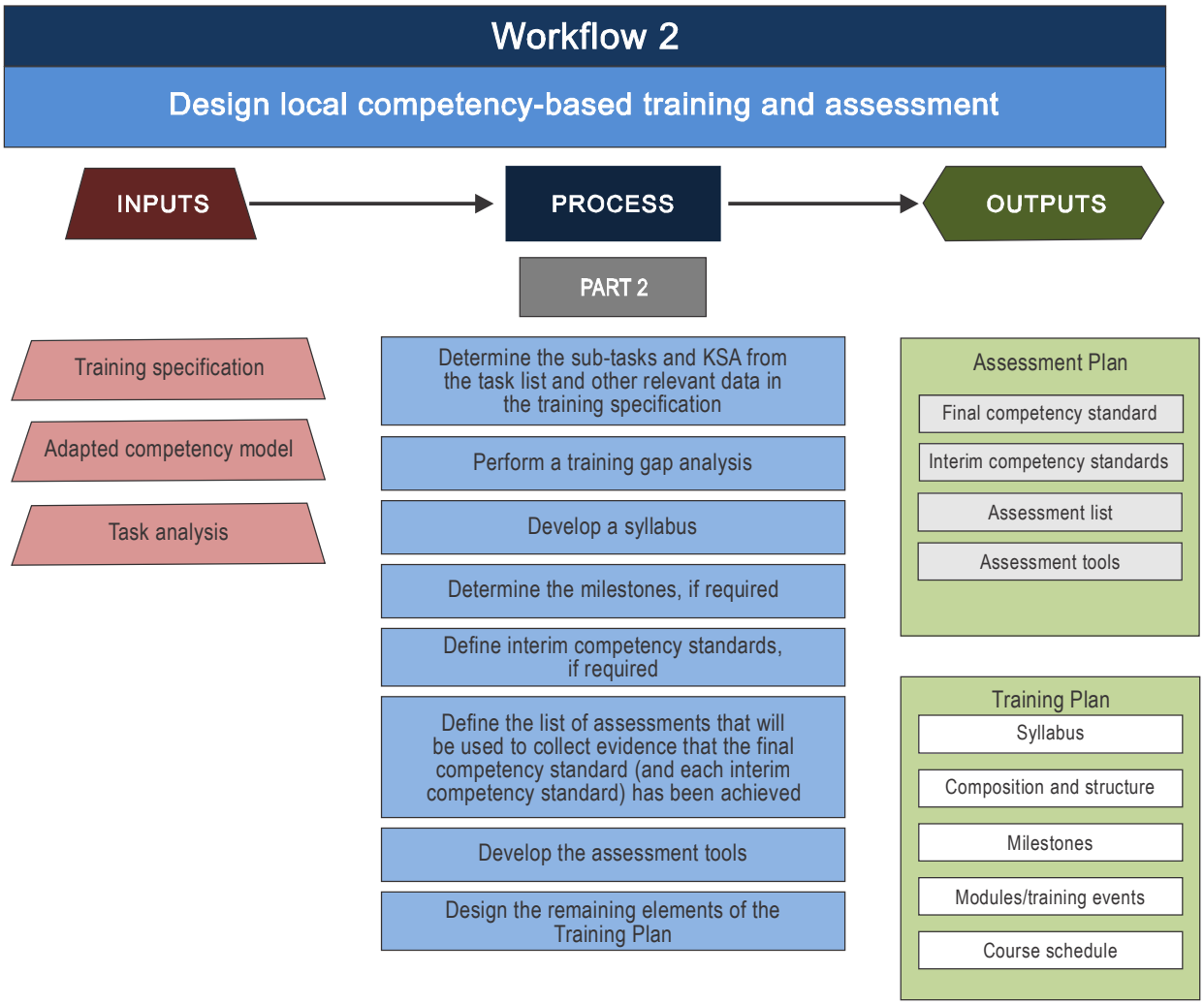

Figure 2-5. Workflow 2, Part 2 — Design the training and assessment plans

2.7.6 The process utilizes the outputs from previous stages: the training specification, list of associated tasks the students are learning to perform as part of their job and developed adapted competency model. The process consists of a few steps as described below.

Designing the training plan

2.7.7 The training plan is a document used to:

a) define the structure of the training;

b) aid development of the training material (next stage of the training design); and

c) enable training delivery.

2.7.8 The elements of a training plan, as well as their description, is provided in Table 2-5.

Table 2-5. Elements of a training plan

Training plan elements	
Composition and structure of the course	This is a high-level description of what will be trained (composition) and how the various elements of training relate to each other (structure). If the course covers only one type of training (e.g. engine run), the composition is simple. When a course is composed of more than one type of training (e.g. human factors + extended range operations by twin-engined aeroplanes (ETOPS) + fuel tank safety + operational procedures), how these types of training will relate to each other in terms of structure and sequence will need to be explained.
Syllabus	The syllabus is a list of training elements and related objectives to be covered by the end of the course. The training elements and objectives are derived from the tasks or sub-tasks and associated KSA identified in the training plan design process, as described in Section 2.7. *Note.— Attachment I to Chapter 2 provides an example of a syllabus.*
Milestones	The concept of milestones is described in Section 4.4.1.3 of Attachment C in the *PANS-TRG* (Doc 9868), Part I, Chapter 2. If it has been determined that milestones are necessary to structure the course, the training plan must be aligned to ensure the objectives for each milestone are achieved. Training elements and objectives from the syllabus will be associated with each milestone. Furthermore, where milestones are used, it is necessary to define interim competency standards that are associated with each milestone and the final competency standard that needs to be achieved by the end of the last milestone. See Figure 2-6. It is important that the milestones in the training plan and assessment plan be aligned. The training plan will be used by the training designer(s) to create the training and assessment materials. Figure 2-9 illustrates the relationship between milestones and the assessment and training plans.

Modules, training events and their delivery sequence	Depending on the composition as well as the number, type and complexity of the training objectives, it may be helpful to further subdivide the training into modules (either an entire course or all or some milestones, if milestones are required). This is illustrated in Figure 2-7. Whichever substructure is determined as appropriate (course, milestones or modules), training events are developed to support the substructure. Training events are the smallest units of learning and include classroom-based lessons, simulator exercises, web-based training exercises, case studies, etc. Training events contain the following information: a) which objectives are grouped and taught together; b) the number of periods (i.e. time) needed to teach each group of objectives; c) which method(s) should be used (lessons, case studies, individual simulation, briefing, self-study, etc.); d) which media is used (e.g. simulators, visual aids or textbook); e) the learning rate (i.e. self-paced, time-restricted or real-time); and f) whether the training is delivered to individuals or in groups.
Course schedule	The course schedule shows how the training events and assessments fit together into the duration of the course.

2.7.9 The following steps should be used to design the training and assessment plan.

Determining the sub-tasks and KSA

2.7.9.1 To develop the training, it is necessary to determine which tasks and subtasks the student will perform, and the KSA required to do so. The task list has already been recorded in the training specification (Workflow 1). Therefore, the subtasks and KSA are determined based on the task list in conjunction with the operational, technical, regulatory and organizational requirements identified in the training specification.

2.7.9.2 It is not necessary to list KSA elements for each task; only the elements that are required are listed. Furthermore, the list of tasks and related KSA can be classified based on their criticality and associated airworthiness, safety and human factors impact.

Performing the training gap analysis

2.7.9.3 The training gap analysis is used to compare the tasks and subtasks required to be performed competently, the KSA and the current level of the student population. The outcome of this analysis will be used to develop the training objectives of the syllabus.

2.7.9.4 When it is not possible to accurately analyse the target population, training is developed on an assumed baseline level of tasks/subtasks and KSA. Once the target population is known and if the assumption is incorrect, adjustments should be made to the tasks or subtasks and KSA.

Developing the syllabus

2.7.9.5 The syllabus is the list of training elements and related objectives that will need to be covered by the end of the course. It is designed based on the list of tasks and subtasks and their associated KSA derived from the training specification and adapted competency model.

2.7.9.6 The syllabus is an element of the training plan. Once established, the syllabus will then be used to design further structure of the course, i.e. modules, milestones, etc.

Determining milestones and interim competency standards

2.7.9.7 The concept of milestones and interim competency standards is explained in Section 4.4.1.3 and 4.4.1.4 of Attachment C in the *PANS-TRG* (Doc 9868), Part I, Chapter 2.

2.7.9.8 Where the training is complex and lengthy, it may be beneficial to divide the course into cohesive units organized sequentially. Milestones are established where the training and assessment of a unit have been completed. Where such an approach is taken, milestones will be established and associated training elements from the training syllabus will be determined for each milestone. Furthermore, interim competency standards related to each milestone need to be defined.

2.7.9.9 The result of this process is a high-level description of the learning activities and environment for each milestone, their sequence and a complete description of the interim competency standard associated with each milestone.

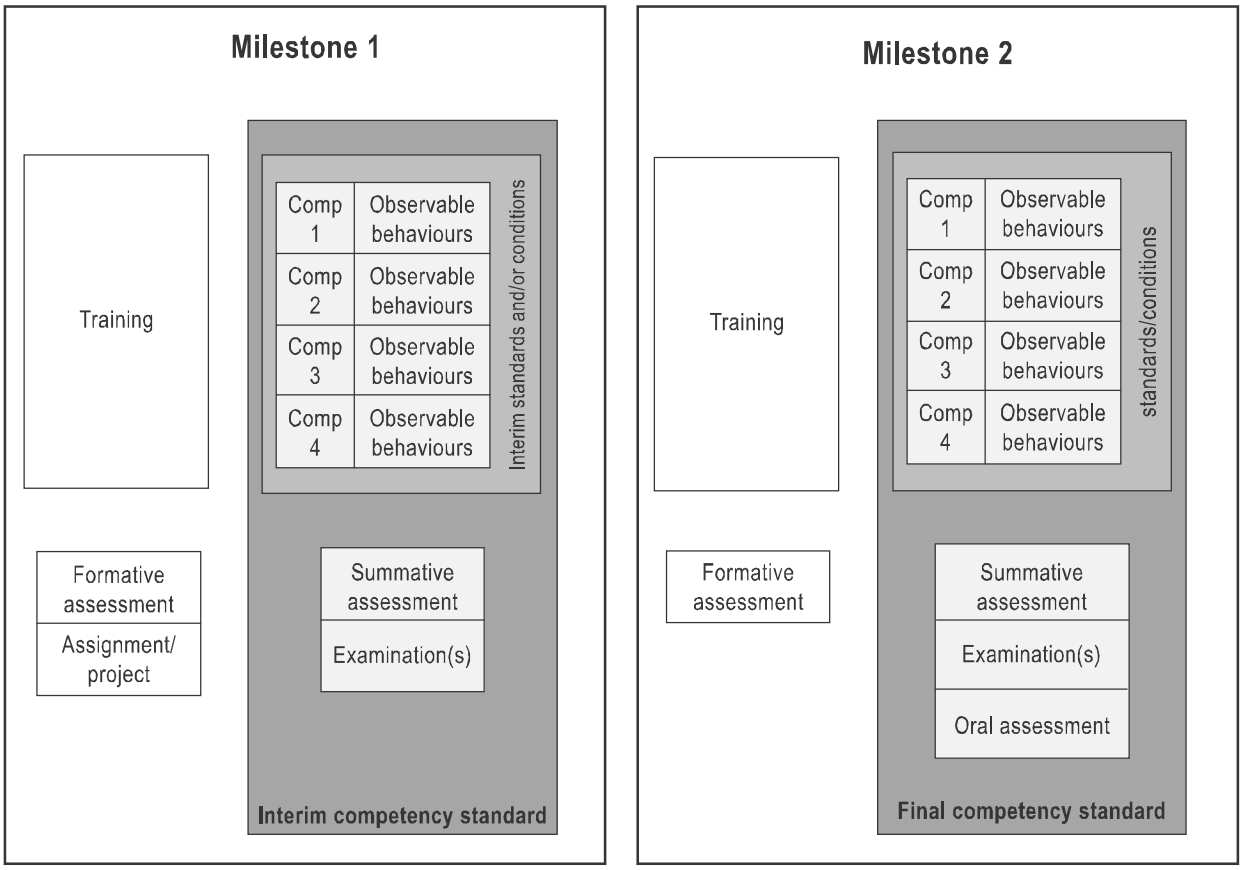

Figure 2-6. Two milestones with an interim and a final competency standard

Establishing modules, training events and their delivery sequence

2.7.9.10 Based on the syllabus, the number, type and complexity of the elements and training objectives of the course can be subdivided in modules which are then associated with established milestones when determined necessary. When substructures of the course are designed (milestones, modules, etc.), the training events are developed to aid course delivery. Training events include classroom training, case study, practical task training, simulator exercises, etc. A description of the training events content is contained in Table 2-5. Finally, their sequence are to be established when all the elements are designed.

2.7.9.11 Training events should be sequenced into an order of delivery that takes into account sound pedagogic practice, the substructure defined and the assessment requirements. The training events are the templates that the training designers use to create the training materials necessary to deliver the course.

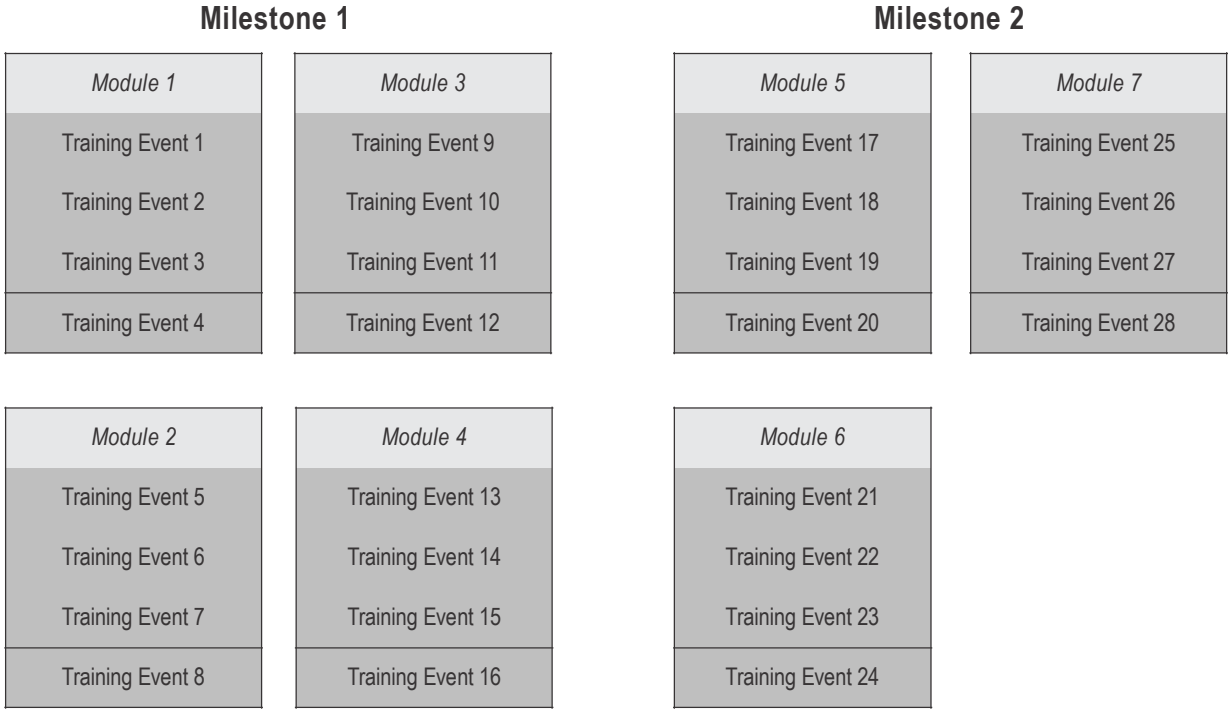

Figure 2-7. Structure of the training plan

Finalizing the course composition and structure and establishing a course schedule

2.7.9.12 Once the composition and structure of the course are designed and all the elements are established (syllabus, milestones, modules, training events), a high-level description of the course elements and how they relate in terms of structure and sequence will be developed.

2.7.9.13 Furthermore, based on the structure composition and duration of each element, a course schedule will be developed.

Note.— Attachment E to Chapter 2 contains an example of the training plan.

Designing the assessment plan

2.7.9.14 The purpose of the assessment plan is to detail how competency is going to be determined. It supports the principles of assessment in a competency-based environment reflected in Section 2.7.

2.7.9.15 When developing the assessment plan, it is important to ensure that any applicable regulatory, operational and other requirements are identified and implemented. The assessment plan should address at least the elements described in Table 2-6.

Table 2-6. Assessment plan elements

Assessment plan elements	
The final competency standard	This final competency standard is the level of competency associated with the final assessment for the training. If the course is divided into milestones, this will be the standard associated with the final milestone. On successful completion of a training course, the student is expected to achieve the final competency standard for that training. This means that they will have successfully completed all required training and assessment determined necessary to demonstrate the competencies and meet the performance criteria as described in the adapted competency model.
The interim competency standard associated with each milestone (if required)	The interim competency standards are associated with milestones that are determined necessary. This can be defined by: 1. modifying the adapted competency model conditions standard; and 2. defining the degree of achievement expected for each performance criteria. An interim competency standard has been achieved when the assessments associated with the relevant milestone has been successfully achieved. Examples of interim versus final competency standard are provided in Attachment F to Chapter 2. Establishing clear competency standards (interim as well as final) and associated performance criteria is one of the principles of the assessment in a competency-based environment.
The list of assessments required for each of the milestone(s) that have been defined	The list of required assessments associated with the milestones may include formative and summative assessments. See Figure 2-9. *Formative assessments* are part of the learning process and they help the students' progress towards interim or final competency standard as well as identify areas requiring

	improvements. During the formative assessment, the instructor provides feedback to the students on their progress. The number of formative assessments will be determined based on the training structure and associated assessment plan. Where necessary, a minimum number of formative assessments to be undertaken can be established as a prerequisite to start the summative assessments. *Summative assessments* are carried out at defined points in the training process and enable the assessment of the competencies with respect to the interim and final competency standard(s). Summative assessments should provide a framework for the assessment of integrated performance of the competencies, in line with the principles of competency assessment. The qualification of instructors and assessors are addressed in Chapter 6. A number of methods may be used to perform those assessments: • Practical assessments through direct observations • Examinations • Oral assessments • Projects and group assignments etc.
Assessment schedule	The assessment schedule describes when assessments should take place. This should be aligned with the training schedule to allow effective progress of the students towards the final competency standard and ensure successful training and assessment outcomes.
Assessment tools	The assessment tools are the tools to be used to collect evidence during the assessments. Such tools can be: • Assessment checklists (check sheets) • Assessment (evidence) guides • Practical training logbooks • Simulation based assessments (virtual reality) • Examination papers • Questionnaires • Oral assessment The appropriate tools should be selected and used based on the assessment methods to be applied.
The pass marks assessments	Where projects, individual or group assignments, examinations or oral assessments form part of the assessment plan, the pass marks must be established.
The number of observations required for assessment of performance	The number of observations to be carried out in the assessment of the interim and final competency standards are to be defined. The number of observations must be adequate to reach reliable and valid results in line with the principles of the competency assessment.

2.7.9.16 In addition, the following need to be covered in the maintenance organization's procedures manual (MOPM) and the training and procedures manual of the AMO and ATO, respectively, describing the assessment procedures:

a) personnel who may conduct assessments and their qualifications;

b) roles and responsibilities of personnel conducting the assessments;

c) assessment procedures (preparation, conduct and post-assessment);

d) conditions under which assessments are to be undertaken;

e) record-keeping; and

f) actions to be taken when a student fails to meet the competency standard(s) of the assessment.

Defining the list of assessments

2.7.9.17 The number of assessments required for a course will be determined in line with the course composition and structure including the course milestones (where applicable).

2.7.9.18 Depending on the course complexity, the required formative and summative assessments will be established and associated with the course milestones (where applicable), modules and other training elements.

2.7.9.19 Interim and final competency standards and KSA to be achieved and assessed in each assessment event are to be defined.

2.7.9.20 Once the list of assessments has been designed, the assessment methods will be defined and relevant assessment tools developed.

2.7.9.21 After the list of assessments and assessment methods have been established, they will be associated with the training schedule to determine when the assessments will occur.

Developing assessment tools

2.7.9.22 Assessment tools are to be developed considering the following:

a) type of assessment (formative or summative);

b) assessment methods to be used (e.g. practical assessment, examination, oral assessment, etc.);

c) performance criteria established for the assessment being developed (interim or final competency standard, examination passing rate, etc.);

d) number of observations required to ensure reliable results (for practical assessment) etc. The following documents may be designed to support practical assessments:

1) *Assessment (evidence) guide*. An assessment (evidence) guide translates the performance criteria from the adapted competency model into practical examples of observations that instructors and assessors can expect to see. It is used to eliminate different interpretations among instructors and assessors and ensures valid and reliable evidence is gathered. It details competencies, their

associated OBs and the expected performance that should be observed at the interim or final competency standard.

2) *Competency checklist.* A competency checklist details the competencies and performance criteria and is used by the AMO/ATO to record the results of each formative and summative assessment. The assessment plan describes how many assessments should be completed for each milestone.

Note.— Attachment G to Chapter 2 provides an example of part of a Competency checklist.

3) *Competency assessment form.* The competency assessment form is used to summarize the results of all the assessments that have been undertaken by a student and represents the evidence of the competency gained during training. The number and method(s) of assessment are described in the assessment plan. The competency assessment form must correlate with the assessment plan. In addition, to determine the competency of the student, an average score is taken for each summative assessment and annotated in the Result section of the competency assessment form. This should then correlate with a check mark that is to be used in the Non-Competent/Competent sections of the Summary of Results. The AMO/ATO may choose to provide this document to students as a record of completion of training.

Note 1.— Attachment F to Chapter 2 provides an example of an assessment plan.

Note 2.— Attachment H to Chapter 2 provides an example of a competency assessment form.

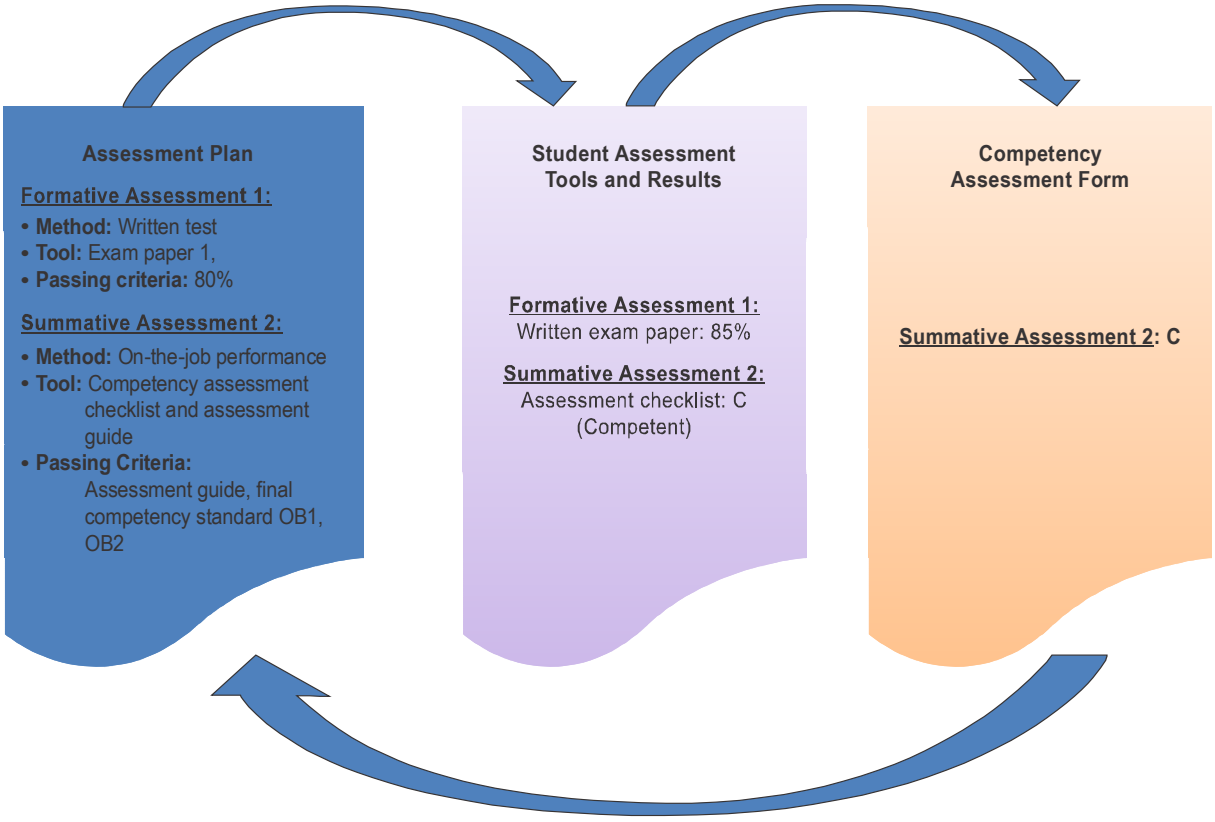

Figure 2-8. Relationship between the assessment plan, student assessment tools and results and competency assessment form

2.7.9.23 The Assessment plan defines all the required assessments, methods and tools including assessment criteria (passing scores) and must comply with any applicable requirements (regulatory, organizational, etc.). Assessments are carried out and are recorded in the Assessment Tools (e.g. checklist, exam paper, etc.) progressively and in compliance with the assessment plan.

2.7.9.24 The Competency Assessment Form summarizes the results of all the assessments required by the Assessment Plan and provides a record of the overall competency achieved during training. The Competency Assessment Form will represent a statement of competency against the required elements of training and will be marked with a “C”, meaning “competent” for every assessment where the required passing criteria has been met. For example, a passing score of 80 per cent for a written exam will be marked with a “C” on the Competency Assessment Form if the student succeeded in gaining the minimum passing score in his assessment.

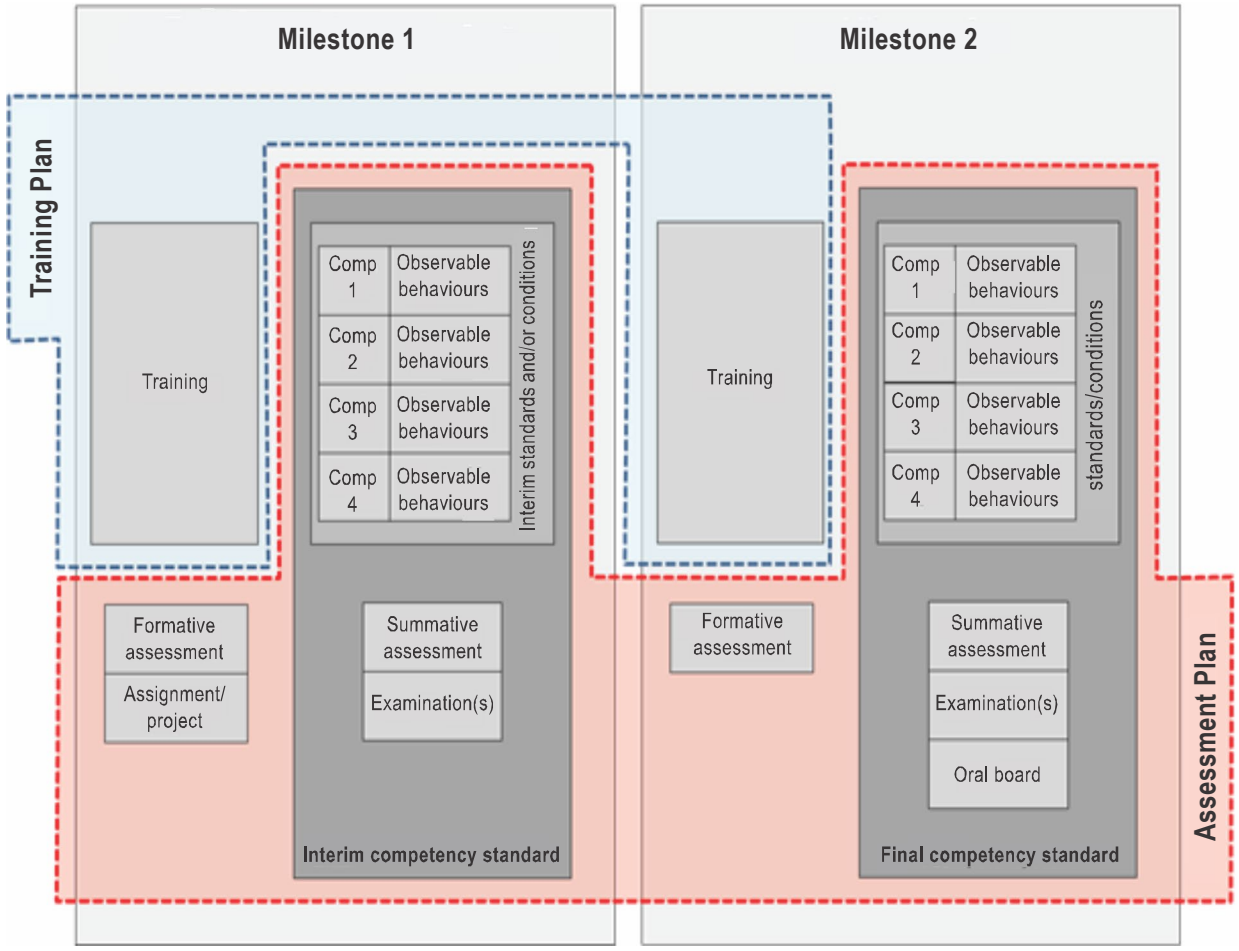

Figure 2-9. Relationship between milestones and the training and assessment plans

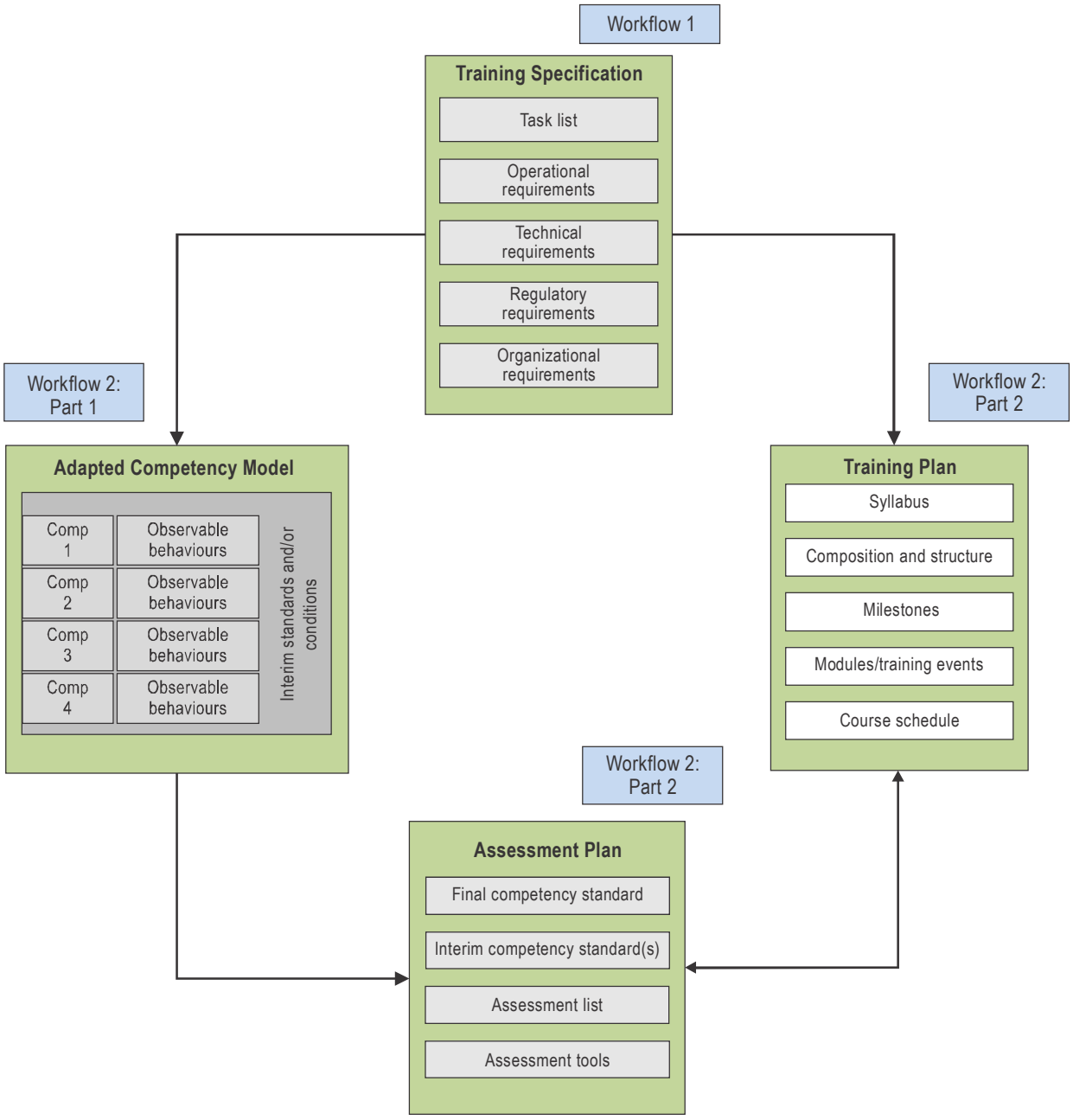

Figure 2-10. Relationship between Workflows 1 and 2

2.8 WORKFLOW 3: DEVELOP THE TRAINING AND ASSESSMENT MATERIALS

2.8.1 During this step, all the training and assessment materials are developed based on the adapted competency model and the training and assessment plans. The process defined in Workflow 3 is illustrated in Figure 2-11. The output from this process should include course schedules, training and assessment materials.

2.8.2 Training and assessment materials include, but are not limited to, training notes, exercise briefings, practical exercises, case studies, presentations, video clips, self-test quizzes, examinations, assessments and assessment tools. The training materials are based on the training specification requirements. Training materials should be revision-controlled to ensure updates and amendments are incorporated regularly and identifiable under revision control process.

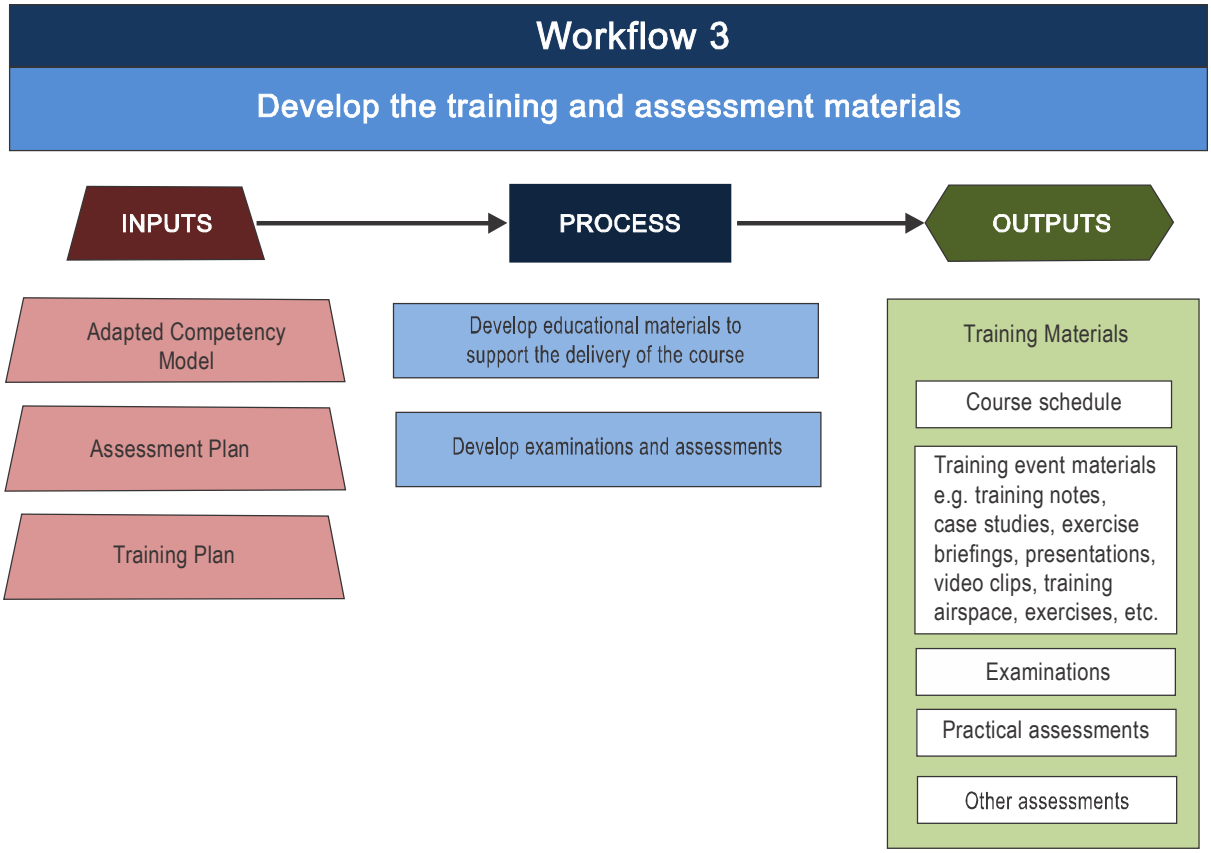

Figure 2-11. Workflow 3 — Develop the training and assessment materials

2.9 WORKFLOW 4: CONDUCT THE COURSE IN ACCORDANCE WITH THE TRAINING AND ASSESSMENT PLANS

Workflow 4 illustrates the process of conducting the course following the training and assessment plans depicted in Figure 2-12.

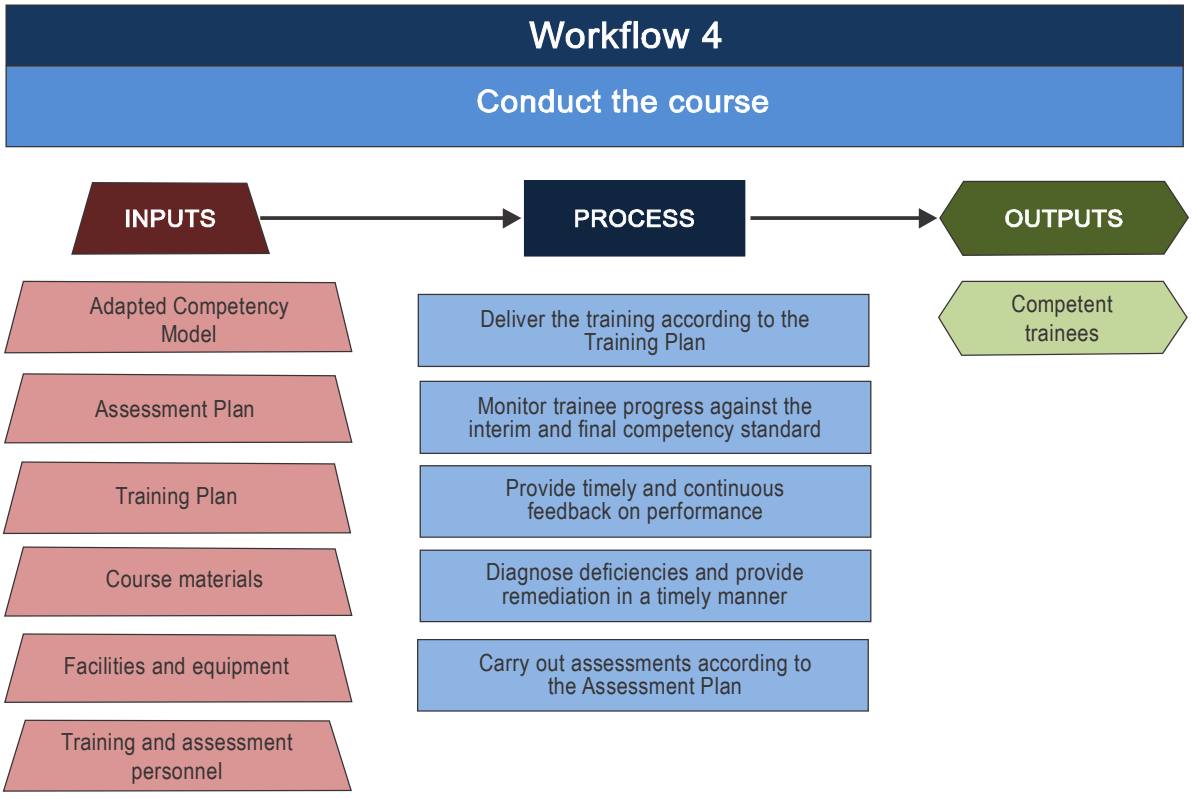

Figure 2-12. Workflow 4 — Conduct the course following the training and assessment plans

2.10 WORKFLOW 5: EVALUATE THE COURSE, INCLUDING THE TRAINING AND ASSESSMENT PLANS

2.10.1 Upon completion of the training, feedback from students, instructors, assessors and employers (where possible) is recommended to determine the effectiveness of the course in supporting the progression of learning towards achieving competency in the workplace.

2.10.2 Evaluation of training and assessment plans should be based on valid and reliable evidence, which may lead to changes or improvements to the course. Figure 2-13 illustrates the process of evaluating a course.

2.10.3 The aim of the course evaluation is to assess the training to determine:

a) effectiveness of the training to support the progression of learning towards achieving competency in the workplace;

b) ability to meet the established objectives (as defined in the training specification);

c) opportunities for improvement; and

d) compliance with applicable requirements (e.g. operations, regulatory, customer, contractual, etc.).

2.10.4 The evaluation of the training must be a continuous process and should involve data collection by various means such as:

a) independent audits;

b) feedback from students;

c) feedback from instructors and assessors;

d) performance review events between the training department (AMO and ATO) and operational department (AMO); and

e) course results (passing rates, grades, etc.).

2.10.5 The evaluation data collected must be analysed and improvement actions formulated and implemented. To determine the effectiveness of the improvement actions, data should be continuously collected and compared against past data before the implementation of improvement.

2.10.6 The AMO and ATO should keep records of course evaluation and improvement actions.

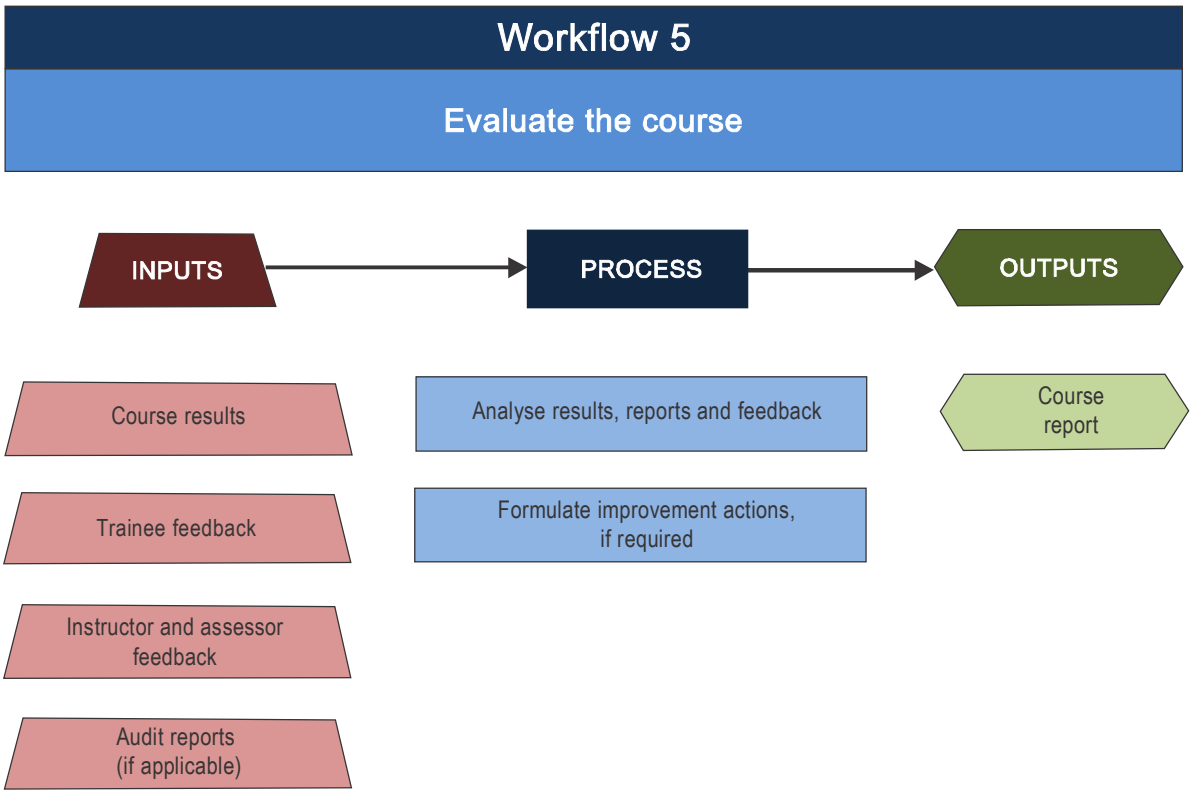

Figure 2-13. Workflow 5 — Evaluate the course, including the training and assessment plans

Attachment A to Chapter 2

HOW TO DEVELOP A TRAINING NEEDS ANALYSIS

Training should be designed to enable all qualified students to perform their tasks at acceptable levels of competency. Task analyses can define those levels. It is important that the focus of the training course be to enable employees to competently perform tasks in addition to learning or understanding the subject matter.

While students cannot be trained to perform all tasks, they can be trained in the competencies needed to perform tasks in general. To ensure the students can perform those tasks, an analysis must be performed on what they need to know or understand.

The purpose of a TNA is to gather information (e.g. per item or system, on how, where and with what information a task is performed) to define the KSA required to perform the task, which will be translated into the training specification.

Note.— The training specification is the output of the TNA (Workflow 1).

Specifically, the purpose of this attachment is to provide an example for a TNA method for aircraft maintenance training. Usually, subject matter experts (e.g. instructors, engineering department personnel, certifying staff, safety department staff, etc.) will conduct the TNA. The example serves to communicate best practice that may be used by AMOs or ATOs.

Training request scenario

Airline XYZ currently operates XXX aircraft equipped with YYY engines. It recently purchased XXX aircraft equipped with ZZZ engines and will soon commence operations. The current licensed workforce is not qualified to maintain and certify ZZZ engines. As a result, the training request received to train the current workforce on the differences of the ZZZ engine. The task is to create a YYY engine ZZZ engine differences course.

Sample TNA for engine differences training

Input	*Process*	*Output*
Training request	Identify the purpose of the training required — train engine differences from YYY engine to ZZZ engine	Training specification — training course requirements Create a curriculum based on identified needs from the TNA process
Task list	Identify tasks specific or unique to the ZZZ engine	
Operational documents	Identify the operational requirements of the ZZZ engine (i.e. engine normal/non-normal procedures, etc.)	
Technical documents	Identify the technical requirements of the ZZZ engine (i.e. bootstrap system, unique tooling, engine test, engine balancing, etc.)	

Regulatory documents	Ensure compliance with applicable regulatory agencies	
Organizational documents	Ensure organizational capability to meet training need (i.e. qualified instructors, training materials, etc.)	
Other documents	Identify any other requirements	

Attachment B to Chapter 2

EXAMPLE OF A TRAINING SPECIFICATION

This training specification provides the basis for design of the adapted competency model.

Training specification for engine differences course for aircraft type training

Item	*Description — training request — engine differences course for aircraft type training*
Purpose	Train engine differences from YYY engine to ZZZ engine
Phases of training	Theory and practical
End qualification	Engine type rating
Task list	**Theory** On completion of this course, the student will possess the detailed theoretical knowledge of the ZZZ engine and its applicable systems, their operation, maintenance and troubleshooting up to the Aircraft Maintenance Manual level on the following: • relationship to airframe, powerplant and avionics systems and applicable components; • review of flight deck, maintenance data, tests and indications; • equipment necessary to perform maintenance; • relevant in-service problems, bulletins and instructions; • use of the technical manuals as approved data and procedures; and • knowledge of relevant inspections and limits applicable to human and environmental factors. **Practical** On completion of this course, the student will be able to: • service and repair the aircraft systems following the maintenance procedures to the level required by the CAA; • troubleshoot and isolate failures to specific line replaceable unit (LRU) to the level as required by the CAA; and • perform system, engine, component and functional check as specified in the maintenance manual.

Item	*Description — training request — engine differences course for aircraft type training*
Operational requirements	Theory training will be instructor-led and conducted in a classroom • Computer-based training in the classroom will support instructor-led training • Relevant maintenance manuals, instructions for continuing airworthiness (ICAs) in support of the associated training Practical (Hangar, Ramp, Engine Shop) • Access to appropriate maintenance manuals • Tooling and equipment to support training activities • Access to an operational engine and associated airplane systems
Technical requirements	Theory • Well-lit classroom with adequate classroom furniture • Computer software and hardware • Projectors • Stationery supplies Practical • Tooling (See maintenance requirements) • Consumables (See maintenance requirements) • Engine access (ZZZ engine) • Operational engine and associated airplane systems
Regulatory requirements	National regulatory requirements may apply to the following aspects of the training: • Content (e.g. subjects to be covered, course syllabus); • Assessments procedure (e.g. written exam, on-the-job assessment); • Course approval (e.g. organizational, CAAs); • Equipment specifications (e.g. simulator, tooling); • Training environment and facilities (e.g. class configuration); • Delivery methodology (e.g. on-the-job, practical, classroom, distance or E-learning); and • Admission prerequisites. • To be granted the new type rating, an individual requires XXX aircraft YYY engine Cat. B1.1 type rating.
Organizational requirements	• Learning management system capable of adjusting individual curriculum; and • Ensuring safe and efficient operation of new aircraft model.
Other requirements	Consideration of any contractual arrangements between the AMO and ATO and customer.

Attachment C to Chapter 2

HOW TO DEVELOP AN ADAPTED COMPETENCY MODEL

The purpose of this attachment is to provide guidance and recommendations for an adapted competency model for engine differences training. The guidelines may be used by AMOs or ATOs to communicate best practices.

The process of developing an adapted competency model includes two inputs: the training specification and the ICAO competency framework for AMP. The ICAO competency framework identifies the competencies and the OBs required for AMP.

Note 1.— The input to Workflow 2, Part 1 is the training specification and the ICAO competency framework.

Note 2.— The output to Workflow 2, Part 1 is the adapted competency model, which is the training specification adapted for CBTA.

Usually, instructors, assessors and developers will develop the adapted competency model. Subject matter experts can provide additional input.

Sample of adapted competency model process for engine differences training

Input	*Process*	*Output*
The training specification (Curriculum) from Workflow 1		Adapted competency model — see example in Attachment D to Chapter 2

Refer to the ICAO competency framework in Attachment J to Chapter 2	Select competencies from the ICAO competency framework applicable to the engine differences course.
	
	For example:
	• Application of procedures
	• Work management
	• Situational awareness
	• Technical expertise
	• Etc.
	
	From the selected competencies, select and, if necessary, adapt observable behaviours. For example:
	• Application of procedures
	  o OB 1.1 to OB 1.5
	• Work management
	  o OBs 2.1, 2.2, 2.3, 2.5, 2.6, 2.8, 2.9	

Input	*Process*	*Output*
	• Situational awareness o OBs 3.1, 3.2, 3.4, 3.5 • Technical expertise o OBs 4.1, 4.2, 4.4 • Etc. Determine the relevant competency standard. Theory • Engine overview • Engine related systems • Engine functions - Normal/Non-normal • Engine tests Practical • Locations • Function, operate and test • Service ground handling • Remove or install • Minimum equipment list or Dispatch deviation procedures guide • Troubleshooting Determine the conditions under which the competencies must be performed. • Theory o Classroom, instructor-led or computer-based training • Practical Hangar, Ramp, Shop – instructor-led	

Attachment D to Chapter 2

EXAMPLE OF AN ADAPTED COMPETENCY MODEL

Airline XYZ associates the engine differences tasks identified in the training specification (Workflow 1) with the following competencies and OBs defined in the *PANS-TRG (Doc 9868)*, Part IV, Chapter 3, Appendix 2.

Airline XYZ adapts the ICAO competency framework for AMP as defined in Attachment J to Chapter 2 as follows.

Adapted competency model for AMP within XYZ Airline (example)

Adapted competency	Description	Performance Criteria				
		OB no.	Observable behaviour (OB)	Competency assessment		
				Interim competency standard	Final competency standard	Condition
Application of procedures	Identify and apply procedures following appropriate documents and applicable regulations, using the appropriate knowledge	1.1	Identifies correct processes and procedures associated with a specific task	• Familiar with the structure of the appropriate manuals and processes • Understand the importance of document revision and configuration control • Identify applicable regulations	• Choose the appropriate maintenance manuals and processes • Demonstrate ability to use appropriate maintenance manuals and processes • Demonstrate knowledge of aircraft system interface • Select manuals and procedures applicable to the maintenance tasks in compliance with organizational requirements • Document work following company procedures	During formative assessment (theory/classroom) and summative assessment (practical/hangar, ramp, shop)
		1.2	Demonstrates proper use of documents	•	•	
		1.3	Applies system knowledge appropriately	•	•	
		1.4	Demonstrates compliance with applicable regulations	•	•	During summative assessment (practical/hangar, ramp, shop)
		1.5	Documents work performed or accomplished correctly	•	•	

Adapted competency	Description	Performance Criteria				
		OB no.	Observable behaviour (OB)	Competency assessment		
				Interim competency standard	Final competency standard	Condition
Work management	Manage available resources efficiently to prioritize and perform tasks in a safe and efficient manner	2.1	Plans, prioritizes and schedules tasks effectively	• Identify the manpower requirement for the task performed • Identify requirements for independent inspections • Ability to identify appropriate equipment, tooling and resources to accomplish tasks	• Demonstrate task knowledge to effectively prioritize and schedule work • Ability to explain when additional help is needed • Exhibit willingness to seek assistance when required • Ability to identify appropriate equipment, tooling and resources to accomplish tasks • Ability to use available tools safely, efficiently and effectively • Clean and inspect work area after completion of tasks • All steps and tasks are completed according to relevant procedures	During summative assessment (practical/hangar, ramp, shop)
		2.2	Identifies where and when assistance is needed	•	•	
		2.3	Requests assistance when and where required	•	•	
		2.4	Selects appropriate tools, equipment and resources to support the efficient achievement of tasks	•	•	
		2.5	Uses available tools safely, efficiently and effectively	•	•	During summative assessment (practical/hangar, ramp, shop)
		2.6	Inspects work area after completion of task	•	•	
		2.7	Verifies that tasks are completed to the relevant procedures	•	•	

Adapted competency	Description	Performance Criteria				
		OB no.	Observable behaviour (OB)	Competency assessment		
				Interim competency standard	Final competency standard	Condition
Situational awareness	Recognize and understand the maintenance environment and relevant information; anticipate future events	3.1	Maintains awareness of the maintenance environment	• Explain if there are any safety issues for the task performed • Understand the safety reporting system	• Demonstrate awareness of weather, hangar, ramp and shop conditions • Monitor safety and hazard conditions • Demonstrate ability to choose information that is correct for the task • Ability to avoid conflicting activities	During summative assessment (practical/hangar, ramp, shop)
		3.2	Maintains awareness of hazard situations	•	•	
		3.3	Verifies that information is accurate and assumptions are correct	•	•	
		3.4	Is cognisant of ongoing concurrent activities	•	•	During summative assessment (practical/hangar, ramp, shop)
Technical expertise	Apply and improve technical knowledge and skills to perform maintenance safely and efficiently	4.1	• Applies technical knowledge and skills as appropriate for the task	• Demonstrate ability to apply knowledge and skills to complete the task • Ability to accurately explain how, what, where and why they are doing a task • Demonstrate ability to accurately apply appropriate procedures.	• Demonstrate ability to apply knowledge and skills to complete the task • Ability to accurately explain how, what, where and why they are doing a task • Demonstrate ability to accurately apply appropriate procedures.	During summative assessment (practical/hangar, ramp, shop)
		4.2	• Answers technical questions accurately	•	•	
		4.3	• Applies appropriate procedures following the applicable standards	•	•	
Etc.						

Attachment E to Chapter 2

EXAMPLE OF A TRAINING PLAN

NOTE: The example below contains the following elements: syllabus, composition and structure, milestones, modules/training events, course schedule.

Sample training plan (Engine Differences Course)

Course: Blue CAA - Mechanical/Avionics (B1/B2) (ZZZ) Engine and Engine Interface Differences – Theoretical

Model: 737 **Extension:** 0% **Exam Type:** Closed

Teach Days: X **Scheduled Time:** 00 Hrs 00 Min

MP: 737-XXX **Version Number:** 2 **Approval Date:** XX/XX/XXXX

Regulatory Agency: Blue CAA **TNA Revision Number:** XXXX-XX

Regulatory Approval Hours: 00 Hrs 00 Min

Regulatory Organizational Approval Number: Blue CAA.147.XXXX

Regulatory Course Approval Number: XXXX

Sample training plan (Engine Differences Course)

Day	*Subject*	*Schedule Time*	*Methodology*	*Observable Behaviours (OBs)*
1	Course introduction Powerplant Engine Engine and fuel control	1:00 2:00 1:00 2:00	Instructor-led	OBs 7.1, 7.3, 8.1, 8.5
2	Engine and fuel control Engine control Engine oil Engine air	1:00 1:00 2:00 2:00	Instructor-led	OBs 7.1, 7.3, 8.1, 8.5
3	Engine ignition/starting Engine exhaust Engine balancing (task) Powerplant 1 exam	1:45 2:00 1:15 1:00	Instructor-led Desktop SIM/CBT	OBs 7.1, 7.3, 8.1, 8.5 OBs 1.1, 1.2, 1.3, 1.5, 2.3, 3.4, 10.10

4	Engine oil Engine ignition Engine starting Powerplant 2 (desktop simulation)	1:00 1:00 2:00 2:00	Instructor-led Desktop simulator lesson	OBs 7.1, 7.3, 8.1, 8.5 OBs 1.1, 1.2, 1.3, 1.5, 2.3, 3.4, 10.10
5	Engine exhaust Exam/debrief	4:00 1:30	Instructor-led Knowledge assessment	OBs 7.1, 7.3, 8.1, 8.5 OBs 1.1, 1.2, 1.3

Course: Blue CAA - Mechanical/Avionics (B1/B2) (ZZZ) Engine and Engine Interface Differences – Practical

Model: 737 **Extension:** 0% **Exam Type:** Closed

Teach Days: X **Scheduled Time:** 00 Hrs 00 Min

MP: 737-XXX **Version Number:** 2 **Approval Date:** XX/XX/XXXX

Regulatory Agency: Blue CAA **TNA Revision Number:** XXXX-XX

Regulatory Approval Hours: 00 Hrs 00 Min

Regulatory Organizational Approval Number: Blue CAA.147.XXXX

Regulatory Course Approval Number: XXXX

Day	*Subject*	*Schedule Time*	*Methodology*	*Observable Behaviours (OBs)*
1	Course introduction Powerplant review Engine review	0:30 2:30 3:00	Instructor-led On aircraft	OB 4.1 OB 4.2 OBs 1.1,1.2, 1.3,1.5, 2.3, 3.4
2	Practical assessment	3:00	On aircraft	OB 4.1 OB 4.2 OBs 1.1,1.2, 1.3,1.5, 2.3, 3,2, 3.4

Attachment F to Chapter 2

EXAMPLE OF AN ASSESSMENT PLAN

An assessment plan includes both the assessment (evidence) guide (Table 2-14 refers) and the list of assessments (Table 2-15 refers). The tables below are examples of how the assessment plan can be designed. Based on the assessment plan, additional assessment tools such as exam papers and oral questionnaires might be required to complete the assessment plan as per Chapter 2.7.

Assessment (evidence) guide

Competency — *Application* of procedures			
Observable Behaviour (OB)		*Interim competency standard*	*Final competency standard*
1.1	Identifies correct processes and procedures associated with a specific task	Familiar with the structure of the appropriate manuals and processes Etc.	Choose the appropriate maintenance manuals and processes Etc.
Competency — Work management			
Observable Behaviour (OB)		*Interim competency standard*	*Final competency standard*
2.1	Plans, prioritizes and schedules tasks effectively	Identify the manpower requirement for the task performed Etc.	Demonstrate task knowledge to effectively prioritize and schedule work Etc.

List of assessments

List of assessments (Summative, Formative)	*Milestones*	*Competency Standard (Interim or Final)*	*Assessment Method*	*Assessment Tools (Assessment (evidence) guide, Competency Checklist, Competency Assessment Form)*	*Passing Criteria*	*Number of observations required for assessment of performance*
Formative assessment	*Taken from training plan	Interim	1. Written exam	1. Test Paper xx	80%	N/A
			2. Oral exam	2. Questionnaire xx	80%	N/A
			3. Practical assessment through observation	3. Competency Checklist xx and Assessment Guide	C	XX
Summative assessment	*Taken from training plan	Final	1. Written exam	1. Test Paper xx	80%	N/A
			2. Oral exam	2. Questionnaire xx	80%	N/A
			3. Practical assessment through observation	3. Competency Checklist xx and Assessment Guide	C	XX

Attachment G to Chapter 2

EXAMPLE OF A COMPETENCY CHECKLIST

A competency checklist is a comprehensive document that could be lengthy. The example below shows the competency checklist for two competency units only: Application of procedures and work management. A complete list would include all the competencies and performance criteria listed in the adapted competency model.

Competency checklist — Engine differences course for aircraft type training

Trainee name:	J. Blogs
Date:	01.01.01
ICS or FCS:	ICS 2
Instructor/assessor name:	J. Smith

The assessment (evidence) guide describes the level of performance required for each competency standard. An overall assessment of competence for the competency standard being assessed can only be made when all performance criteria have been achieved. The performance level (NC, C) is described in the table below.

For formative assessment, grading supports the learning progress and can be used for course evaluation purposes.

Application of procedures		*NC*	*C*
PC/OB 1.1	Identify correct processes and procedures associated with a specific task		
PC/OB 1.2	Demonstrate proper use of documents		
PC/OB 1.3	Apply system knowledge appropriately		
PC/OB 1.4	Demonstrate compliance with applicable regulations		
PC/OB 1.5	Predict the future operational situation		

Comments:……
……
……
……

Work management		*NC*	*C*
PC/OB 2.1	Plan, prioritize and schedule tasks effectively		
PC/OB 2.2	Identify where and when assistance is needed		
PC/OB 2.3	Use a variety of techniques to effectively manage the traffic		
PC/OB 2.4	Select appropriate tools, equipment and resources to support the efficient achievement of tasks		
PC/OB 2.5	Use available tools safely, efficiently and effectively		
PC/OB 2.6	Inspect work area after completion of task		
PC/OB 2.7	Verify that tasks are completed to the relevant procedures		

Comments:……
……
……
……
……

Performance level is shown in the legend below:

(1) Not competent (NC)
(2) Competent (C)

Signature: OJT Instructor:_____ Date:_____

Attachment H to Chapter 2

EXAMPLE OF A COMPETENCY ASSESSMENT FORM

NOTE: This form contains the record summarizing the results of all the assessments undertaken by the student.

COMPETENCY ASSESSMENT FORM

Summative assessments			
Number	Date undertaken	Assessor/s	Result
1			
2			
…			

Summary of results:

The performance level (NC, C) is described in the table below.

	Adapted Competencies	*NC*	*C*
1.	Application of procedures		
2.	Work management		
3.	Situational awareness		
4.	Technical expertise		
5.	System thinking		
6.	Coordination and handover		
7.	Risk management		
8.	Teamwork		
9.	Problem-solving and decision making		
10.	Self-management and continuous learning		
11.	Communication		

Comments:..……..…… …… …… …… …… ……
Performance level is shown in the legend below: (1) Not competent (NC) (2) Competent (C)
Recommendation: (Competent/Not competent) …… Name: ……..….. Signature: …… Date: …….

_____

Attachment I to Chapter 2

EXAMPLE OF A SYLLABUS

The following example shows all the subjects for an Engine Differences course for aircraft type training.

Day	*Title*
1	Course introduction Powerplant Engine Engine and fuel control
2	Engine and fuel control Engine control Engine oil Engine air
3	Engine ignition/starting Engine exhaust Engine balancing (task) Powerplant 1 exam
4	Engine oil Engine ignition Engine starting Powerplant 2 (desktop simulation)
5	Engine exhaust

Attachment J to Chapter 2

ICAO COMPETENCY FRAMEWORK FOR AIRCRAFT MAINTENANCE PERSONNEL

Competency	Definition	OB no.	Observable Behaviours (OBs)
ICAO Competency 1 APPLICATION OF PROCEDURES	Description 1 Identify and apply procedures following appropriate documents and applicable regulations, using the appropriate knowledge	1.1	Identifies correct processes and procedures associated with a specific task
		1.2	Demonstrates proper use of documents
		1.3	Applies system knowledge appropriately
		1.4	Demonstrates compliance with applicable regulations
		1.5	Documents work performed or accomplished correct
ICAO Competency 2 WORK MANAGEMENT	Description 2 Manage available resources efficiently to prioritize and perform tasks in a safe and efficient manner	2.1	Plans, prioritizes and schedules tasks effectively
		2.2	Identifies where and when assistance is needed
		2.3	Requests assistance when and where required
		2.4	Manages time effectively
		2.5	Selects appropriate tools, equipment and resources to support the efficient achievement of tasks
		2.6	Uses available tools safely, efficiently and effectively
		2.7	Offers and accepts assistance, when necessary, and asks for help
		2.8	Inspects work area after completion of task
		2.9	Verifies that tasks are completed to the relevant procedures
		2.10	Manages environmental stress, interruptions, distractions, variations and failures effectively
ICAO Competency 3 SITUATIONAL AWARENESS	Description 3 Recognize and understand the maintenance environment and relevant information; anticipate future events	3.1	Maintains awareness of the maintenance environment
		3.2	Maintains awareness of hazard situations
		3.3	Recognizes the future operational situations
		3.4	Verifies that information is accurate and assumptions are correct
		3.5	Is cognisant of ongoing concurrent activities
		3.6	Assesses situations and reports deviations

Competency	Definition	OB no.	Observable Behaviours (OBs)
ICAO Competency 4 TECHNICAL EXPERTISE	Description 4 Apply and improve technical knowledge and skills to perform maintenance safely and efficiently	4.1	Applies technical knowledge and skills as appropriate for the task
		4.2	Answers technical questions accurately
		4.3	Keeps up to date on specialized technical knowledge and skills
		4.4	Applies appropriate procedures following the applicable standards
ICAO Competency 5 SYSTEM THINKING	Description 5 Understand and determine how the various components of systems management interact and affect the overall system safety performance	5.1	Evaluates the inter-relationship between policies, processes and procedures
		5.2	Evaluates the inter-relationship between various systems including quality planning, quality control and quality assurance of the stakeholder
		5.3	Recognizes importance of continuous improvement, reactive and proactive processes
		5.4	Recognizes the essential components of a functional safety management system and their interoperability
		5.5	Recognizes whether the stakeholder’s management processes are appropriate for the size and scope of the operation
		5.6	Correctly interprets performance data analysis
		5.7	Assesses if the stakeholder safety objectives achieve the desired safety requirements
		5.8	Provides feedback on potential deficiencies of the regulatory framework
		5.9	Understands that root cause(s) of deficiencies results from single-point or systemic failure(s)
ICAO Competency 6 COORDINATION AND HANDOVER	Description 6 Manage coordination and handover between personnel	6.1	Coordinates with personnel and other stakeholders
		6.2	Selects coordination/handover method based on circumstances, including the urgency of coordination, the status of facilities and the prescribed procedures
		6.3	Report safety-critical information
		6.4	Coordinates handover using the prescribed coordination procedures
		6.5	Coordinates changes to status of equipment, systems and functions
		6.6	Uses clear and concise terminology for verbal coordination and confirms that the message was properly received
		6.7	Uses standard message formats and protocols for non-verbal coordination

Competency	Definition	OB no.	Observable Behaviours (OBs)
		6.8	Conducts effective briefings during position handover including transfer of maintenance tasks
ICAO Competency 7 RISK MANAGEMENT	Description 7 Demonstrate an effective safety approach to the work environment considering its risk profile and the availability of resources	7.1	Carries out comprehensive risk assessments using appropriate methodologies
		7.2	Makes decisions based on risk assessment outcome
		7.3	Identify accurately problem areas or hazards that may negatively impact safety
		7.4	Recognizes company policies, work practices or organizational cultures that shows increased levels of risk
		7.5	Analyses root causes applicable to their task
ICAO Competency 8 TEAMWORK	Description 8 Operate safely and efficiently as a team member	8.1	Fosters an atmosphere of open communication
		8.2	Encourages team participation and cooperation
		8.3	Uses feedback to improve overall team performance
		8.4	Provides feedback constructively
		8.5	Shows respect and tolerance for other people
		8.6	Carries out duties in support of a team
		8.7	Uses negotiating and problem-solving techniques to manage unavoidable conflict when encountered
		8.8	Raises relevant concerns in an appropriate manner and good judgement
		8.9	Accepts feedback constructively
		8.10	Shares experiences with the aim of continuous improvement
		8.11	Manages interpersonal conflicts to maintain an effective team environment
		8.12	Anticipates and responds appropriately to the needs of others
		8.13	Demonstrates integrity and honesty
		8.14	Demonstrates soundness
ICAO Competency 9 PROBLEM-SOLVING AND DECISION MAKING	Description 9 Accurately identify and resolve problems using the appropriate decision-making processes	9.1	Determines possible solutions to an identified problem
		9.2	Prioritizes effectively
		9.3	Manages risks effectively
		9.4	Considers rules and operating procedures when determining possible solutions to a problem in decision making
		9.5	Implements a chosen solution to a problem

Competency	Definition	OB no.	Observable Behaviours (OBs)
		9.6	Organizes tasks following determined priorities
		9.7	Applies appropriate mitigation strategies for the identified hazards
		9.8	Works through problems without reducing safety
		9.9	Considers expediency and efficiency
ICAO Competency 10 SELF MANAGEMENT AND CONTINUOUS LEARNING	Description 10 Demonstrate personal attributes that improve performance and maintain an active involvement in self-learning and self-development	10.1	Manages stress in an appropriate manner
		10.2	Self-evaluates to improve performance
		10.3	Adapts to the demands of a situation as needed
		10.4	Engages in continuous development activities
		10.5	Takes responsibility for own performance; detects and resolves own errors
		10.6	Improves performance through self-evaluation
		10.7	Seeks and uses feedback to improve performance
		10.8	Maintains self-control and performs effectively in adverse situations
		10.9	Maintains awareness of developments in aviation and technological evolution
		10.10	Participates in learning activities
ICAO Competency 11 COMMUNICATION	Description 11 Communicate effectively in all situations and ensure clear and common understanding	11.1	Selects appropriate method of communication
		11.2	Uses effective verbal communication
		11.3	Uses effective written and other non-verbal communication
		11.4	Maintains situational awareness when selecting method of communication, speaks clearly, accurately and concisely
		11.5	Uses appropriate vocabulary and expressions for communications with stakeholders
		11.6	Demonstrates active listening by asking relevant questions and providing feedback
		11.7	Verifies comprehension of counterparts and corrects as necessary uses eye contact, body movements and gestures that are consistent with verbal messages where applicable, interprets non-verbal communication accurately
		11.8	Uses eye contact, body movements and gestures that are consistent with verbal messages where applicable
		11.9	Interprets non-verbal communication accurately

Chapter 3

GUIDELINES FOR THE IMPLEMENTATION OF COMPETENCY-BASED TRAINING AND ASSESSMENT FOR AIRCRAFT MAINTENANCE PERSONNEL

3.1 GENERAL

3.1.1 This chapter provides guidance to CAAs, AMOs or ATOs on the roles and measures required to facilitate the efficient implementation of CBTA for AMP.

3.1.2 CBTA for AMP uses a modular approach suited for the wide variety of maintenance tasks. These programmes can be customized to specific sets of competencies required to perform defined maintenance operations, with each competency representing a “building block”.

3.2 GUIDELINES FOR CIVIL AVIATION AUTHORITIES (CAAs)

3.2.1 Licences are issued by CAAs to permit persons to perform specified activities in aviation. These licences are granted following a successful examination or assessment during which a person must demonstrate the ability to perform the permitted activity to a defined standard.

3.2.2 The activities that AMP may perform are diverse and require a broad spectrum of competencies. As a result, most States define their own aircraft maintenance licensing system. Some States have recently made efforts to harmonize their aircraft maintenance licensing systems.

3.2.3 CAAs are to ensure that all CBTA programmes conducted by an ATO or AMO follow the relevant requirements for that training and assessment as prescribed in the regulation.

3.2.4 The CAA will grant an organizational approval to an ATO or AMO, which will specify among other things, the scope of training each organization is approved to provide that may include the following:

a) *“Basic training”* programmes;

b) *“Aircraft type training”* programmes;

c) other training programmes (not leading to a license);

d) type of assessments; and

e) organization requirements:

1) facilities;

2) training employee qualifications;

3) records of instructors and assessors;

4) training course plans;

5) training procedures and quality management system, including auditing;

6) maintenance training material;

7) examination and assessment standards;

8) instructional aids and equipment; and

9) keeping of student records.

3.2.5 In deciding whether to approve the organization as an ATO or AMO for the conduct of training and assessment, the CAA must determine whether the ATO or AMO has met all the regulatory requirements when approving the organization for the conduct of training and assessment.

3.2.6 The CAA will issue an aircraft maintenance engineer licence or endorse an existing licence with a particular aircraft type rating or approval to a student upon receipt of evidence. Such evidence should be from the relevant training provider (i.e. the ATO or AMO) attesting to the person's successful completion of the relevant training, final examinations and assessments and in a format approved by the CAA.

3.3 GUIDELINES FOR APPROVED TRAINING ORGANIZATIONS (ATOs)

3.3.1 The ATO is to ensure it provides the maintenance training and assessments according to the types of training it is approved to carry out. In addition, the ATO may issue the appropriate document to students who have successfully completed that training and assessment in the format approved by the CAA.

3.3.2 An ATO that provides CBTA must describe its Quality Management System, how it meets the relevant regulatory requirements for that training and assessment, and subsequent qualification of its students in its training and procedures manual.

3.3.3 The ATO is to ensure that the training programme is aligned to the scope of training for which it is approved. The ATO must ensure that the training programme provides the students a level of competency that satisfies industry requirements and expectations.

3.4 GUIDELINES FOR APPROVED MAINTENANCE ORGANIZATIONS (AMOs)

3.4.1 An AMO should ensure it provides the maintenance training and assessments following the types of training for which it is approved to conduct. In addition, the AMO may issue certification authorizations to its employees who have successfully completed that training and assessment.

3.4.2 An AMO that provides CBTA training and assessment for its certifying employees must describe its Quality Management System, how it meets the relevant regulatory requirements for that training and assessment, and subsequent qualification and certification authorization of its employees in its MOPM.

3.4.3 The AMO should ensure the training programme supports and is aligned with the scope of maintenance for which it is approved to provide. The training must also provide a level of competency to its AMP that supports the scope of maintenance activities that the AMO is approved to provide.

3.5 AMP TRAINING AND LICENSING PATH

3.5.1 A continuous evaluation of the CBTA is required to ensure that it remains effective and relevant to current maintenance practices. All relevant Standards related to an ATO described in Annex 1, Appendix 2 should be applied. This includes the approval of the curriculum and quality assurance system.

3.5.2 The AMOs or ATOs should ensure that a continuous evaluation programme is in place to assess the effectiveness of the training programme. Such an evaluation programme should be assessed for acceptability in accordance with the CAA's approval of the organization. Examples on how to set up a continuous evaluation programme are contained in Attachment G to Chapter 2.

Note 1.— Continuous evaluation of the training programme should not be confused with the students' assessment programme.

Note 2.— Guidance material for the approval of the training and assessment plans of CBTA programmes can be found in the PANS-TRG *(Doc 9868). The quality assurance system used by an ATO in implementing these programmes can be found in the* Manual on the Approval of Training Organizations *(Doc 9841).*

3.5.3 The continuous evaluation of the training programme to ensure its effectiveness of the training and identify any improvements should be included into the design process of the training programme.

3.5.4 As part of the CAA's oversight, AMOs or ATOs may be required to provide regular feedback to the CAA on the progress of initial implementation of the CBTA programme.

3.5.5 The success of the implementation of an AMP CBTA programme depends on effective coordination and cooperation between the CAA, the ATOs and the AMOs employing the trained personnel. CAAs should encourage such cooperation and coordination between the ATOs and the AMOs.

3.5.6 As part of the CAA's oversight of the AMO or ATO, CAAs should assess all proposed training programmes before implementation. This is to ensure that the training programme complies with the regulatory requirements for that training and assessment and aligns with the scope of training and assessment of the AMO or ATO.

Note.— This is to ensure that it meets the general provisions for CBTA as provided in the PANS-TRG*, (Doc 9868), Part III, Chapter 1.*

3.6 COMPETENCY-BASED TRAINING AND ASSESSMENT — BASIC TRAINING AND LICENSING

3.6.1 Upon the completion of basic training, students should demonstrate the competencies associated with the standard practices of aircraft maintenance activities. In order to demonstrate these competencies, the underlying KSA must be acquired. CBTA for basic training should include, but is not limited to, the following generic competencies and standard practices, which are applicable to all types of aircraft, aeronautical products in existing environments:

a) proper use and handling of tools and equipment for:

   1) general application;

   2) work on aircraft mechanical systems and components;

   3) work on aircraft structural work; and

   4) work on electrical aircraft systems and components;

b) use of standard hardware and material, such as:

   1) mechanical hardware (e.g. screws, washers, seals, etc.);

   2) aircraft structural hardware (e.g. fasteners, brackets, clamps, etc.); and

   3) electrical hardware (e.g. wires, light bulbs, switches, relays, circuit boards, etc.);

c) application of standard processes, such as:

   1) work safety related processes (e.g. use of ladders, personal protective equipment, fire extinguishers, etc.);

   2) general rules for the handling of certain aircraft systems (e.g. insertion of landing gear pins, drainage of water systems, pressure bleeding of hydraulic systems, removal/installation of electronic boxes, etc.);

   3) handling of equipment in the maintenance work area (e.g. operation of ground power units, aircraft docking, aircraft towing, aircraft jacking, aircraft grounding, etc.); and

   4) planning and preparation of maintenance tasks;

d) AMP's ability to use information related to aircraft and component system design and operation:

   1) understand and interpret original equipment manufacturer maintenance training material, (including description and operation of particular kind/type of equipment) to be able to follow maintenance procedures or maintenance instructions; and

   2) explain the generic design and operation principles of aircraft systems and components as they apply to specific equipment the student is maintaining;

e) AMP's ability to use maintenance documentation and other job aids:

   1) competent in the use of maintenance documentation (i.e. ability to find proper information for the task being performed);

   2) read, understand and interpret information and physically apply it to maintenance task being performed; and

   3) competently prepare and maintain maintenance records in compliance with rules and regulations;

f) AMP's ability to adhere to regulations, procedures and standards to:

1) follow regulations established by CAAs and identify which regulations apply in certain situations;

2) understand intent and interpret the contents;

3) be ready at all times to follow the regulations; and

4) be aware which standards have to be applied; and

g) consideration of human factor principles in maintenance which includes knowledge about application of human factor issues and their effects during work performance of a specific maintenance task under varying environmental situations to ensure the activity is performed safely.

Note.— Some CAAs mandate human factors requirements in their legislation.

3.6.2 In order to complete basic training, a student will need to pass final examinations and assessments overseen by the CAA. Upon the student's successful completion of basic training (including final examinations and assessments), the CAA may issue aircraft maintenance licences without endorsement for any particular rating. The aircraft maintenance license serves as evidence that the competencies have been met. See Basic training and licensing pathway in Example 1 in Figure 3-1.

3.7 COMPETENCY-BASED TRAINING — TYPE-RATING TRAINING AND AMO AUTHORIZATION

3.7.1 At the completion of competency-based training for a particular maintenance rating or approval, students should be able to demonstrate that they are competent to perform maintenance tasks for that rating or approval.

Note.— These maintenance tasks are described in the ICAs found in a variety of manuals and maintenance instructions, which describe how these tasks are executed to the applicable standards. In order to perform tasks following maintenance instructions, an AMP would need to apply the relevant competencies learned in the basic training for the particular rating or approval.

3.7.2 Competency-based training for a particular maintenance rating or approval should address the features that are unique to the aircraft type or component to be worked on and were not included in the basic training. CBTA for a rating or approval should include but is not limited to the following features:

a) location and identification of systems and components;

b) operation and monitoring of systems and components;

c) analysis of system or component functions;

d) troubleshooting;

e) removal and installation of units;

f) performance of adjustments and tests;

g) use of appropriate tools, equipment and materials;

h) human factors; and

i) safety issues.

3.7.3 Because of the wide variety in the scope of work undertaken by different AMOs and their personnel, AMOs or ATOs are responsible for the contents of training programmes for a particular rating or approval required for the maintenance activities the AMO is approved to carry out.

3.7.4 The CAA should closely monitor CBTA programmes it approved for a particular rating. The description of these programmes should be included in the training and procedures manual of the ATO and the MOPM of the AMO. The evaluation of the effectiveness of the training programmes is the responsibility of both the ATO and AMO and should be included in the auditing and monitoring activities performed by the CAA.

3.7.5 Assessors designated by the AMOs or ATOs and accepted by the CAA are responsible for the final competency-based examinations and assessments of the students in courses for a particular rating or approval. These examinations and assessments should not only examine the attained knowledge, skills and attitude, but should also ensure the students can demonstrate their competency to perform maintenance tasks to defined standards as per the maintenance instructions. Based on the successful completion of these examinations and assessments, the AMO should issue an aircraft maintenance certification authorization as evidence of the holder's competence for that particular rating or approval.

3.7.6 The procedures to conduct examinations and assessments of students should be described in the ATO training and procedures manual. The procedures to conduct assessment for the issuance of AMO certification authorizations should be described in the MOPM. The CAA should approve the procedures of both organizations and exercise oversight. See Aircraft type training pathway in Example 2 of Figure 3-2 and AMO certification authorization training pathway in Example 3 of Figure 3-3.

3.8 COMPETENCY-BASED TRAINING AND ASSESSMENT — CERTIFICATION AUTHORIZATION OF NON–LICENCED AMP

3.8.1 If the AMO decides to implement CBTA for non-licenced AMP, the training programme must comply with the guidelines contained in this manual and any regulatory requirements of the respective CAA. Upon successful completion of CBTA training and assessment, the AMO should issue a certification authorization.

3.8.2 The CAA should monitor and oversee CBTA programmes it approves for non-licensed AMP. Descriptions of these programmes are to be included in the AMO's MOPM. The evaluation of the effectiveness of the training programmes is the responsibility of the AMO and to be included in the auditing and monitoring activities performed by the CAA.

3.8.3 Assessors designated by the AMO and accepted by the CAA are responsible for the final competency-based examinations and assessments of the students in courses for non-licenced AMP. The examinations and assessments should not only examine the attained knowledge, skills and attitude but also ensure that the students can demonstrate their competency to perform maintenance tasks to defined standards according to maintenance instructions. Based on the successful completion of these examinations and assessments, the AMO is to issue an aircraft maintenance certification authorization as evidence of the holder's competency. See AMO certification authorization training pathway for non-licenced holder in Example 4 of Figure 3-4.

3.9 COMPETENCY-BASED TRAINING AND ASSESSMENT — DIFFERENCES TRAINING — RATING OR APPROVAL

3.9.1 If the AMO or ATO decides to implement differences training using the CBTA method for licensed AMP, the training programme must comply with the guidelines contained in this manual and any regulatory requirements of the respective CAA.

3.9.2 Upon successful completion of the training and assessment, the AMO and ATO should issue appropriate documentation as evidence of completion of the training. Based on receipt of the evidence, the CAA endorses the student's licence with the new rating or approval and the AMO is to issue the student with an aircraft maintenance certification authorization for that particular rating or approval.

3.10 COMPETENCY-BASED TRAINING AND ASSESSMENT — TRAINING AND LICENSING PATHWAYS

The CBTA can be introduced in different ways in the existing training and licensing paths. The following pathways illustrate how this can be accommodated.

Example 1. CBTA approach to basic training conducted by an ATO that leads to the issue of a basic licence by the CAA.

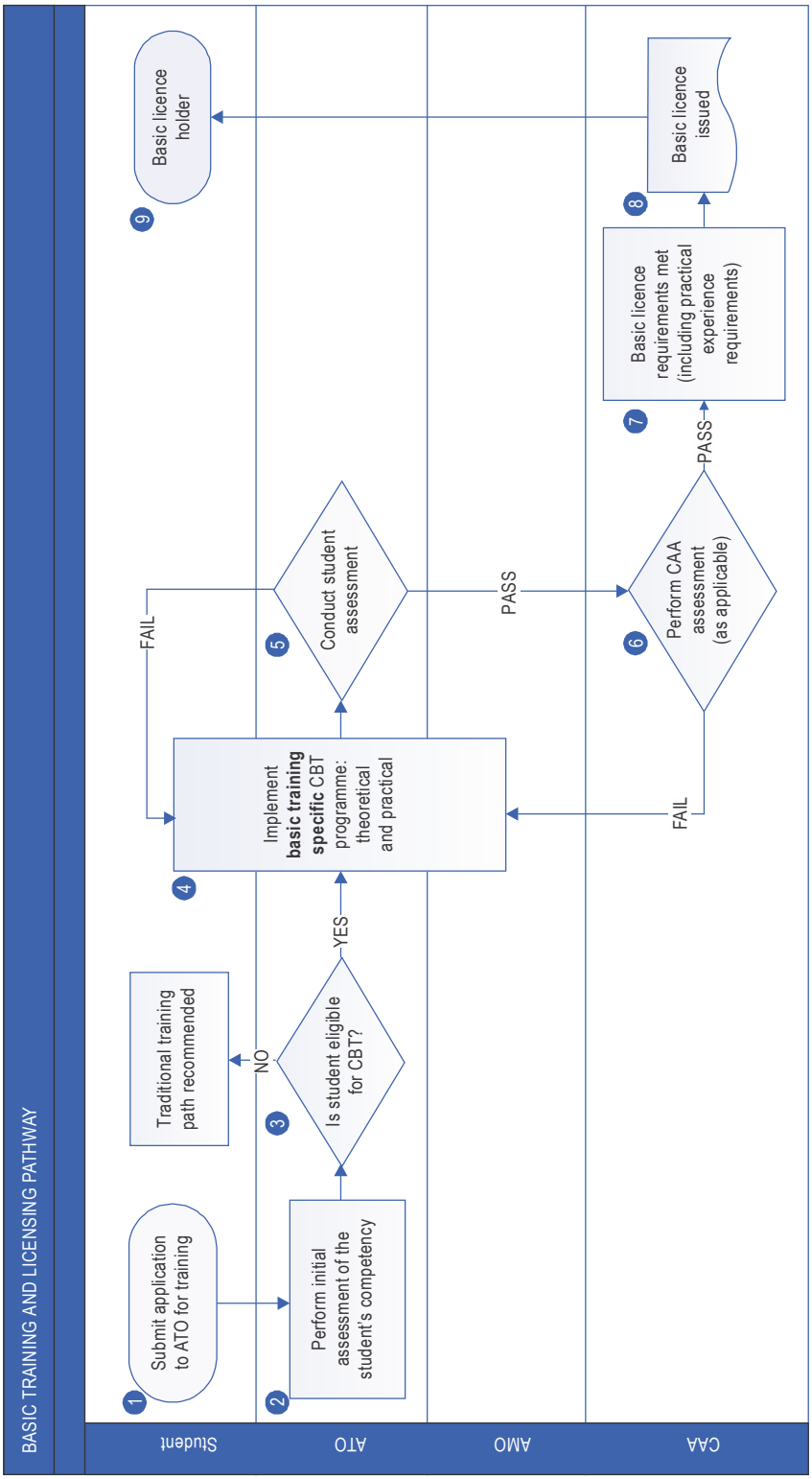

Figure 3-1. Basic training and licensing pathway (Example 1)

An explanation of the components that make up this workflow is outlined as follows:

1. *Submit application to ATO for training* — the individual submits an application to the ATO to undertake basic training.

2. *Perform initial assessment of the applicant's competency* — the ATO performs an initial assessment of the applicant's competency to determine gaps that may exist between the applicant's knowledge and the requirements for the basic licence.

3. *Is the applicant eligible for CBTA*?

    a) YES — move to next step in process; or
    b) NO — traditional training pathway recommended to the prospective student.

4. *Implement basic training-specific CBTA programme: theoretical and practical* — for additional guidance, refer to Chapter 3.

5. *Conduct student assessment:*

    a) PASS — move to next step in process; or
    b) FAIL — go back and repeat the elements of the basic training CBTA programme that were failed and undertake a further final CBTA assessment.

6. *Perform CAA assessment (as applicable)* — based on the training report received from the ATO, the CAA carries out an assessment of the student's (licence applicant) training results (theoretical and practical) to determine whether the student has met the training requirements for the granting of an aircraft maintenance licence:

    a) PASS — move to next step in process; or
    b) FAIL — go back and repeat the elements of the basic training CBTA programme that were failed and undertake a further final CBTA assessment and CAA assessment.

7. *Basic licence requirements met*— the CAA is satisfied that the student has successfully completed basic theoretical and practical training, including any additional regulatory requirements for practical experience on aircraft.

8. *Basic licence issued* —the CAA issues a basic aircraft maintenance licence to the student on the basis that the student has successfully completed basic training and met the regulatory requirements for grant of a basic licence.

9. *Basic licence holder* — the individual is the holder of a basic licence, the privileges of which are prescribed in legislation by the Licensing Authority and aligned with the requirements of Annex 1.

Example 2. CBTA approach to aircraft type training conducted by an ATO that leads to an endorsement of a specific aircraft type rating on an individual's existing licence by the CAA.

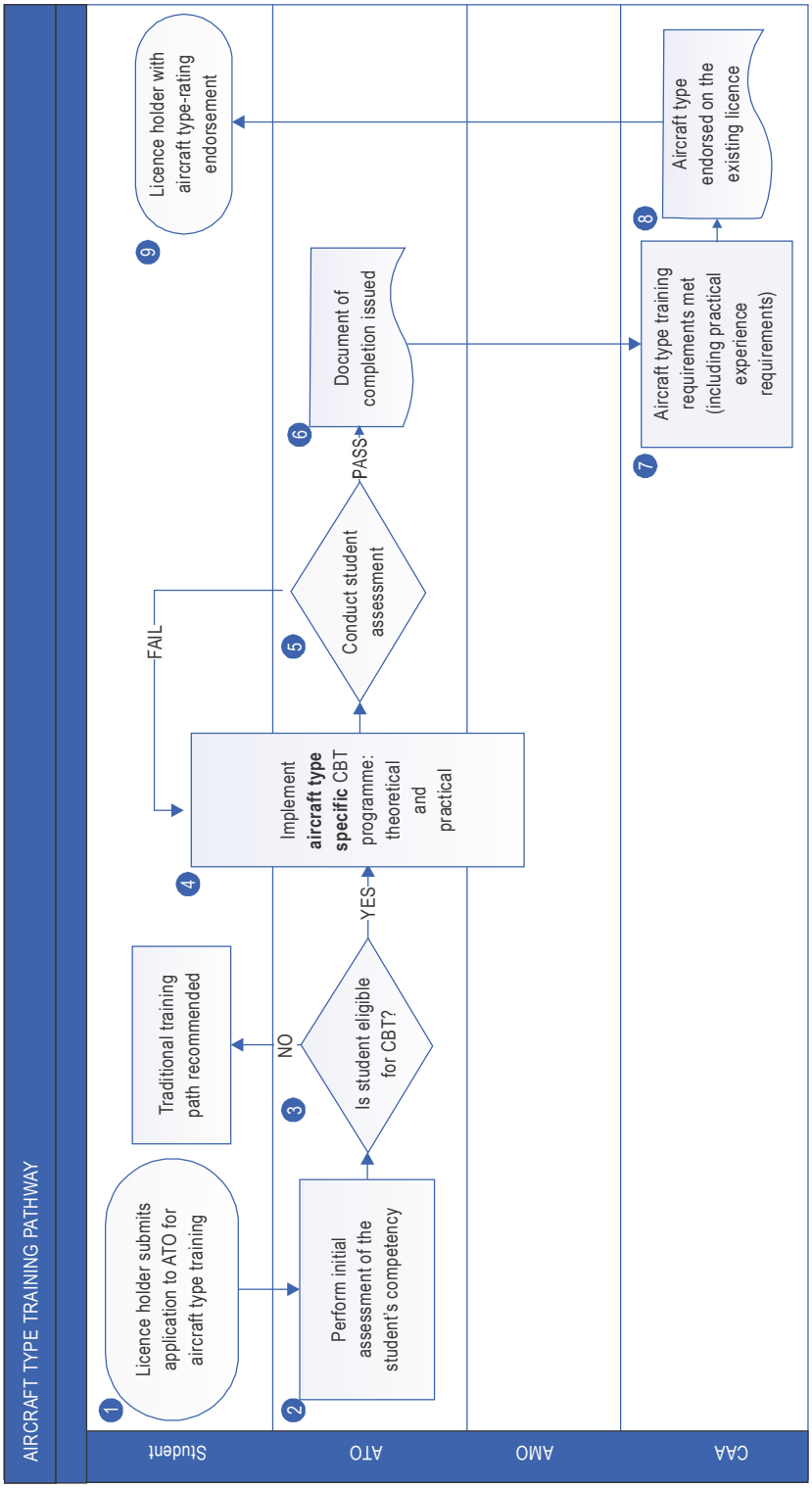

Figure 3-2. Aircraft type training pathway (Example 2)

An explanation of the components that make up this workflow is outlined as follows:

1. *Licence holder submits application to ATO for aircraft type-training* — the individual submits an application to the ATO to undertake a specific aircraft type-training course.

2. *Perform initial assessment of the applicant's competency* — the ATO performs an initial assessment of the applicant's competency to determine gaps that may exist between the applicant's knowledge and the requirements for type training.

3. *Is the applicant eligible for CBTA*?

    a) YES — move to next step in process; or

    b) NO — traditional training pathway recommended to the prospective student.

4. *Implement aircraft type-rating specific CBTA programme: theoretical and practical* — for additional guidance, refer to Chapter 3.

5. *Conduct student assessment:*

    a) PASS — move to next step in process; or

    b) FAIL — go back and repeat the elements of the aircraft type-rating training CBTA programme that were failed and undertake a further final CBTA assessment.

6. *Issue appropriate document of successful completion of type-rating training* — the ATO provides a document of the student's successful completion of the specific aircraft type-rating training course.

7. *Aircraft type-rating training requirements met (including practical experience requirements)* — the CAA is satisfied that the individual has successfully completed the specific aircraft type-rating theoretical and practical training course, including any additional regulatory requirements for practical experience on aircraft.

8. *Aircraft type rating endorsed on the existing licence* — the CAA endorses the student's existing licence with the specific aircraft type rating on the basis that the individual has successfully completed the specific aircraft type-rating training and met the regulatory requirements for grant of the type-rating.

9. *Licence holder with aircraft type-rating endorsement* — the individual is the holder of a licence endorsed with a specific aircraft type rating, the privileges of which are prescribed in legislation by the Licensing Authority and aligned with the requirements of Annex 1.

Example 3. CBTA approach to training conducted by an AMO that leads to the issue of an AMO certification authorization for an individual holding an existing licence.

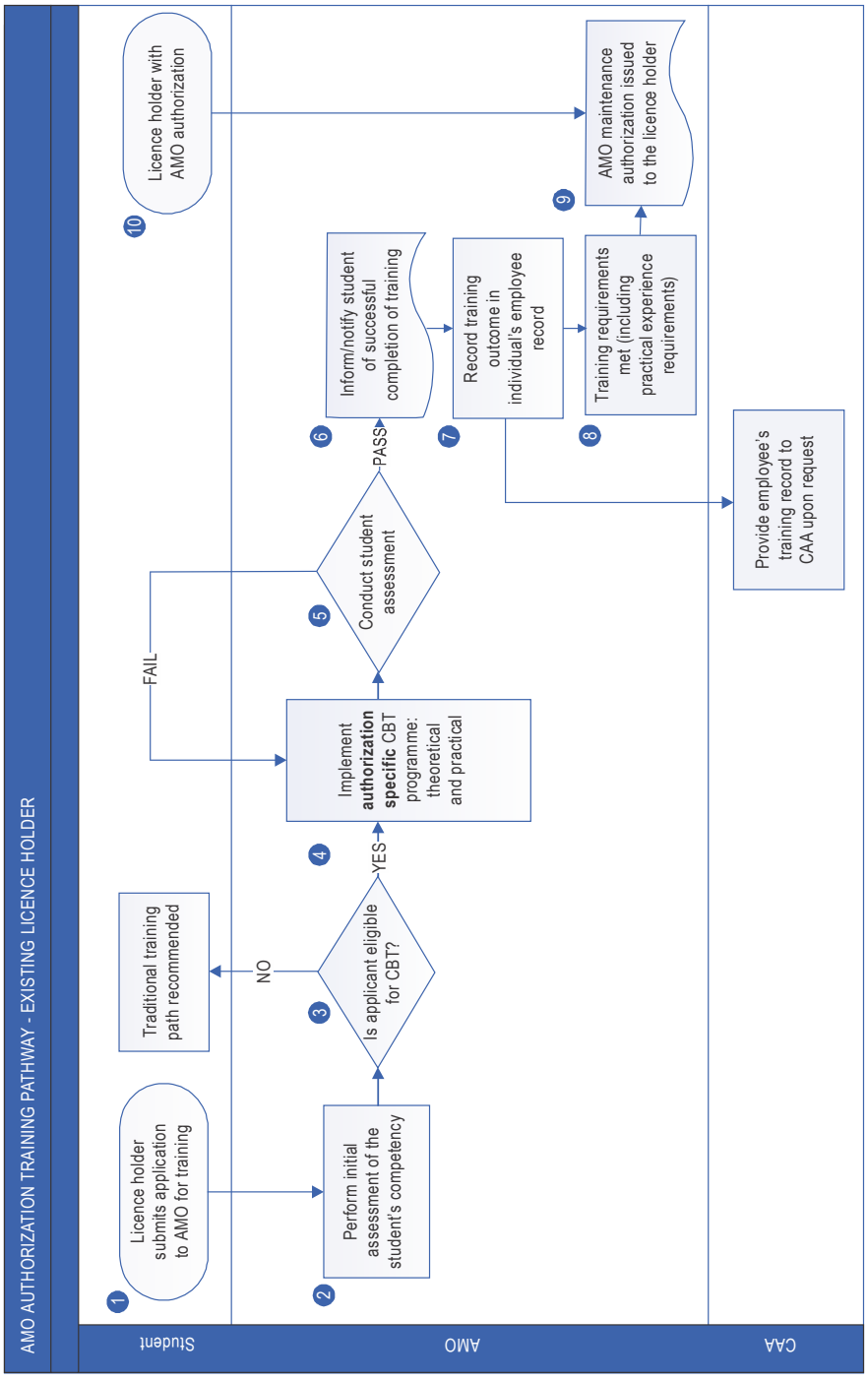

Figure 3-3. AMO certification authorization training pathway — existing licence holder (Example 3)

An explanation of the components that make up this workflow is outlined as follows:

1. *Licence holder submits application to AMO for training* — the individual submits an application to the AMO to undertake a specific training course.

2. *Perform initial assessment of the applicant's competency* — the AMO performs an initial assessment of the applicant's competency to determine gaps that may exist between the applicant's knowledge and the requirements for AMO certification authorization training.

3. *Is the applicant eligible for CBTA*?

    a) YES — move to next step in process; or

    b) NO — traditional training pathway recommended to the AMO employee.

4. *Implement certification authorization specific CBTA programme: theoretical and practical* — for additional guidance, refer to Chapter 3.

5. *Conduct student assessment:*

    a) PASS — move to next step in process; or

    b) FAIL — go back and repeat the elements of the certification authorization training CBTA programme that were failed and undertake a further final CBTA assessment.

6. *Inform/notify student of successful completion of training* — the AMO informs/notifies the student of the successful completion of the certification authorization of the specific training course.

7. *Record training outcome in student's employee record* — the AMO makes an entry into the student's employment record of successful completion of the training and provides the record to the CAA upon request.

8. *Training requirements met (including practical experience requirements)* — the CAA is satisfied that the student has successfully completed the theoretical and practical training aspects of the course, including any additional regulatory requirements for practical experience on aircraft related to the certification authorization.

9. *AMO certification authorization issued to the licence holder* — the AMO issues a certification authorization to the licence-holding employee in recognition that the individual has successfully completed a course of training appropriate to the scope of work for which that individual is authorized.

10. *Licence holder with AMO certification authorization* — the individual is the holder of a licence issued with a specific certification authorization by the AMO. The scope of work covered by the certification authorization is recorded against the individual's employment record and is aligned with the requirements of Annex 1.

Example 4. CBTA approach to training conducted by an AMO that leads to the issue of a *specialized certification authorization* to an employee who is not a licence holder.

Note.— Specialized certification authorization refers to certification authorizations for specialized tasks such as welding, non-destructive testing/inspection other than colour contrasts, surface treatment, heat treatment, fabrication of specified parts for minor repairs and minor modifications. Such specialized tasks are normally associated with specialized service(s) process specification and require particular skill and/or qualification.

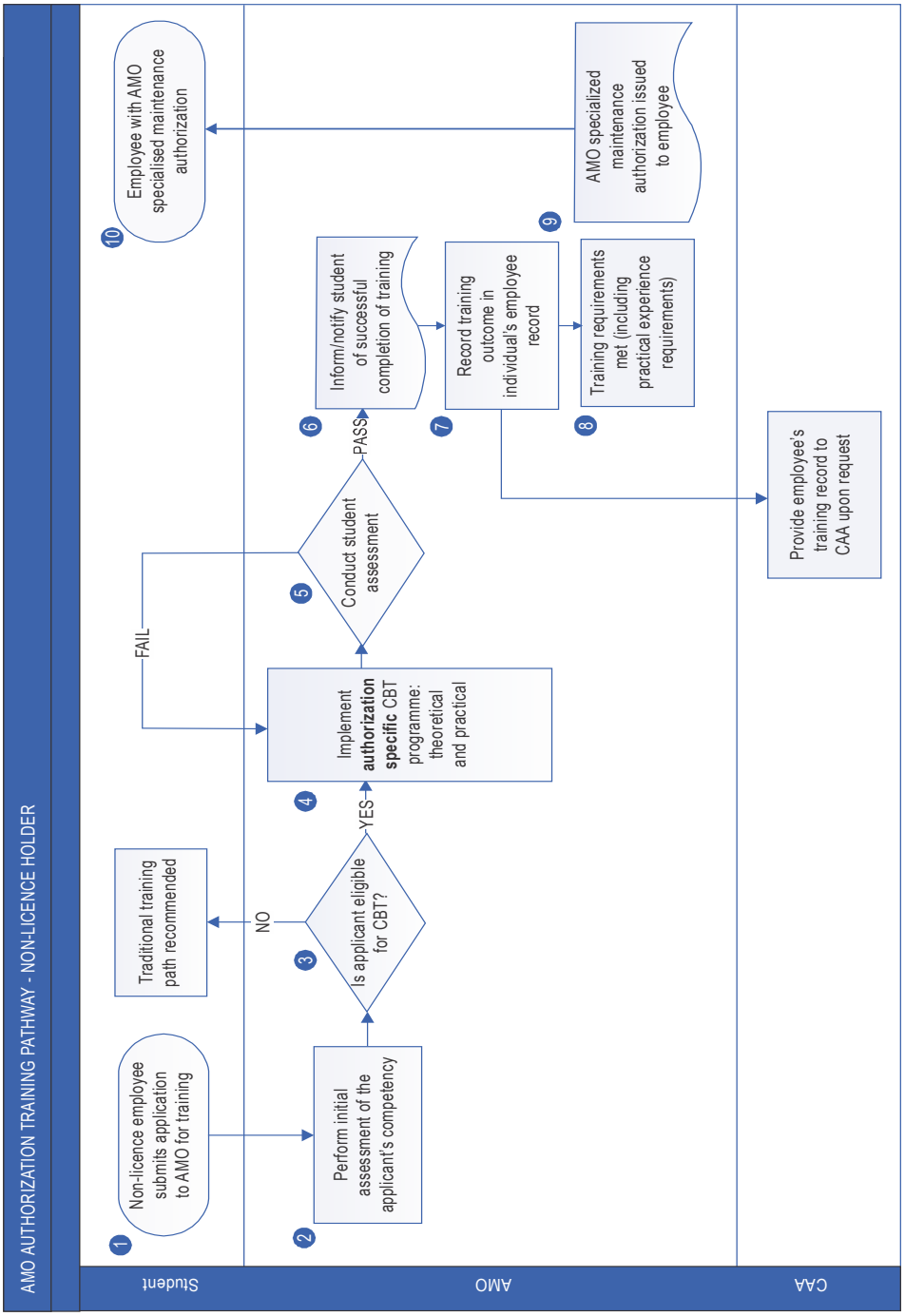

Figure 3-4. AMO certification authorization training pathway — non-licenced holder (Example 4)

An explanation of the components that make up this workflow is outlined as follows:

1. *Employee who is not a licence holder submits application to AMO for training* — the individual submits an application to the AMO to undertake a specific training course.

2. *Perform initial assessment of the applicant's competency* — the AMO performs an initial assessment of the applicant's competency to determine gaps that may exist between the applicant's knowledge and the requirements for AMO certification authorization training.

3. *Is the applicant eligible for CBTA*?

    a) YES — move to next step in process; or

    b) NO — traditional training pathway recommended to the AMO employee.

4. *Implement certification authorization specific CBTA programme: theoretical and practical* — for additional guidance, refer to Chapter 3.

5. *Conduct student assessment:*

    a) PASS — move to next step in process; or

    b) FAIL — go back and repeat the elements of the certification authorization training CBTA programme that were failed and undertake a further final CBTA assessment.

6. *Inform/notify student of successful completion of training* — the AMO informs/notifies the student of the successful completion of the certification authorization of the specific training course.

7. *Record training outcome in student's employee record* — the AMO makes an entry into the student's employment record of successful completion of the training and provides this record to the CAA upon request.

8. *Training requirements met (including practical experience requirements)* — the CAA is satisfied that the student has successfully completed the theoretical and practical training aspects of the course, including any additional regulatory requirements for practical experience on aircraft related to the specialist certification authorization.

9. *AMO certification authorization issued to the licence holder* — the AMO issues a specialist certification authorization to the employee in recognition that the individual has successfully completed a course of training appropriate to the scope of work for which that individual is authorized.

10. *Employee with AMO specialized certification authorization* — the individual is the holder of a specialized certification authorization issued by the AMO. The scope of work covered by the specialized certification authorization is recorded against the individual's employment record.

Chapter 4

COMPETENCY-BASED TRAINING AND ASSESSMENT — AIRCRAFT MAINTENANCE PERSONNEL REFRESHER TRAINING

4.1 GENERAL

This chapter provides guidance on refresher training for AMP using the CBTA approach. It also provides guidelines to AMOs or ATOs in the preparation and provision of refresher training for AMP. The objective of refresher training is to ensure that AMP maintains competency**.**

Note 1.— Refresher training and continuation training are considered the same in this manual.

Note 2.— CBTA may be used for refresher training applicable to AMP that have not used the CBTA approach before.

4.2 REFRESHER TRAINING MATERIAL

4.2.1 The CBTA approach described in this manual should be applied in the design and delivery of the training material for the refresher training required for AMP.

4.2.2 The purpose of refresher training is to review and reinforce existing AMP competencies and to ensure currency. It should be related to the rating and certification authorization of the AMP and conducted regularly. It may cover theoretical and/or practical training, which may be conducted through simulations or practical exercises.

4.2.3 Refresher training may vary according to different functions and applicable requirements. For example:

a) AMP may require general refresher training such as human factors, safety management system or company procedures training;

b) AMP who hold specific rating and certification authorization may require specific refresher training to maintain rating and certification authorization, such as electrical wiring interconnect system (EWIS), fuel tank safety or for a specific type; or

c) AMP who work in a specific job function may require refresher training related to their roles as inspectors, line maintenance, base maintenance or component repair personnel.

4.2.4 The CAA, AMO or the air operator may determine the frequency and duration of refresher training.

Chapter 5

COMPETENCY-BASED TRAINING AND ASSESSMENT LICENCES AND PRIVILEGES

5.1 GENERAL

This chapter provides material on the implementation of a competency-based approach training and assessment for personnel working in aircraft maintenance, including those with certification privileges. This material is complementary to those provided in the *PANS-TRG* (Doc 9868), Part III, Chapter 2. Furthermore, the material will be useful to CAAs responsible for approving AMO or ATO training programmes.

5.2 EXISTING AIRCRAFT MAINTENANCE LICENCES AND TRAINING PROGRAMMES

5.2.1 As aircraft maintenance includes a wide range of activities, AMP requires a wide range of competencies depending on the:

a) type and scope of work (line or base maintenance);

b) capability and structure of the maintenance organization (global vs local, pooling teams);

c) work environment.

5.2.2 Most Licensing Authorities issue aircraft maintenance licences as per one of the following maintenance function groups:

a) specific groups (e.g. airframe, engines, avionics, and aircraft systems); or

b) broad groups (e.g. line maintenance, base maintenance, shop maintenance and their special processes).

Within these groups, there may be additional subsets such as:

a) specific aircraft type rating; or

b) rating for a certain level or complexity of work (e.g. Level 1-2-3 or Level A-B-C).

5.2.3 Where AMP is required to hold a licence, training programmes are to follow the licensing requirements. Where AMP is not required to hold licences, training programmes are required to follow the minimum requirements of Annex 1.

5.3 LINK BETWEEN COMPETENCY-BASED TRAINING AND ASSESSMENT AND PRIVILEGES

5.3.1 As holders of licence and certification authorizations are granted privileges to perform maintenance tasks and be accountable for them, the competencies required to perform these maintenance tasks should form the basis of training, examinations and assessments.

5.3.2 The Licensing Authority or AMO is to ensure that an applicant for a particular licence and certification authorization, respectively, demonstrates the required set of competencies in relation to the privileges granted.

5.4 ISSUANCE OF LICENCES AND CERTIFICATION AUTHORIZATIONS

5.4.1 The Licensing Authority sets the standards for the issuance of licences in terms of contents, training and experience requirements, examinations and assessments, and administrative procedures. It may delegate some or all of these functions to designated personnel of AMOs or ATOs. Where certain functions may be delegated, procedures must be documented following the requirements of the Licensing Authority.

5.4.2 In order to obtain a licence or certification authorization, an applicant must demonstrate that the required competencies associated with the licence or certification authorization have been acquired through formal training (traditional, CBTA, etc.), practical experience, self-study or a combination of these methods.

Involvement of the Licensing Authority in CBTA

5.4.3 The scope, requirements and privileges of the AMP licence issued, its ratings and certification authorizations are to be stipulated in the Licensing Authority's regulations.

5.4.4 The Licensing Authority may delegate certain functions leading to the issuance of a rating or endorsement to designated personnel of AMOs under its jurisdiction and will exercise oversight over the designees' performance of delegated functions. AMOs will then issue those certification authorizations which reflect the scope of maintenance work performed by the organization.

5.4.5 The scope and privileges of the certification authorizations, as well as the prerequisites for their issuance, extension, currency, revocation, cancellation and renewal are subject to the approval of the Licensing Authority.

Involvement of ATOs in CBTA

5.4.6 An ATO conducting CBTA for AMP should follow the training programme approved by the CAA for the issuance of a licence. To obtain the approval, the ATO must have the necessary documentation, manuals and equipment to conduct the course.

5.4.7 The CAA or the AMO may delegate ATO personnel as assessors to conduct competency-based exams and assessments. The CAA is to specify all requirements for competency-based exams and assessments, including contents, delivery and achievement standards, and maintain oversight of the training and assessment processes.

Involvement of AMOs in CBTA

5.4.8 Applicants for a basic licence may work in AMOs to gain practical experience under the supervision of licensed personnel. In conjunction with self-study, distance learning or classroom training, these applicants may acquire the required competency to be assessed for the issuance of a licence by the Licensing Authority.

5.4.9 For an AMO seeking to provide training that will allow an acceptable means of compliance with the experience requirements established in Annex 1, the training, training programme, instructors and facilities should meet the requirements of an ATO. The training programmes are to be approved by the CAA.

5.4.10 A specialized maintenance certification authorization requires the AMO to have a certification authorization system according to the degree of specialization required by its personnel and related to its scope of work performed in the AMO. The privileges granted by the certification authorizations are based on documented procedures following the requirements of the CAA. The documented procedures should also include instructions on how competency-based examinations and assessments are performed to ensure that certification authorizations are granted to personnel who can execute the privileges according to the defined standards.

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Chapter 6

DEVELOPER, INSTRUCTOR AND ASSESSOR

6.1 GENERAL

6.1.1 This chapter describes the role of developers, instructors and assessors in a CBTA environment. All developers, instructors and assessors must have an understanding of the overall CBTA approach.

6.1.2 The instructors and assessors that use the adapted competency model, the training and assessment plan and the associated materials to implement a course must be competent to deliver CBTA.

6.2 INSTRUCTING AND ASSESSING THEORETICAL AND PRACTICAL TRAINING

6.2.1 One of the requirements of CBTA is for multiple observations to be conducted throughout a course or training session. As detailed in Chapter 2, there are usually two types of assessment that take place:

a) Formative assessments — Assessments that are a part of the learning process where instructors provide feedback to students on how they are progressing toward the interim or final competency standard and associated performance deficiencies; and

b) Summative assessments — Assessments that are used to establish if the interim or final competency standard has been achieved.

6.2.2 In the case of formative assessment, instructors need to be competent in teaching and assessing as they may be required to do both at the same time. The results of the assessment should be recorded and presented to the students. Such feedback may include positive aspects of the performance and opportunities for improvements.

6.2.3 In the case of summative assessments, there will be no further teaching as the objective is to determine if a standard has been met.

6.2.4 When assessments are conducted in an operational environment, the person responsible for safety must be identified. In most cases, this would be the person(s) conducting the assessment, but it may also be an additional instructor, a responsible person or an organization that is monitoring the safety but not conducting the assessment.

6.2.5 In a CBTA environment, the same person may instruct and perform assessments. The following section describes the general requirements for instructors and assessors to be able to do their job in such environment.

6.3 GENERAL REQUIREMENTS FOR INSTRUCTORS AND ASSESSORS

To instruct or assess in a CBTA environment, instructors and assessors should:

a) fully understand the principles of CBTA;

b) have detailed knowledge of the adapted competency model and assessment plan which may include multiple milestones with interim competency standards; and

c) use the tools and documentation that ensure a fair and objective assessment of interim and final competency standards (i.e. assessment (evidence) guides, competency checklists and competency assessment forms).

6.4 RESPONSIBILITIES AND QUALIFICATION OF COURSE DEVELOPERS

6.4.1 A course developer should be reliable, assertive, a team player and should have proficiency in the following:

a) communication;

b) instructional design;

c) course development; and

d) language in which the course is being developed.

6.4.2 In addition, course developers:

a) for non-aviation subjects (e.g. Mathematics, Physics, etc.) should have a related background to the required level or access to a subject matter expert;

b) for aviation maintenance subjects should have a relevant aviation background or access to a subject matter expert; and

c) should be familiar with human factors and aviation safety.

6.4.3 It is desirable that the course developers be familiar with the subject matter they are developing, including the appropriate training methods and tools, as applicable.

Note.— It is important that the course developers understand the CBTA process and can define learning objectives according to the TNA.

6.4.4 A course developer should be able to perform the following:

a) conduct analyses:

1) preliminary analysis;

2) job and task analysis; and

3) population analysis;

b) develop training material:

1) design curriculum;

2) define training objectives;

3) design mastery tests;

4) design modules;

5) determine the training strategy;

6) select training media;

7) produce CBTA materials; and

8) carry out developmental testing of CBTA materials; and

c) evaluate training material:

1) validate CBTA materials;

2) evaluate whether job performance objectives are met; and

3) evaluate whether organizational and operational objectives are met.

Note.— For additional information, refer to the PANS-TRG *(Doc 9868), Part I, Chapter 3.*

6.5 RESPONSIBILITIES AND QUALIFICATION OF COURSE INSTRUCTORS

6.5.1 An instructor should be reliable, assertive, sociable, a motivator, have the urge to learn and share knowledge, a team player and should have proficiency in the following:

a) communication;

b) language in which the course is being taught;

c) relevant knowledge for information technology (IT) used; and

d) if applicable, the ability to qualify for airport security clearance.

6.5.2 In addition:

a) instructors for non-aviation subjects (e.g. Mathematics, Physics, etc.) should have a related background to the required level; and

b) instructors for aviation maintenance subjects:

1) should possess applicable relevant experiences in a continuing airworthiness or aviation maintenance organization;

2) practical instructors should hold relevant licence and approval or an alternative qualification acceptable to the CAA; and

3) possess knowledge of human factors and aviation safety.

6.5.3 The instructors should be trained and/or qualified in the subject matter they are delivering, including appropriate training methods and tools, as applicable. They should also be trained in coaching, guiding and assisting students. It is important that the instructor understands the CBTA process, proactively support the learning process of students and can evaluate OBs.

6.5.4 An instructor should be able to:

a) deliver the intended CBTA training programme;

b) utilize fundamentals in training methodology;

c) apply basics and theory of learning and tutoring;

d) demonstrate mastery of the classroom;

e) instruct, tutor and facilitate;

f) employ new training technologies, including distance learning methods; and

g) use a learning management system (LMS).

Note.— For additional information, refer to the PANS-TRG *(Doc 9868), Part I, Chapter 3.*

6.5.5 Instructors should be appropriately trained to become competent in their subject area(s). The CBTA instructors should:

a) instruct according to CBTA training programme;

Note.— The training programme includes elements such as training and assessment plan, training materials, delivery methodology, etc.

b) understand the merits of, and provide timely and continuous feedback on student's performance;

Note.— Feedback is a vital component of learning that helps students progress toward the interim and final competency standards. Feedback may be positive to reinforce desirable performance, or it may be information about how the student's performance differs from the standard. Feedback should be supportive and timely, and the student should finish each session with a clear understanding of what the student will need to do to progress.

c) use the adapted competency model to diagnose the reason(s) for performance difficulties; and

Note.— The adapted competency model, particularly the performance criteria, helps the instructor to analyse a student's performance and identify which competencies may be lacking. For example, a student who is routinely feeling overloaded may show poor performance. Instead of focusing on correcting the overall poor performance, the instructor should consider identifying a wider number of possible performance issues with the aid of the adapted competency model that may affect the student's performance. Such issues may include:

1) failure to make use of the training tools and equipment to increase efficiency;

2) more focus on the use of the training tools and equipment rather than the training content; and

3) lack of familiarity with standard procedures.

d) manage issues related to OBs.

Note.— OBs identified in the adapted competency model are contained in Attachment J, Chapter 2. Instructors should use the assessment (evidence) guide to identifying OB issues to use the appropriate technique(s) to support students in acquiring or adjusting OBs.

6.6 RESPONSIBILITIES AND QUALIFICATION OF COURSE ASSESSORS

6.6.1 An assessor should be reliable, assertive, sociable, a motivator, have the urge to learn and share knowledge and should have proficiency in the following:

a) communication;

b) language in which the course is being taught;

c) relevant knowledge for IT used; and

d) if applicable, be able to qualify for airport security clearance.

6.6.2 In addition:

a) assessors for non-aviation subjects (e.g. Mathematics, Physics, etc.) should have a related background to the required level; and

b) assessors for aviation maintenance subjects should:

1) have applicable relevant experiences in a continuing airworthiness or aviation maintenance organization;

2) hold relevant licence and approval; and

3) have knowledge of human factors and aircraft safety.

6.6.3 Assessors must be trained and/or qualified in the subject matter they are assessing, including the appropriate assessment methods and tools, as applicable, in evaluation techniques, grading, guiding and assisting of students. It is important that the assessors understand the CBTA process and have the competency to assess OBs.

6.6.4 The assessor should be able to:

a) deliver and assess the intended CBTA assessment plan;

b) apply basics and theory of evaluating and grading methods;

c) demonstrate mastery of the assessment environment;

d) consider any safety aspects during assessment;

e) employ new assessment technologies; and

f) use LMS.

6.6.5 In a competency-based environment, the assessor should:

a) gather evidence of competent performance through objective observations by using the competency checklists; and

b) assess all the evidence to determine if the student's performance demonstrates that the student has acquired or maintained the competencies defined in the adapted competency model and training plan.

6.6.6 The assessor should submit all the competency checklists and completed competency assessment resulting from any examinations or other assessments to the ATO or AMO.

6.6.7 The assessor who is conducting assessment in a practical environment should:

a) be able to assess overall performance and concurrently evaluate the performance of separate competencies in line with the principles of the competency assessment outlined in Chapter 2, Section 2.7.4;

Note.— The assessor needs to evaluate if the student demonstrates an overall performance of the OBs as one of the competency requirements. In addition, if the performance is not at the defined competency standard, the assessor should identify and provide evidence for any inadequate student OBs. The assessor should use the evidence obtained to reach a substantiated conclusion about the practical performance of the student. See Attachment D to Chapter 2 for an example of the list of OBs associated with each adapted competency in the ICAO Adapted Competency Model to be used to evaluate practical performance of the student.

b) use the tools provided in the assessment plan; and

Note.— The assessment plan provides the assessment details, including the tools to be used to assess competency.

c) provide feedback to students in a manner that will aid their progress.

Note.— Being assessed can be a stressful experience for students, particularly in the case of summative assessments. Nonetheless, the assessor should be able to provide feedback to the students in a manner that encourages a positive mind-set and a willingness to continue to learn and make progress. In some instances, particularly where the performance is unsatisfactory, the assessor should take into account the sensitive aspect of delivering difficult messages to ensure that feedback is objective and substantiated for the students to understand how to improve performance.

— END —

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