



ICAO

Doc 10057

Manual on Air Traffic Safety Electronics Personnel Competency-based Training and Assessment

First Edition, 2017



Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION **Documents**



Document Sharing Hub

Downloaded from ICAO Doc 10057, 2017-01-01



| ICAO

Doc 10057

Manual on Air Traffic Safety Electronics Personnel Competency-based Training and Assessment

First Edition, 2017

Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION

Documents
Document Sharing Hub

Published in separate English, Arabic, Chinese, French, Russian
and Spanish editions by the
INTERNATIONAL CIVIL AVIATION ORGANIZATION
999 Robert-Bourassa Boulevard, Montréal, Quebec, Canada H3C 5H7

For ordering information and for a complete listing of sales agents
and booksellers, please go to the ICAO website at www.icao.int

**Doc 10057, *Manual on Air Traffic Safety Electronics
Personnel Competency-based Training and Assessment***
Order Number: 10057
ISBN 978-92-9258-177-0

© ICAO 2016

All rights reserved. No part of this publication may be reproduced, stored in a
retrieval system or transmitted in any form or by any means, without prior
permission in writing from the International Civil Aviation Organization.

AMENDMENTS

Amendments are announced in the supplements to the *Products and Services Catalogue*; the Catalogue and its supplements are available on the ICAO website at www.icao.int. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

[illegible][illegible]

10057 2017

TABLE OF CONTENTS

	<i>Page</i>
Foreword	(x)
Glossary	(xx)
Acronyms	(xx)
Publications	(xx)
Chapter 1. Introduction	1-1
1.1 Purpose	1-1
1.2 Context	1-1
1.3 ATSEP training phases	1-1
1.4 ATSEP training paths	1-1
1.1 Certificates of competence	1-1
Chapter 2. Developing a competency-based training and assessment programme for ATSEP	2-1
2.1 Introduction	2-1
2.2 Steps to develop ATSEP competency-based training and assessment	2-1
2.3 Assessment	2-1
2.4 Evidence guide	2-1
Chapter 3. Initial training phase	3-1
3.1 Introduction	3-1
3.2 Basic training module	3-1
3.3 Qualification training modules	3-1
Chapter 4. Unit training phase	4-1
4.1 Introduction	4-1
4.2 Training plan	4-1
4.3 Assessment plan	4-1
4.4 Unit training modules	4-1
Chapter 5. Continuation training	5-1
5.1 Introduction	5-1
5.2 Refresher training	5-1
5.3 Emergency training	5-1
5.4 Conversion training	5-1
Chapter 6. Development training	6-1

Appendix A. Developing ATSEP competency-based training and assessment: Examples	App A-1
Appendix B. Recommended training objectives for initial training	App B-1
Appendix C. Training objectives taxonomy	App C-1
Appendix D. Examples for development training	App D-1

FOREWORD

The Next Generation of Aviation Professionals (NGAP) initiatives were launched to ensure that sufficient numbers of qualified and competent aviation professionals will be available to operate, manage and maintain the future international air transport system. In May 2009, the NGAP Task Force was created and was instrumental in supporting the preparatory work for the NGAP Symposium conducted at ICAO from 1 to 4 March 2010. Among the outcomes drawn from the NGAP Symposium were:

- a) the need to develop regulatory frameworks that enable and support the use of modern training and learning technologies (competency-based training, evidence-based training and increased use of simulation) and that are not an obstacle to industry best practices; and
- b) the need to define competencies for all aviation activities affecting safety in order to facilitate, through the use of internationally agreed upon standards and assessment practices, the free-flow of professionals.

The effective performance of the air traffic management (ATM) system depends on competent and qualified ATM professionals. The ATM system is evolving towards a globally integrated and collaborative system. Air traffic safety electronics personnel (ATSEP) involved in the installation, operation and maintenance of the communication, navigation, surveillance/air traffic management (CNS/ATM) system must have a shared understanding of what is expected of them in terms of performance wherever they may work in order to support a globally interoperable system and to achieve optimum capacity within acceptable safety limits. This shared understanding becomes critical when considering the increasing traffic and the growing complexity and interconnectedness of the systems involved. As controller-pilot and system-to-system interfaces evolve, the ATSEP installing, operating and managing the CNS/ATM system need common competencies and practices to ensure seamless operations.

In February 2015, procedures for the implementation of competency-based training and assessment for ATSEP were included in the *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868). These procedures provide States, air navigation service providers (ANSPs) and training providers with guidance on how to structure their approach to training and assessment of ATSEP. The procedures provide a flexible framework that stakeholders can adapt to their local operational contexts and requirements.

Some of the provisions already included in the PANS-TRG are of a generic nature and can apply to all aviation functions including ATM personnel. The purpose of this manual is to provide additional guidance to the provisions of the PANS-TRG and support stakeholders in the successful implementation of competency-based training and assessment for ATSEP.

Comments concerning the manual should be addressed to:

The Secretary General
International Civil Aviation Organization
999 Robert-Bourassa Boulevard
Montréal, Québec Canada H3A 2R2

Downloaded from ICAO Doc 10057, 2017-01-01

GLOSSARY

DEFINITIONS

Approved training. Training conducted under special curricula and supervision approved by a Contracting State.

Assessment (evidence) guide. A guide that provides detailed information (e.g. tolerances) 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.

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

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

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

Competency unit. A discrete function consisting of a number of competency elements.

Performance criteria. Simple, evaluative statements on the required outcome of the competency element and a description of the criteria used to judge whether the required level of performance has been achieved.

Downloaded from ICAO Doc 10057, 2017-01-01

ACRONYMS

The following abbreviations are used in this document:

ACC	area control centre
ADS-B	automatic dependent surveillance — broadcast
ADS-C	automatic dependent surveillance — contract
AIP	aeronautical information publication
ANS	air navigation services
ANSP	air navigation service provider
ATC	air traffic control
ATCO	air traffic controller
ATM	air traffic management
ATS	air traffic services
ATSEP	air traffic safety electronics personnel
CNS	communication, navigation, surveillance
COM	communication
DF	direction finder
DME	distance measuring equipment
EMI	electro-magnetic interference
FAT	factory acceptance test
FIR	flight information region
GBAS	ground-based augmentation system
GNSS	global navigation satellite system
GPS	global positioning system
HHI	human-human interaction
HMI	human-machine interaction
IEEE	Institute of Electrical and Electronic Engineers
ILS	instrument landing system
IMS	integrated management system
LR	logging and reporting
LRM	lowest replaceable module
MLS	microwave landing system
MSSR	monopulse secondary surveillance radar
NavAid	navigation aid
NDB	non-directional beacon
OJT	on-the-job training
PO	position operation
QMS	quality management system
RF	radio frequency
RR	release and restoration
S/E	system/equipment
SAT	site acceptance test
SMC	system monitoring and control
SMS	safety management system
SS	site specific SMC task
SSR	secondary surveillance radar
TFI	technical flight inspector

(xii)

TRM	team resource management
UAC	upper area control centre
UHF	ultra high frequency
VHF	very high frequency
VOR	very high frequency omnidirectional radio range

PUBLICATIONS

(referred to in this manual)

Annexes to the Convention on International Civil Aviation

Annex 1 — *Personnel Licensing*
Annex 3 — *Meteorological Service for International Air Navigation*
Annex 10 — *Aeronautical Telecommunications*
Annex 11 — *Air Traffic Services*
Annex 14 — *Aerodromes*
Annex 19 — *Safety Management*

Procedures for Air Navigation Services (PANS)

Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444)
Procedures for Air Navigation Services — Training (PANS-TRG, Doc 9868)

Manuals

Aeronautical Surveillance Manual (Doc 9924)
Global Navigation Satellite System (GNSS) Manual (Doc 9849)
Human Factors Training Manual (Doc 9683)
Manual on Testing of Radio Navigation Aids (Doc 8071)
Performance-based Navigation (PBN) Manual (Doc 9613)
Safety Management Manual (SMM) (Doc 9859)

10057-2017

Chapter 1

INTRODUCTION

1.1 PURPOSE

1.1.1 This manual provides guidance to air navigation service providers (ANSPs) and training organizations on the development of air traffic safety electronics personnel (ATSEP) competency-based training and assessment programmes.

1.1.2 This chapter introduces concepts underlying the development of ATSEP competency-based training and assessment programmes.

1.2 CONTEXT

1.2.1 Regulatory environment

1.2.1.1 ATSEP are personnel proven competent in the installation, operation and/or maintenance of a communications, navigation, surveillance/air traffic management (CNS/ATM) system. It is the responsibility of the ANSP to define the scope of ATSEP activities (*Procedures for Air Navigation Services — Training* [PANS-TRG, Doc 9868] refers).

1.2.1.2 ATSEP play a significant role in the safe operation of CNS/ATM systems. All those involved in the development of competency-based training and assessment programmes for ATSEP should have a detailed understanding of the regulatory environment in which they work.

1.2.1.3 ATSEP training programmes should be clearly linked to ATSEP activities taking into consideration the ANSP's safety management and quality assurance systems as well as any security concerns.

1.2.1.4 National regulations may define the requirements with respect to age, knowledge, experience, skills and attitudes of ATSEP.

1.2.2 ATSEP scope of activities

1.2.2.1 ATSEP may perform tasks on a wide variety of CNS/ATM systems and equipment requiring a wide range of competencies, and expertise as well as knowledge and skills in electronics, computer sciences and networks. In addition, the ATSEP roles to be carried out may range from technician to high-level engineer.

1.2.2.2 Figure 1-1 illustrates the possible scope of ATSEP activities using as a basis the engineering life cycle from system conception through design, operation and, lastly, decommissioning.

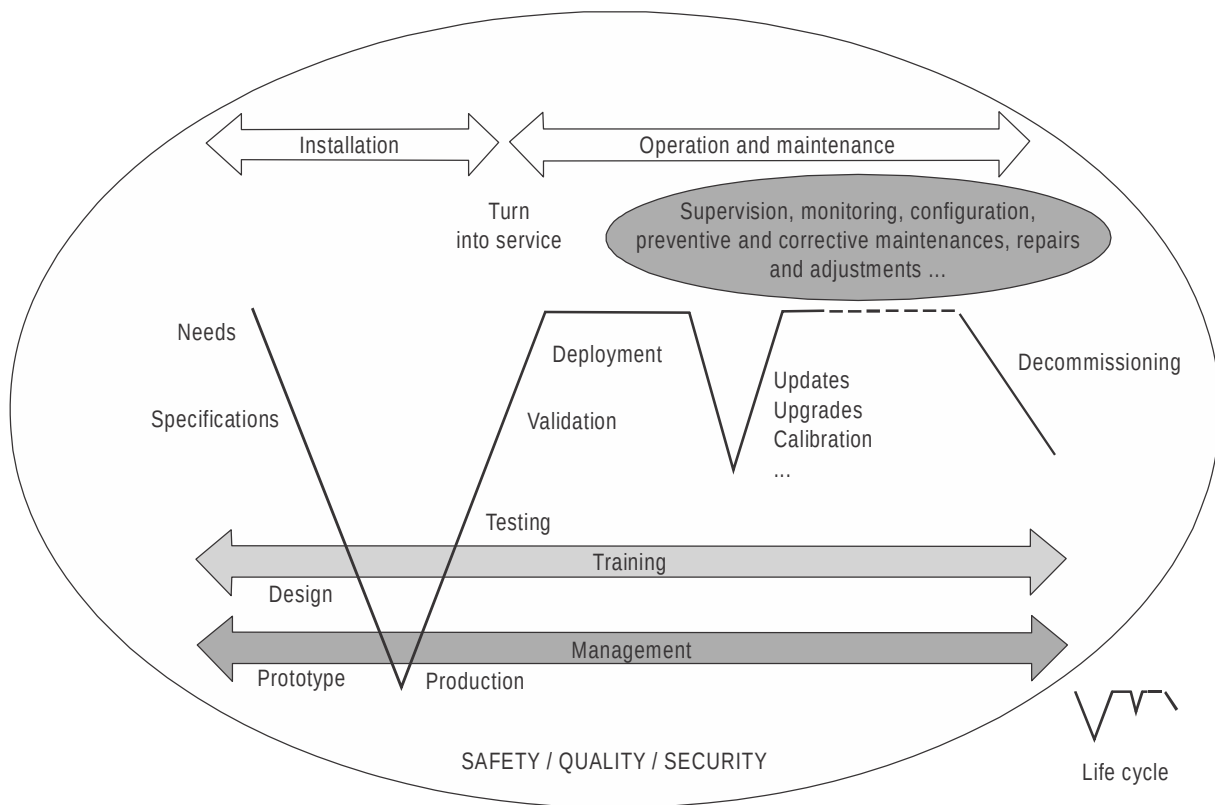


Figure 1-1. Scope of ATSEP activities

1.2.2.3 The ANSP is responsible for determining the scope of its ATSEP activities by selecting the activities from within the cycle depicted in Figure 1-1:

- a) **Scope of operational activities.** Supervision, monitoring, control and reporting in real time of technical services, supported by electronic systems and/or equipment for CNS/ATM.
- b) **Scope of maintenance activities.** Preventive maintenance, corrective maintenance and/or modification and updates of supporting electronic systems and/or equipment for CNS/ATM.
- c) **Scope of installation activities.** Project management, specification, conception, validation, integration, test and acceptance, safety assessment, calibration, certification, optimization and upgrade of supporting electronic systems and/or equipment for CNS/ATM, engineering activities.

1.2.2.4 In addition to technical activities, others may be added related to management, teaching or assessment, safety management, security management (e.g. networks) and quality management.

1.2.2.5 The degree of responsibility given to ATSEP varies among States and ANSPs. In all cases, the ATSEP must be proven competent to work on CNS/ATM systems or equipment ensuring safety and quality through a documented process.

1.2.2.6 Once an ANSP has determined the scope of ATSEP activities, it can establish ATSEP job descriptions comprised of identified tasks.

1.2.2.7 With the introduction of new technologies, maintenance methods and design processes, States and ANSPs should regularly review the scope of ATSEP activities to ensure that ATSEP maintain competencies appropriate to their current activities and with an eye to future activities. Training programmes should be focused on the specific activities assigned to ATSEP within an ANSP.

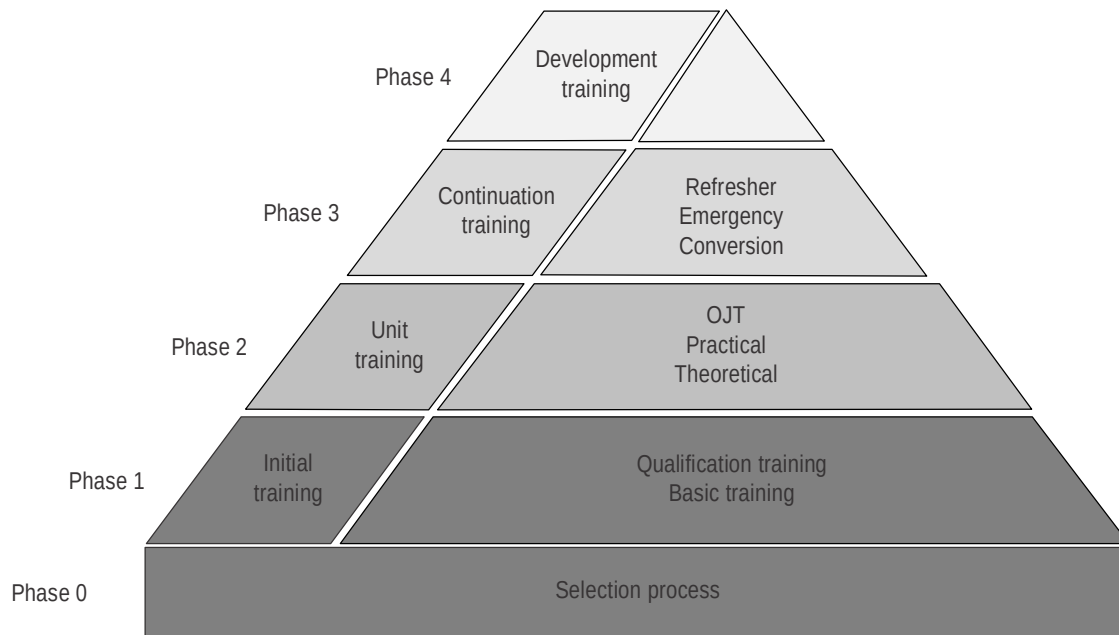


Figure 1-2. ATSEP training phases

1.3 ATSEP TRAINING PHASES

1.3.1 To ensure global standardization, it is recommended that ATSEP training be organized in the phases illustrated in Figure 1-2:

a) **Phase 0: Selection**

The selection process is not a training phase. However, the ANSP will select candidates in line with its ATSEP profiles and activities.

b) **Phase 1: Initial training**

Initial training is designed to provide underpinning knowledge and skills and is delivered in two parts: basic training applicable to all ATSEP and qualification training specific to ATSEP profiles.

c) **Phase 2: Unit training**

After successfully completing the initial training phase, ATSEP undergo unit training. This phase is oriented to the activities an ATSEP will perform in a specific environment. Unit training addresses theoretical and practical issues from equipment-specific and/or site-specific perspectives. It includes on-the-job training (OJT). It is in this phase that ATSEP competencies are developed and assessed.

d) **Phase 3: Continuation training**

The continuation training phase is designed to maintain competencies and prepare for system upgrades and/or modifications. It includes refresher, emergency and conversion training.

e) **Phase 4: Development training**

This phase focuses on the development of additional competencies required by a change to or an evolution of an ATSEP's profile.

1.3.2 The ATSEP competency framework can be found in the PANS-TRG.

1.4 ATSEP TRAINING PATHS

1.4.1 ATSEP will go through training at different points in their careers. Typically, ATSEP will progress from the selection phase to the completion of the unit training phase. In order to maintain competency, they will go through the continuation training phase. Additionally, an ATSEP will require training when:

- a) There is a change within a system on which the ATSEP is already working. This is addressed through continuation training (see Chapter 5).
- b) The ATSEP changes domains (e.g. from navigation to surveillance). This is addressed through either initial training or unit training (see Chapter 3, 4).
- c) A change of activities and associated competencies (e.g. change from maintenance operations to system implementation) is addressed through development training (see Chapter 6).
- d) Any additional system to be operated by an ATSEP is addressed through unit training (see Chapter 4).

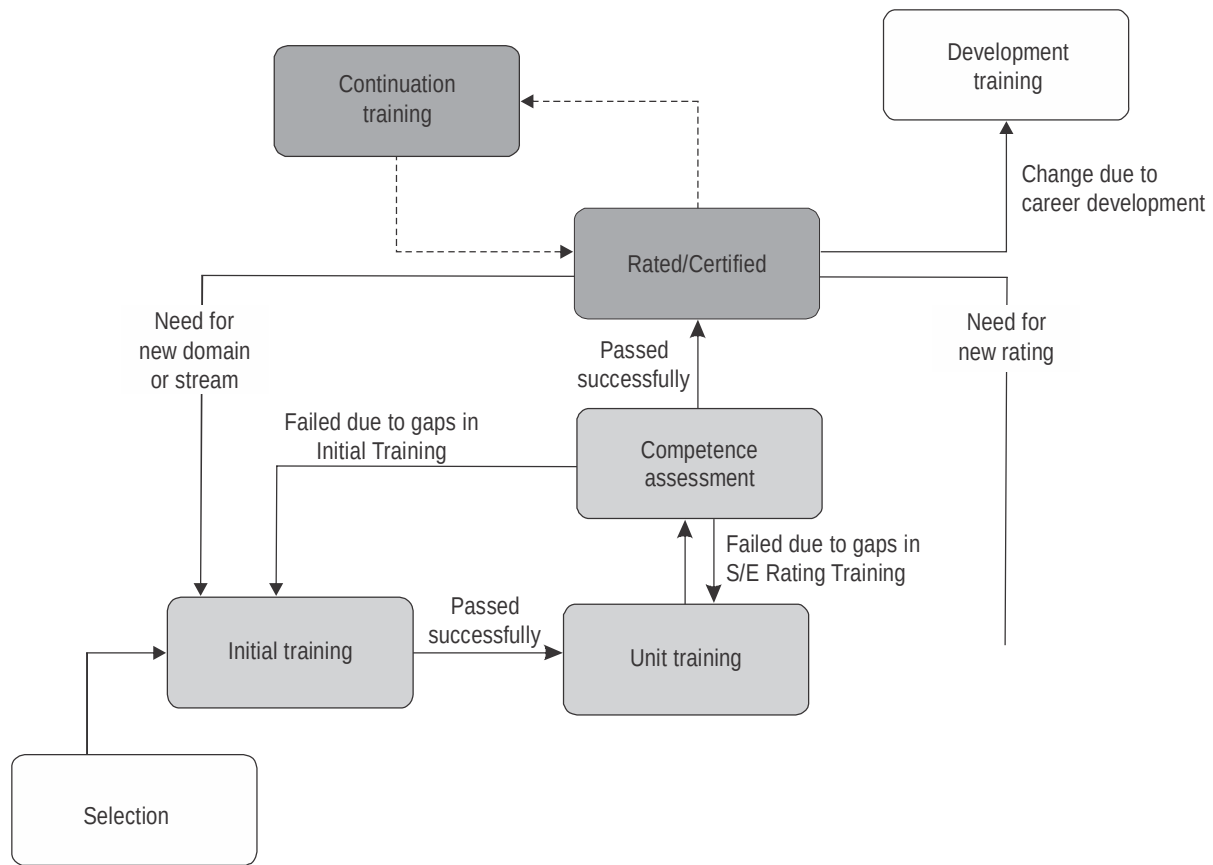
1.4.2 The progression through ATSEP training is illustrated in Figure 1-3.

1.5 CERTIFICATES OF COMPETENCE

1.5.1 Certificates of competence can take several forms such as:

- a) a license delivered by an authority;
- b) a certificate delivered by an ANSP or training organization/academy; and/or
- c) a diploma/academic degree delivered by an accredited educational institution.

1.5.2 Certificates of competence may be valid for a predetermined period. An ANSP should collect and maintain evidence that its ATSEP are competent to perform the activities assigned to them.

**Figure 1-3. ATSEP training progression**

Chapter 2

DEVELOPING A COMPETENCY-BASED TRAINING AND ASSESSMENT PROGRAMME FOR ATSEP

2.1 INTRODUCTION

2.1.1 PANS-TRG describes procedures for the design of a competency-based training and assessment programme including those for ATSEP. This chapter builds on these procedures and provides guidance to ANSPs and training organizations on steps to develop an ATSEP competency-based training and assessment programme.

2.1.2 Appendix A provides detailed examples of these steps for two different fictitious ANSPs.

2.2 STEPS TO DEVELOP ATSEP COMPETENCY-BASED TRAINING AND ASSESSMENT

2.2.1 This chapter outlines four steps in the development of an ATSEP competency-based training and assessment programme.

- a) Step 1 — Define profiles and activities within the ANSP's predetermined ATSEP scope and develop job description(s);
- b) Step 2 — Associate initial training modules to the ATSEP job objective as identified in the job description;
- c) Step 3 — Associate competency units, competency elements and performance criteria to the ATSEP tasks; and
- d) Step 4 — Develop training and assessment plans for unit training.

It is recognized that training and assessment plans should be developed for all training phases. However, Step 4 focuses specifically on unit training.

2.2.2 ***Step 1 – Define profiles and activities within the ANSP's predetermined ATSEP scope and develop job description(s)***

2.2.2.1 At the completion of this step, an ANSP should have grouped activities under ATSEP profiles in a way that suits the ANSP's needs and environment. Chapter 1 describes at a high level how an ANSP can identify the scope of its ATSEP operational, maintenance and installation activities and how this results in the development of ANSP-specific ATSEP profiles with corresponding job descriptions. The outcome of Step 1 can be used for many human resources functions including competency-based training and assessment.

2.2.2.2 ANSPs can group ATSEP activities by determining the activities that are conducted inside the organization by ATSEP, inside the organization by non-ATSEP and outside the organization by ATSEP. The composition of these groups will effectively define the scope of ATSEP activities within an ANSP.

2.2.2.3 These activities can be derived from operations manuals, equipment manuals, and/or manufacturer's documentation, if available. If these are not available, the ANSP should use the opportunity provided by the implementation of ATSEP competency-based training and assessment to develop or make available these documents. In small ANSPs, there can be a single ATSEP profile, while in large ones there may be several ATSEP profiles. These ATSEP profiles provide the basis of ATSEP job descriptions.

2.2.2.4 ATSEP activities can generally be grouped under installation, operation and maintenance. Groups of activities may be expanded or combined depending on the local ANSP environment.

2.2.2.5 The selection process and all phases of training are based on the ANSP-specific ATSEP profiles. ATSEP profiles are living documents: they should be adjusted continually to effectively address an ANSP's organizational needs. These updates may result in changes to the selection criteria, and to the training and assessment plan.

2.2.3 ***Step 2 – Associate initial training modules to the ATSEP job objective as identified in the job description***

2.2.3.1 The purpose of initial training is to provide the underpinning knowledge and skills that ATSEP will need to achieve the job objective in accordance with the job description that the ANSP has developed in Step 1. At the completion of Step 2, ANSPs or training organizations will have identified the training modules of the initial training phase corresponding to the ATSEP job objective.

2.2.3.2 Initial training is made up of basic training and qualification training. This manual details recommended basic and qualification training modules in Appendix B. An ANSP or training organization should use as a starting point the job objective and identify which training modules in Appendix B apply. The knowledge and skills acquired through the initial training modules should have a clear link to the tasks the ATSEP will perform and the competencies they will need to demonstrate on the job.

2.2.3.3 Assessment at this stage will normally be conducted using assessment tools such as multiple choice questions, written/oral examinations, and practical examinations. At this stage, the evidence guide used for competency assessment would not be required as competencies are usually demonstrated during the unit training phase.

2.2.4 ***Step 3 – Associate competency units, competency elements and performance criteria to the ATSEP tasks***

2.2.4.1 Once this step is completed, ANSPs and training organizations will have identified and adapted the relevant competency unit, competency elements and performance criteria required for the ATSEP to perform their tasks. With all of these elements, the ANSPs will have a clear view of what tasks their ATSEP should perform and what competencies they should demonstrate in the operational environment.

2.2.4.2 ANSPs and training organizations can find the ICAO ATSEP competency framework in the PANS-TRG and should use it as a reference for this step. The ICAO competency framework should be adapted to suit the ATSEP tasks identified by the ANSP. These competencies are structured in competency units, competency elements and performance criteria. See Appendix A for detailed examples.

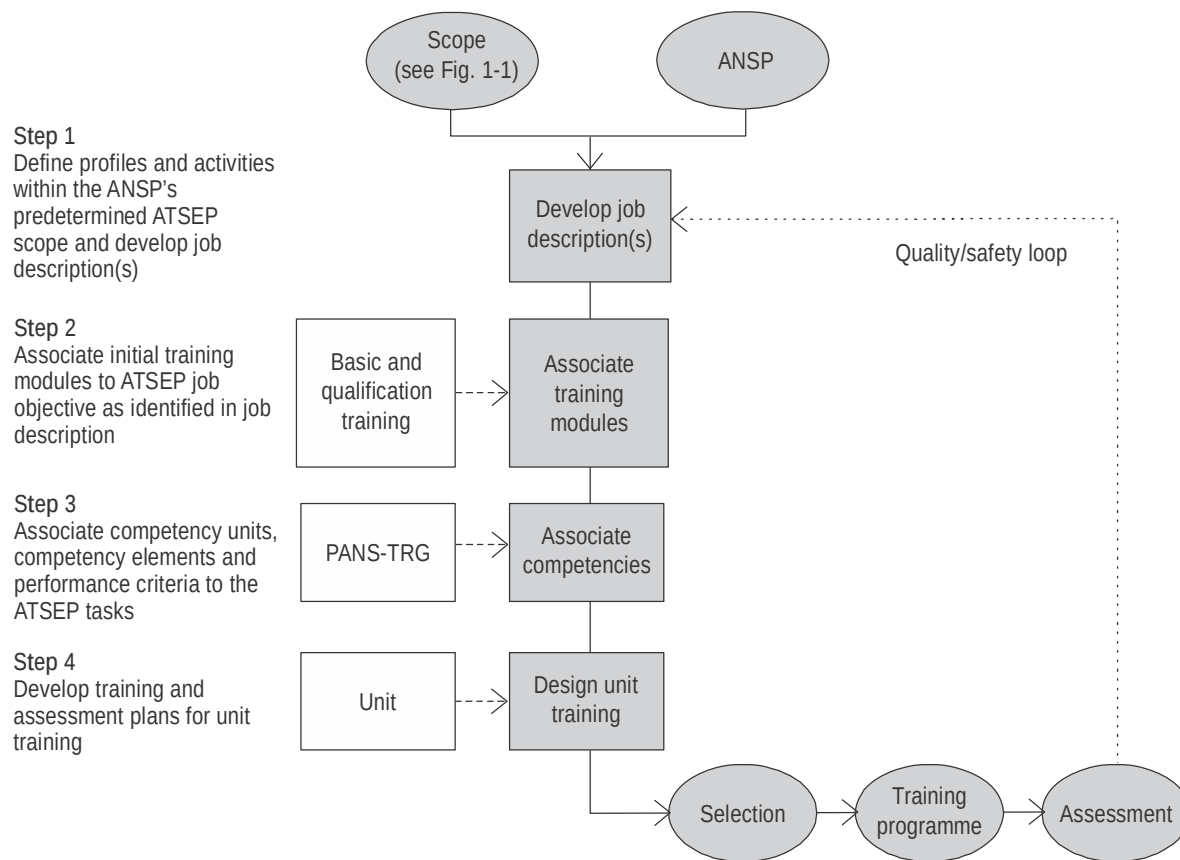


Figure 2-1. Process to design competency-based ATSEP training

2.2.5 Step 4 – Develop training and assessment plans for unit training

2.2.5.1 At the completion of this step, ANSPs and training organizations will have developed a training plan based on the tasks and an assessment plan based on the performance criteria identified previously. This phase combines training specific to the system or equipment and will usually include site and on-the-job training. In unit training, trainees have to demonstrate the successful performance of the tasks, including:

- a) knowledge of the local environment and relevant procedures;
- b) practical skills related to the local environment, system and equipment; and
- c) competencies identified as necessary for the ATSEP profile for the unit.

2.2.5.2 A unit training and assessment plan for each ATSEP job description should be developed.

2.2.5.3 The training plan is a document used for structuring, developing and delivering training. The purpose of the training plan is to detail the following:

- a) composition and structure of the unit training course;
- b) syllabus;

- c) modules, training events and their delivery sequence; and
- d) course schedule.

2.2.5.4 Training designers will use the training plan to develop the training and assessment materials.

2.2.5.5 When the duration or the complexity of unit training is such that it makes pedagogic sense to check that a trainee is progressing towards competence at an acceptable pace, the course may be divided into milestones. Milestones are cohesive building blocks of learning that are organized into a logical sequence that generally progresses from the simple to the complex. Each milestone is comprised of both training and assessment(s). Milestones build on one another; therefore a trainee would need to successfully complete the training and assessment for the first milestone before proceeding to the next one.

2.2.5.6 On successful completion of unit training, trainees will have achieved the final competency standard. They will have successfully completed all the required training and assessments that have been determined as necessary to demonstrate the competencies and meet the performance criteria as described in the competency framework of the ATSEP.

2.2.5.7 If unit training has been divided into milestones, it will be necessary to define an interim competency standard for each milestone. For practical assessments, this may be achieved by:

- a) modifying the conditions and/or standards of accomplishment; and
- b) stating the degree of achievement expected for each performance criterion.

2.2.5.8 An interim competency standard is achieved when all the required assessments for that milestone have been successfully achieved.

2.2.5.9 In unit training, the training plan should identify the relevant training objectives for the activities that the ATSEP will perform on the system or equipment of the operational unit. For identical activities, the training plan may be re-used for different ATSEP. Where an ANSP has a generic ATSEP job description, training plans become generic as well but may be adapted taking into account prerequisite knowledge, skills, competencies and experience.

2.2.5.10 Training materials include the course schedule, training notes, case studies, exercises, briefings, presentations, video clips, etc. Training organizations typically have their own practices for this development process.

2.2.5.11 The purpose of the assessment plan is to detail how competence is going to be determined during unit training based on the performance criteria. It supports the principles of assessment in a competency-based environment. The assessment plan details:

- a) the final competency standard associated with the final milestone;
- b) the interim competency standard associated with each milestone (if required);
- c) the list of assessments (e.g. questionnaire, practical examination demonstration, written or oral examinations, test on position, test in simulation) that are required for each of the milestones that have been defined;
- d) when these assessments should take place;
- e) the pass marks for oral and written assessments, examinations and questionnaires;

- f) the number of observations required, at the interim and final competency standard, to assess performance; and
- g) tools used to collect evidence during practical assessment.

2.2.5.12 It is assumed that the organization has a training and procedures manual that describes the administrative procedures relating to:

- a) which personnel may conduct assessments and their qualifications;
- b) roles and responsibilities of personnel during the conduct of assessments;
- c) assessment procedures (preparation, conduct and post-assessment);
- d) conditions under which the assessment is undertaken;
- e) record-keeping; and
- f) actions to be taken when a trainee fails to meet the requirements of the assessment.

2.3 ASSESSMENT

2.3.1 Table 2-1 describes the principles that should drive competency-based assessments.

Table 2-1. Principles of competency-based assessments

Clear criteria for assessing competence	This is established using the ICAO ATSEP Competency Framework adapted to meet local requirements as detailed in Appendix 2 to Chapter 3 of the PANS-TRG, Second Edition.
An integrated performance of the competencies	This requires a demonstration by the trainee undergoing training and/or assessment of the seamless interaction of the competencies with each other. The assessment of whether or not the trainee has reached the competency required can only be made once all of the required competencies are demonstrated in an integrated manner.
Valid and reliable evidence	Documented guidelines of the performance to be observed and the conditions under which they are to be observed enables the same assessment result to be achieved by different assessors.
Multiple observations	Multiple observations must be carried out to determine whether or not a trainee has achieved the final or interim competency standard.

2.3.2 Assessment is an integral part of the competency-based training process. For the ATSEP, assessments provide incentive and motivation, and confirm that learning and competence have been achieved. From the instructor's point of view, assessment demonstrates if training objectives have been met. Performance during assessments also indicates whether the instruction methods used are effective or should be improved. The sole purpose of assessments is to measure whether or not the ATSEP trainee has achieved the training objectives and the relevant competencies.

2.3.3 ATSEP should always be informed as to how they will be assessed. The information should include the conditions that will exist during the assessment, the performance that is expected from the ATSEP and the standards of accomplishment that have to be met. ANSPs and/or authorities should have in place processes to deal with assessment failures. ATSEP should be informed of the result of their assessments, and instructors should offer feedback on how to correct a mistaken response or unsatisfactory practical performance.

2.3.4 The assessment plan should describe the process and tools that will be used to determine how an ATSEP's performance compares to the performance criteria. This evidence is needed to demonstrate that the ATSEP has attained the required competencies and also to provide 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.

2.3.5 Once an ATSEP has demonstrated the required performance, it is necessary to maintain this level of performance and therefore maintain competency. Continuation training is a mechanism for ensuring competencies are maintained, and therefore a continuation training plan is required. The plan will be influenced by many factors, e.g. activity exposure, technical developments, new procedures or changes in the profile. Chapter 5 contains more information about continuation training.

2.3.6 As part of a safety and/or a quality management system, a process to benchmark, maintain and improve the efficiency and quality of training is required. A continuous feedback system gathering data from trainees, instructors, assessors, ANSPs and organizations should be implemented. The feedback system may use different methods (e.g. written feedback, moderated feedback) and technologies (e.g. handwritten, electronic). Any feedback should be documented and traceable.

2.3.7 Training objectives should indicate the conditions under which ATSEP performance will be performed and assessed and the standard of accomplishment that must be attained. For basic and qualification training, only the standard of accomplishment of training objectives should be achieved. In unit training, trainees should not only meet the standard of accomplishment, but also the competency standards associated with their job description.

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

- a) unique and/or multiple choice questionnaire;
- b) written and/or oral examination;
- c) practical examination (demonstration);
- d) test on position; and
- e) test in simulation.

2.3.9 Assessments should take into account the taxonomy level related to the training objective. The taxonomy levels are described in Appendix C.

2.3.10 Where possible, States or ANSPs should build an examination question repository or at least a comprehensive written list of all questions and performance exercises. Due to the rapid evolution of technology and systems, these questions and performance exercises must be kept up to date to ensure the currency of the ATSEPs' knowledge and skills.

2.4 EVIDENCE GUIDE

An evidence guide provides practical examples of what can be observed for given competency and performance criteria in certain conditions. The evidence guide also provides the criteria for assessment at the interim or final competency standard. It ensures that instructors and assessors interpret performance criteria consistently and that valid and reliable evidence is gathered.

Appendix A provides an example of an evidence guide.

2.4.1 Competency Checklist

A competency checklist is used to record evidence of multiple observations at different milestones during training. A sufficient number of checklists should be collected to ensure that the trainee demonstrates a consistent and integrated performance of competencies.

2.4.2 Assessment Form

The assessment form details the competencies and conditions for the assessment of performance. The assessment outcome is *competent* or *not competent* for the assessment undertaken.

Chapter 3

INITIAL TRAINING PHASE

3.1 INTRODUCTION

3.1.1 The purpose of this chapter is to describe the modules considered necessary for initial training. Initial training provides underpinning knowledge and skills and is delivered in two parts: basic training applicable to all ATSEP and qualification training specific to ATSEP profiles as described in Chapters 1 and 2.

3.1.2 During this phase, ATSEP acquire the knowledge and skills required to subsequently undertake unit training. Initial training materials can be enhanced by including examples to illustrate real-life situations and using available systems and equipment. Training objectives can be added as required.

3.1.3 Section 3.2 describes the components of the basic training module and Section 3.3 of the qualification training modules. Proposed training objectives for these modules can be found in Appendix B.

3.2 BASIC TRAINING MODULE

3.2.1 All ATSEP should successfully complete basic training. At the end of basic training, trainees should have acquired general knowledge regarding:

- a) international and national organizations and standards;
- b) air traffic services, airspace standards, aeronautical information systems, meteorology and altimetry;
- c) CNS/ATM concepts; and
- d) human factors.

3.2.2 The training organization should ensure that ATSEP successfully achieve all basic training objectives before proceeding to the qualification training modules. Each training objective should be associated with a condition and a standard of accomplishment. A condition refers to anything that may qualify performance in the local environment. The standard of accomplishment relates to the taxonomy level identified for the training objective. See Appendix C.

International and national organizations and standards

3.2.3 CNS/ATM systems operations are regulated by international organizations that provide rules and standards to ensure the safe operation and interoperability of ANS worldwide. Among these organizations are ICAO, the European Civil Aviation Conference (ECAC), the European Aviation Safety Agency (EASA) and the Institute of Electrical and Electronic Engineers (IEEE). Achievement and maintenance of safety and efficiency in air navigation operations depend on the standardization of operational practices for international services. The syllabus should give a general view on aviation regulations as adopted by ICAO and implemented in international ANS operations.

Air traffic services, airspace standards and meteorology

3.2.4 CNS/ATM systems are vital to the safe, reliable and efficient delivery of air traffic services. ATSEP perform critical tasks on CNS/ATM systems or equipment which impact users. In order for ATSEP to fully understand the impact of their work on these systems, they must have a sound knowledge of the ATM operational environment. The consequences of system outages and their negative impact on users (i.e. pilots, air traffic controllers) may result in unsafe situations or cause excessive delays in airline operations.

CNS/ATM concepts

3.2.5 The ATSEP's main activities are to maintain, modify, repair and develop CNS/ATM systems, while keeping them fully operational and safe. The consequences of system outages and their direct impact on the users (i.e. pilots, air traffic controllers) may result in unsafe situations or cause excessive delays in airline operations. The syllabus gives a general view of these concepts, including power distribution.

Human factors

3.2.6 Lapses in human performance are cited as causal factors in the majority of accidents. A better understanding and knowledge of human factors in ATSEP work can potentially decrease the accident rate. This module introduces ATSEP to fundamental human factors concepts in ANS.

3.3 QUALIFICATION TRAINING MODULES

3.3.1 Following the successful completion of basic training, ATSEP will require qualification training relevant to the ATSEP profile for a given ANSP.

3.3.2 At the completion of the qualification modules, ATSEP must be able to explain the purpose of each system, each piece of equipment and its technical specifications. They must also be able to explain the effect and impact on the service when these systems or equipment are being worked on.

3.3.3 The training objectives for the qualification modules listed below are described in Appendix B. Each training objective should be associated with a condition and a standard of accomplishment. The training objectives should include in their conditions, as appropriate, a laboratory environment, exposure to specific equipment as well as access to appropriate training materials, reference documentation, test equipment and tools.

3.3.4 The training organization should ensure that ATSEP successfully achieve all training objectives in accordance with the standard of accomplishment and the approved standards and procedures.

3.3.5 Finally, ATSEP must understand the impact of their work on the users and on the overall ANS communication system.

Communication module

3.3.6 Communication systems provide a means of relaying essential information for the safe and orderly operation of the ANS. Communication involves much more than radio transmitters and receivers; it also includes communication protocols, networks, types of media, recorders and safety aspects.

Navigation module

3.3.7 Radio navigation systems provide a means of relaying essential information for the safe and orderly operation of the ANS. Radio navigation systems can be located anywhere on the airport, in its vicinity, at a great distance from the airport, or can be satellite-based systems.

Surveillance module

3.3.8 An aeronautical surveillance system provides the aircraft position and other essential information to ATM and/or airborne users to assist their safe and orderly operation. Surveillance systems can be located anywhere on the airport, in its vicinity, or at a great distance from the airport.

3.3.8.1 ATSEP should meet the standard of accomplishment whereby all maintenance, calibration and certification should be performed as per the approved standards and procedures.

Data processing/automation module

3.3.9 Data processing/automation systems provide the means of relaying essential information for the safe and orderly operation of ANS. Data processing/automation includes a combination of hardware platforms and operating system software. Proper hardware and software configurations are essential for a safe and orderly ANS. Data processing/automation systems can be located anywhere at the area control centre (ACC), on the airport, or in its vicinity, or remote from the ACC or airport.

System monitoring and control (SMC) module

3.3.10 The implementation of CNS/ATM systems and equipment has led to new ways of providing SMC. Most ANSP have centralized the SMC functions within a geographical area, typically the flight information region (FIR) or the area of responsibility. Many ACC/UAC have an SMC suite or position staffed by qualified SMC ATSEP. In other cases SMC suites or positions for CNS systems and equipment are centralized. Both options may co-exist. The SMC ATSEP are responsible for the day-to-day operation (normally 24 hours per day, 7 days per week) of all operational systems and equipment within their area of responsibility. The SMC ATSEP ensure a quick response to malfunctions or failures by diagnosing the problem, activating fall-back procedures and initiating the repair. The SMC ATSEP coordinates between the operational air traffic controller (ATCO) supervisor and the operational CNS/ATM ATSEP within the area of responsibility. The SMC ATSEP also coordinates between those responsible for different areas.

3.3.10.1 Training for the SMC ATSEP should emphasize the requirement to communicate appropriately with all relevant stakeholders such as the ATCO supervisor, rescue units, military units or others. Thus, training should address team resource management (TRM), human-machine interaction (HMI) and human-human interaction (HHI) skills.

3.3.10.2 SMC ATSEP activities can be categorized in a generic list. To complete each of these activities, ANSPs should describe site procedures, identify the activities in each of the areas of responsibility and number them. The following naming conventions should be used to categorize SMC activities:

- a) LR — logging and reporting;
- b) MC — monitor and control;
- c) RR — release and restoration;

- d) PI — problem isolation and service restoration;
- e) PO — position operation; and
- f) SS — site specific SMC tasks.

Note that based on Step 1 identified in Chapter 2, not all categories need to be served by the same SMC ATSEP or even by an SMC ATSEP as such.

3.3.10.3 The SMC qualification module will be developed, implemented and delivered based on the activities identified by the ANSP. Trainees shall perform SMC activities in accordance with approved procedures and apply TRM, HMI and HHI concepts.

3.3.10.4 Training objectives related to the SMC qualification module should include in their conditions exposure to specific SMC equipment equal to or representative of the SMC environment, as well as reference documentation and tools. Alternatively, simulation or scenarios could be used to enable the performance of the objective without the need for operational equipment. In addition, the performance of training objectives should be achieved in specific situations relating to an FIR/ACC. This module should include exercises on applied standards and procedures, as well as operational practices.

Infrastructure module

3.3.11 Infrastructure equipment and systems play a vital role in the operation of CNS/ATM systems and consequentially in the safe and orderly operation of ANS. The integrity and reliability of CNS/ATM systems depend on the quality, availability, capacity and reliability of electrical power supply sources, equipment and systems.

3.3.11.1 ATSEP must understand the impact of their work on the users and on the overall CNS/ATM power supply system.

3.3.11.2 Training objectives related to the infrastructure qualification module should include in their conditions that performance should be achieved in a laboratory environment, given an exposure to specific power supply equipment along with the appropriate and pertinent reference documentation, test equipment and tools.

Engineering module

3.3.12 Most States have regulatory requirements for ensuring that CNS/ATM systems and equipment are specified, researched, designed, developed, tested, validated and installed by qualified ATSEP. Generally, ANSPs establish a distinct group of specialized ATSEP who are responsible for the engineering and the installation of all CNS/ATM systems and equipment.

3.3.12.1 The engineering module will be developed, implemented and delivered in compliance with the ATSEP profile and activities required by an ANSP. The trainees shall perform their tasks in accordance with approved local and/or national standards and procedures.

Chapter 4

UNIT TRAINING PHASE

4.1 INTRODUCTION

4.1.1 The purpose of this chapter is to provide additional guidance regarding Step 4 described in Chapter 2 on developing training and assessment plans for unit training.

4.1.2 After successfully completing the initial training phase, ATSEP undergo unit training. This phase is oriented to the activities and competencies an ATSEP will perform in a specific technical and operational environment as defined during Step 3 described in Chapter 2.

4.1.3 Unit training addresses theoretical and practical issues specific to the equipment and site of an operations unit. Unit training includes on-the-job training (OJT). It is in this phase that ATSEP competencies are developed and assessed.

4.2 TRAINING PLAN

4.2.1 In principle, the training plan for unit training can be organized in three modules:

- a) technical and operational environment;
- b) system/equipment; and
- c) OJT.

4.2.2 Training content should address:

- a) functionality of the system/equipment;
- b) actual and potential impact of ATSEP actions on the system/equipment; and
- c) impact of the system/equipment on the operational environment.

4.2.3 Unit training builds on the theoretical knowledge and skills learned during the initial training phase. In addition, training objectives in the areas of human factors and teamwork should also be considered relevant in unit training.

4.2.4 The level of training must be appropriate to the ATSEP profile but would not normally go beyond the replacement of the lowest replaceable module (LRM) or electronic boards of the system and equipment. Normally, unit training should not cover repair of LRMs or boards. If required, training for repairs should be conducted outside the scope of unit training.

4.2.5 Unit training can be implemented at a specialized training centre, at the factory, on site or a combination thereof. However, OJT should be conducted on site in the operational environment.

4.2.6 Unlike initial training, detailed training objectives are not provided for the unit training phase because unit training is specific to an ATSEP job, a system or equipment for a given ANSP. Thus, only generalized training objectives can be provided.

4.2.7 Before new systems become fully operational, a sufficient number of ATSEP must be available to maintain the systems and should therefore have completed the relevant unit training. ATSEP initially qualified to start operation should participate in the factory acceptance test (FAT) and/or the site acceptance test (SAT) prior to receiving a manufacturer's training course.

4.3 ASSESSMENT PLAN

During unit training, competencies for an ATSEP profile are developed as identified in Step 3 of Chapter 2. The assessment plan for the unit training phase should describe the specific process and tools that will be used to determine how an ATSEP's performance compares to the training plan and to the competencies that have been identified in the ATSEP profile. Evidence is collected through a variety of assessment methods and tools to document an ATSEP's progression towards achieving competence. The assessment plan for unit training should comply with the principles outlined in Table 2-1 of Chapter 2. (For an example of an evidence guide, see Appendix A.)

4.4 UNIT TRAINING MODULES

Technical and operational environment module

4.4.1 ATSEP trainees should have detailed knowledge of the technical and operational environment which can directly influence ANS such as facilities, maintenance procedures, and quality, safety and security policies. At the end of this module and in accordance with the ATSEP profile, the trainee will be able to:

- a) describe the infrastructure environment and system and equipment involved in the ANS;
- b) apply rules for circulation (e.g. access to shelters, driving certificate, technical rooms, security rules);
- c) identify facilities (power supply, air-conditioning, etc.);
- d) use the proper vocabulary relative for communication with other services; and
- e) apply safety rules and maintenance procedures.

4.4.2 For ATSEP with prior experience in the operational environment, unit training should only address the areas where a gap has been identified.

System/equipment module

4.4.3 Trainees should be familiar with the specific system or equipment for the unit, in particular with the principles of its design, the different hardware and software elements and their interactions and functionality.

4.4.3.1 This module builds on what was learned during qualification training and is specific to the equipment type on which the ATSEP will work.

4.4.3.2 At the end of this module and in accordance with the ATSEP profile, the trainee will be able to:

- a) identify and explain the details of the different components of the system;
- b) describe the protocols used and the data flow;
- c) explain the different functionality and the performance of the system;
- d) explain the significance of the parameters and error messages;
- e) explain the functionality of the HMI and SMC and their operation; and
- f) use appropriate action in installation and/or maintenance and/or operation activities.

On-the-job training module

4.4.4 The purpose of this module is to develop, consolidate and assess the competencies, knowledge and skills gained within the operational environment and on specific system/equipment required for the rating.

4.4.4.1 During OJT, the trainee will perform the activities for the job in the operational environment (e.g. operations, supervision, troubleshooting exercises, replacement, installations, testing of faulty modules, calibration). The trainee will also apply procedures for installation, maintenance and/or operation particular to the measurement, testing and restarting of the system or equipment in order to certify that it meets the standards.

4.4.4.2 This module includes practical exercises on systems and/or equipment where the trainee works on live equipment under the supervision of an experienced ATSEP or instructor.

4.4.4.3 At the end of this module and in accordance with the ATSEP tasks, the trainee will be able to:

- a) follow the logistic processes and apply the safety procedures (access to the station, power supply, air-conditioning, safety rules, etc.);
- b) operate the system or equipment, perform the necessary control and monitoring functions (periodic measurement, start or restart, configuration, etc.), including the HMI and SMC;
- c) run all available built-in tests, diagnostics and checks on the system or equipment;
- d) troubleshoot the system/equipment in the operational environment by:
 - 1) analysing the warnings, errors, alarms or failure messages or indications;
 - 2) identifying problem areas and faulty unit or LRM;
 - 3) performing replacement of unit or LRM;
 - 4) calibrating or reconfiguring the system if required;
 - 5) restoring the system or equipment to an operational mode; and
 - 6) conducting installation activities.

4.4.4.4 After the successful completion of unit training and competency assessment, the ATSEP will obtain certification and/or a rating of competence (proven competent status).

AVIA 10057 2017

Chapter 5

CONTINUATION TRAINING

5.1 INTRODUCTION

5.1.1 This chapter provides guidelines to States and ANSPs in the preparation and provision of continuation training for ATSEP. The objective of continuation training is to ensure that the ATSEP maintains up-to-date operational competence.

5.1.2 Maintaining ATSEP competence is part of an Integrated Management System (IMS) in place in each ANSP. IMS is composed of a Quality Management System (QMS) and a Safety Management System (SMS) with a risk analysis and mitigation process. This last process takes into account all changes (minor or major) made by the ANSP. Gathering evidence on the maintenance of ATSEP competence is therefore vital from an IMS point of view and should comply with the principles identified in Table 2-1 of Chapter 2.

5.1.3 There are three types of continuation training:

- a) refresher training which reviews or reinforces existing competencies;
- b) emergency training which includes training for unusual situations; and
- c) conversion training (system/equipment changes, upgrade and/or changes in procedures).

5.2 REFRESHER TRAINING

5.2.1 Refresher training is designed to review or reinforce existing ATSEP competencies. It should be site-specific, conducted on a regular basis and related to the rating and/or certification of the ATSEP. It should cover theoretical knowledge as well as practical skills which can be acquired through simulations or practical exercises.

5.2.2 Refresher training can be designed in a number of ways. It can be system-specific, domain-based or role-based training. For example:

- a) ATSEP who hold only a single rating/certification should receive refresher training specific to that rating/certification.
- b) ATSEP who hold ratings/certifications for a number of systems or equipment within the same unit could receive specific refresher training for each system or piece of equipment or follow a global training course covering all relevant systems and equipment.
- c) In the case of multi-rated/multi-certified ATSEP (e.g. COM, NAV, SUR, SMC), refresher training specific to that rating/certification is likely to be most effective. However, a generic course to cover a number of ratings/certifications could be designed and provided to such ATSEP.
- d) For ATSEP who are project managers in system installation or requirements, engineering role-based refresher training may be appropriate.

5.2.3 The ANSP should determine the frequency and duration of refresher training. It should be scheduled periodically for all ATSEP. The frequency of refresher training will depend on:

- a) activity exposure;
- b) complexity of the system/equipment/activity; and
- c) impact of the loss of the system/equipment on the service provision.

5.2.4 Refresher training may be carried out either on-site or off-site, whichever is the most appropriate. Where possible, it is advantageous that part of the training be carried out on representative systems or equipment (e.g. on a spare system).

5.3 EMERGENCY TRAINING

5.3.1 Emergency training refers to training for the management of non-routine situations. It is linked to the competency unit “management of non-routine situations” and the subsequent competency elements and performance criteria.

5.3.2 Non-routine situations can be described by the following characteristics:

- a) can be immediate or short term; and/or
- b) engage or endanger human life; and/or
- c) involve major degradation of service provision.

5.3.3 Training for these situations is aimed at dealing with causal factors impacting safety, such as but not limited to:

- a) natural events (e.g. earthquakes, tornado, flood, fire);
- b) security breach (e.g. terrorism, cyber-attack, sabotage); and
- c) technology breach (e.g. major system failure, power failure).

5.3.4 Training for management of non-routine situations can be facilitated in a number of ways, including but not limited to:

- a) recurrent training or exercises based on written procedures;
- b) round-table discussion dealing with a hypothetical scenario;
- c) lessons-learned exercises based on experience; and
- d) debriefing after major events, incidents or accidents to enhance safety and/or security.

5.4 CONVERSION TRAINING

5.4.1 Conversion training should be triggered by a change to an existing system that impacts operations. Triggers for setting up of conversion training include:

- a) updates on reference material from relevant regulatory provisions and from aeronautical information publications (AIPs);
- b) new maintenance procedures;
- c) new standards and operating procedures;
- d) new factors affecting system performance;
- e) system monitoring and control changes;
- f) system modification (hardware, software, firmware);
- g) new monitoring, calibrating and measuring equipment available for ATSEP; and
- h) organizational changes leading to the identification of new competency elements.

5.4.2 Conversion training is system- or equipment-specific. It should be provided to all impacted ATSEP prior to the change being deployed. The ATSEP profile and competencies as well as other phases of training (e.g. unit training, refresher training) should be adjusted in accordance with the change.

5.4.3 Conversion training should be designed to familiarize the ATSEP with any change or update in the system, equipment, procedure or practice that may have occurred since the last training session. Training objectives should be derived from the difference between the current situation and the situation after deploying the change.

5.4.4 Typically, conversion training is related to a specific planned change and is scheduled once. The duration is dependent on the nature of the change and the ATSEP affected.

5.4.5 Conversion training can be delivered through various means ranging from dedicated training sessions to briefings, operational instructions, information papers or others. It may be carried out either on-site or off-site, whichever is the most appropriate. Where relevant, it is advantageous that part of the training be carried out on representative systems or equipment (e.g. on a spare system).

Downloaded from ICAO Doc 10057, 2017-01-01

Chapter 6

DEVELOPMENT TRAINING

6.1 Development training consists in developing the additional competencies required when taking on new activities. Typically, this is initiated as a result of career progression.

6.2 These new activities may include:

- a) carrying out a training function (e.g. OJT instructor);
- b) managing staff;
- c) writing requirements;
- d) validating and testing equipment or systems;
- e) managing quality, safety or security; and
- f) auditing.

6.3 If a significant change of activities is identified, initial or unit training may be required. The process described in Chapter 2 to set up competency-based training also applies to development training provided that the ANSP considers these new activities as part of the ATSEP profile.

6.4 A number of examples for development training are outlined in Appendix D.

Document ID: 10057-2017

Appendix A

DEVELOPING ATSEP COMPETENCY-BASED TRAINING AND ASSESSMENT: EXAMPLES

In this appendix, two examples are given for the application of the steps to develop ATSEP competency-based training and assessment as described in Chapter 2. The organizational structures used are examples. ANSPs may choose organizational structures that are different from those represented. Their purpose is to describe in more detail how ATSEP competency-based training and assessment can be developed for a given organizational structure of an ANSP.

EXAMPLE 1: SMALL ANSP “ABC” OPERATING AT SEVERAL REGIONAL AIRPORTS

In this example, ANSP ABC operates CNS services at a number of regional airports in a country. The number of staff is small and, to limit costs, employees are generalists and not specialized. ATSEP have to serve several systems so that the number of staff is optimized. The ANSP’s strategy is to concentrate on core activities and to procure support from external providers — mainly manufacturers — for in-depth maintenance activities.

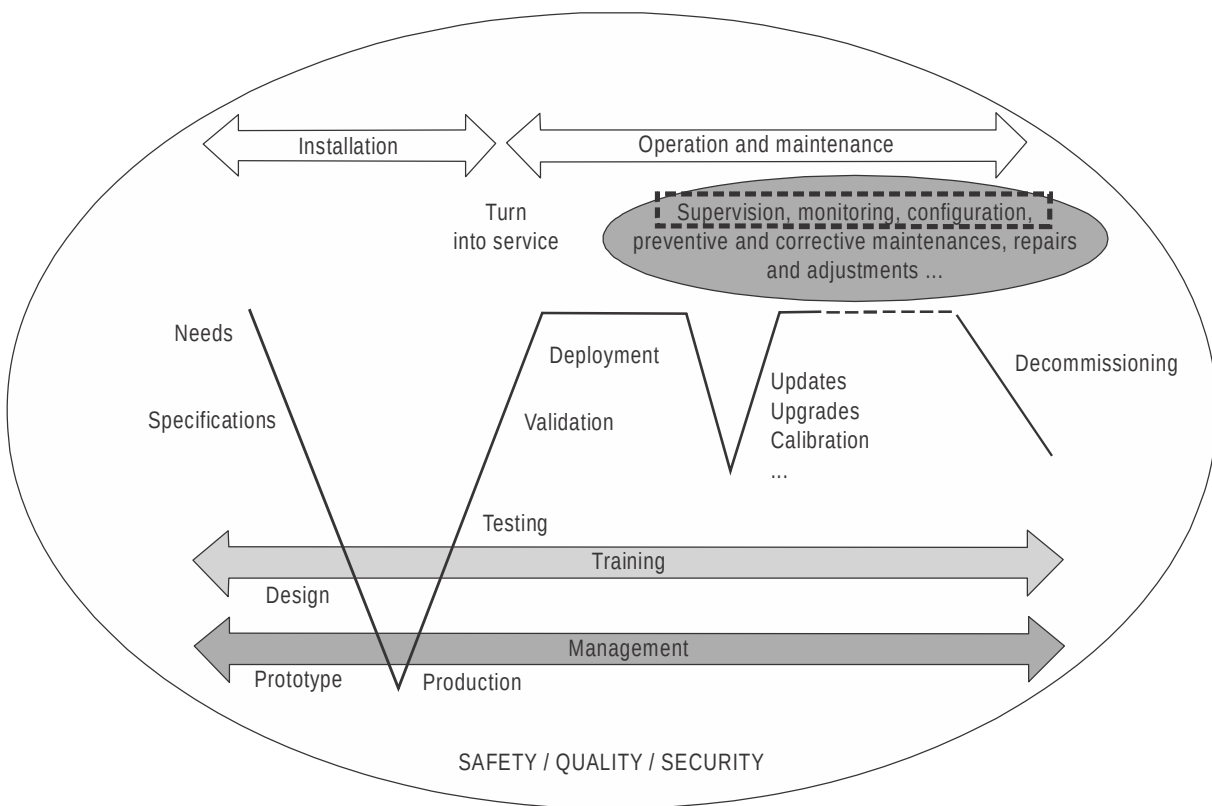


Figure A-1. ATSEP Scope within ANSP “ABC” (example)

Step 1 — Define profiles and activities within the ANSP's predetermined ATSEP scope and develop job description(s)

Within ANSP ABC, the ATSEP activities are scoped as supervision, monitoring and configuration (see dotted rectangle in Figure A-1).

Specifically, the ATSEP is designated to work at the regional airport SMALLAIRPORT, servicing a VOR, a DF, an r/t system and an ASR.

ATSEP job description within ANSP ABC

The following job description is used within ANSP ABC:

<i>Item</i>	<i>Description</i>
Job title	SMC ATSEP at regional airport SMALLAIRPORT
Job objective	Supervise, monitor and configure the related equipment (VOR, DF, r/t system, ASR)
Entry level	Technician with four years of previous job experience (minimum) or Bachelor of engineering with initial job experience
General nature of the job	Responsible execution of activities for supervision, monitoring and configuration of the related equipment
Key responsibilities	• Operational availability of the related equipment • Compliance to regulatory requirements • Compliance to internal procedures
List of tasks	a) Monitor the following systems: VOR, DF, r/t and ASR. b) Receive and forward error messages. c) Initiate maintenance activities based on error messages received. d) Relate to manufacturer for maintenance activities. e) Inform customers (airport) on status of troubleshooting process. f) Document and report.

This job description provides the basis for the selection of ATSEP for ANSP ABC.

**Step 2 — Associate initial training modules to ATSEP
job objective as identified in job description**

ANSP ABC associates the ATSEP job objective identified above with the following pre-defined training modules (see Chapter 3):

Predefined Training Modules	Job Objective
	Supervise, monitor and configure the related equipment (VOR, DF, r/t system, ASR)
Basic	X
Qualification communication	X
Qualification navigation	X
Qualification surveillance	X
Qualification data processing/automation	
Qualification SMC	X
Qualification infrastructure	X
Qualification engineering	

**Step 3 — Associate competency units, competency elements
and performance criteria to the ATSEP tasks**

ANSP ABC associates the ATSEP tasks identified above with the following competency units and competency elements:

.....

ATSEP Tasks	Competency Units / Competency Elements (See Appendix 2 to Chapter 3 of the PANS-TRG [Doc 9868] for the full descriptions of each Competency Unit and Competency Element)									
	Engineering	Situation Awareness	Service Provision	Coordination	Management of non-routine Situations	Problem Solving and Decision Making	Self-Management and Continuous Learning	Workload Management	Teamwork	Communication
Monitor of the VOR, DF, r/t, ASR systems		2.1 2.2 2.3	3.1				7.2 7.5	8.4		
Receive and forward error messages		2.2	3.2	4.1	5.2		7.2 7.5			10.2
Initiate maintenance activities based on error messages received				4.1 4.2	5.2		7.2 7.5	8.4		
Relate to manufacturer for maintenance activities				4.2	5.2		7.2 7.5	8.4		10.2
Inform customers (airport) on status of troubleshooting process				4.2			7.2 7.5			10.2
Document and report			3.2				7.2 7.5	8.4		
Summary of competency elements		2.1 2.2 2.3	3.1 3.2 3.3	4.1 4.2	5.2		7.2 7.5	8.4		10.2

Performance criteria

In this step, we associate performance criteria to the competency elements identified above.

Competency Element	Performance Criteria
<i>(See Appendix 2 to Chapter 3 of the PANS-TRG [Doc 9868] for the full descriptions of each Competency Element and Performance Criterion)</i>	
CE2.1	PC2.1
CE2.2	PC2.2, PC2.3
CE2.3	PC2.4, PC2.5
CE3.1	PC3.1
CE3.2	PC3.2
CE3.3	PC3.4
CE4.1	PC4.1
CE4.2	PC4.2
CE5.2	PC5.3, PC5.4
CE7.2	PC7.2
CE7.5	PC7.7
CE8.4	PC8.4
CE10.2	PC10.2, PC10.3

Step 4 — Develop the training and assessment plans for unit training

The training plan for unit training is designed based on the tasks identified above. The assessment plan for unit training is designed based on the performance criteria identified above. As indicated in Chapter 2, 2.2.5, the training plan is used to develop the training materials. It is not intended in this example to provide a comprehensive set of training materials (i.e. course schedule, training notes, case studies, exercises, briefings, presentations, video clips) since these could be developed in a variety of ways depending on the ANSP and/or training organization. However, the “Training Content” table below provides an indication of the possible content of the unit training programme based on the ANSP ABC ATSEP job description. For this example, theory is taught first followed by OJT for each system. Training on Unix, network, tools and procedures can take place anywhere in the sequence.

Similarly, as indicated in Chapter 2, 2.2.5, an assessment plan details assessment events and tools that will be used to determine if an ATSEP achieves competence during and at the end of unit training. It is not intended in this example to provide a comprehensive list of all assessment events and tools since these could be developed in a variety of ways depending on the ANSP and/or training organization. However, the “Evidence Guide” table below provides an indication of the performance criteria associated with the expected performance at different milestones during unit training as well as at the end of unit training when all competencies should be demonstrated in an integrated manner. In this example, no competency assessment is applied in classroom courses. Peer review is used as the assessment for a final checkout.

In implementing competency-based training and assessment, ANSP ABC will identify lessons learned and feed them back in the relevant part of the process to ensure that the training programme remains relevant and effective.

Training content

Item	Provider	Duration [d] ¹	Type	Remarks
Unix training course	External	3	Mediated training	Can be skipped if knowledge and skills already established
Network training course	External	2	Classroom	Can be skipped if knowledge and skills already established
Overview training on VOR	External, e.g. manufacturer	2	Classroom + lab	
Overview training on r/t system	External, e.g. manufacturer	2	Classroom + lab	
Overview training on ASR	External, e.g. manufacturer	5	Classroom + lab	
Field training on VOR	Own unit	3	On-the job	
Field training on DF	Own unit	3	On-the job	
Field training on r/t system	Own unit	3	On-the job	
Field training on ASR	Own unit	5	On-the job	
Overview on procedures	Internal	1	Classroom	
Overview on documentation tools	Internal	½	Classroom	

Evidence Guide

As part of the progression towards the final competency standard (FCS), it may be necessary to establish interim competency standards (ICSs). ICSs will be associated to milestones marking progression through the unit training phase. On successful completion of unit training, trainees will have achieved the FCS. This means that they will have successfully completed all the required training and assessments that have been determined as necessary to demonstrate the competencies and meet the performance criteria to meet the job objective identified in the ATSEP job description.

In this example, it has been decided to establish two ICSs towards the achievement of the FCS.

1. Some of the durations may depend on availability of external courses and thus may differ.