EUR AMHS COM Centre Training Guidelines

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Scope of the Document

The present document is intended to provide information and guidance on the training and expertise required for personnel involved in the operation and maintenance of a COM Centre. It should be used in conjunction with ICAO Annex 10 and associated ICAO Manuals as well as relevant regulations, procedures and documents that locally apply.

Comments on the document would be appreciated for the preparation of any subsequent edition.

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References

[1] ICAO Annex 10 – Aeronautical Telecommunications, Volume II and Volume III

[2] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications - ATS Message Handling Services (ATSMHS), First Edition – 2010

[3] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part III – Upper Layer Communications Service (ULCS) and Internet Communications Service (ICS), , First Edition – 2010

[4] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part IV – Directory Services, Security and Systems Management, First Edition – 2010

[5] ICAO Doc 9896-AN/469: Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocols, First Edition – 2010

[6] ICAO EUR Doc 020, EUR AMHS Manual, latest Edition

[7] ICAO Training Guideline Courses 172 and 176

[8] ICAO Doc 7192 Part E-2 “Training Manual – ATSEP”

[9] ICAO Doc 8259 “Manual of Planning and Engineering of the AFTN”

[10] ESARR5 - ATM Services Personnel

[11] EUROCONTROL Specification for ATSEP Common Core Content Initial Training

[12] EUROCONTROL-SPEC-0136, EUROCONTROL Specification on the Air Traffic Services Message Handling System (AMHS), Edition 2.0 18/09/2009

[13] ICAO EUR Doc 005 CIDIN Manual

[14] ICAO EUR ATS Messaging Management Manual

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1 Introduction

1.1 Scope of the Document and Purpose

1.1.1 A COM Centre is a vital component of ANS. Therefore it should be staffed by personnel with sufficient knowledge and understanding of the service they are supporting and the potential effects of their work on the safety and efficiency of air navigation.

1.1.2 In the frame of their training policy, ANSPs should establish training plans to ensure that COM Centre staff is be properly trained in order to maintain the availability, continuity, accuracy and integrity levels requested for the service provided. This rule applies equally to AFTN, CIDIN and AMHS.

1.1.3 Early AMHS experiences have indicated that AMHS training in particular should be approached in a more systematic manner, due to the complexity of the protocol, available implementation options and significant changes in operating procedures.

1.1.4 The purpose of this document is to define a training process and specify training guidelines in order to have a common level of training for staff that operates and maintains COM Centres with AMHS capabilities in the EUR Region.

1.1.5 By means of such training, it is expected that COM Centre staff will obtain the appropriate skills to specify, evaluate, operate and maintain an AMHS system in a appropriate manner and consequently provide harmonised, homogenous and consistent AMHS services.

1.1.6 The document is applicable to all AMHS involved personnel, e.g. System Supervisors, Operators, Maintainers, Engineers, End Users, etc. It must be pointed out that the actual structure, naming and responsibilities of the personnel, varies among ANSPs.

1.1.7 ICAO, EUROCONTROL and EU sources were consulted for the development of the training concepts and methodology presented herein. The proposed training syllabus is derived from in depth COM Centre expertise. Anticipated feedback from States implementing AMHS will be used to evolve and refine the document.

1.2 Structure of the document

1.2.1 The EUR AMHS COM Centre Training Guidelines document consists of 3 Chapters and 2 Appendices:

Chapter 1: Introduction

Chapter 2: Indicative minimum Technical Skills and Job profiles

Chapter 3: Recommended training modules baseline and related syllabus

Appendix A: Glossary

Appendix B: List of Abbreviations

2 Minimum Technical Skills

2.1 Introduction

2.1.1 The philosophy adopted in building the present document is to formulate a common reference for all States, by defining minimum training requirements allocated to specific profiles applicable to personnel involved in AMHS COM Centre operation, maintenance and supervision, generally categorised as ATSEP[1].

2.1.2 The comprehensive term ATSEP is used to define *engineering and technical personnel undertaking operational safety related tasks* or personnel who operate and maintain CNS/ATM equipment approved for operational use [ESARR5].

2.1.3 Today the most updated documentation available that defines a clear training path for engineering and technical personnel is the "Specification for ATSEP Common Core Content Initial Training" and the ICAO "Training Manual –ATSEP".

2.1.4 The training concepts and syllabus of the document in hand were derived from relevant training streams of the aforementioned documentation. This approach is justified by the fact that ATSEPs work on a wide range of CNS/ATM systems and equipment (AMHS is one of them), each of which requires training to achieve specific skills that will eventually lead to operational competence.

2.1.5 This chapter incorporates input data available from the above and other sources and the best practices applied by European ANSPs.

2.2 AMHS Constituents

2.2.1 AMHS training could be distinguished as covering three major activities of AMHS deployment:

a. AMHS Specification and Testing

b. AMHS Installation and Technical Support

c. AMHS Operation and Supervision

2.2.2 Based on the EUR AMHS Manual [6], AMHS operational management is structured in the following macro areas:

- Fault management;
- Configuration management;
- Accounting management;
- Preventive maintenance;
- Performance management;

[1] For the purposes of the document at hand the term is used in a broad sense with no intention to mandate any particular staff classification scheme – this remains an ANSP responsibility.

- Security management.

2.2.3 Effective operational management of an AMHS COM Centre is implemented through the smooth integration of the following tasks:

- Running the system according to operational requirements;
- Ensuring operational service of equipment whilst technically repaired;
- Tactically establish priorities for maintenance/repairs;
- User Agent application use.

2.2.4 In practical terms, the staff involved in the above tasks is performing the following functions:

a. AMHS System Administration/Supervision (ASS)

b. AMHS System Operation (ASO)

c. AMHS System Technical Support (Maintenance) (ASM)

d. AMHS End System Operation (AEO)

2.2.5 Depending on the organizational structure of each ANSP, the same personnel may be performing one or a combination of the above functions.

2.2.6 A structural training development could give flexibility, in order to combine training material of various categories according to any ANSP needs.

2.2.7 The competence macro areas concerning these functions are reported in Table 1.

2.2.8 Job descriptions are reported in section 2.3.

	ASS	**ASO (24hrs)**	**ASM**	**AEO**
Fault management	**X**	**X**	**X**	
Preventive Maintenance			**X**	
Configuration management	**X**	**X**	**X**	
Accounting management	**X**			
Performance management	**X**	**X**	**X**	
Security management	**X**		**X**	
Operation	**X**	**X**		**X**
Basic UA Configuration & H/W Monitoring	**X**		**X**	**X**

Table 1 – Indicative Areas of competence per profile

2.2.9 The following assumptions should be taken into account:

As-1. All profiles can be associated to the figure of "Engineering and Technical Personnel Undertaking Operational Safety Related Tasks" as reported in ESARR5.

As-2. Each ANSP should have personnel that cover the above competence areas, but it's not necessary for the same personnel to cover all areas.

As-3. The document does not concern training management for AMHS program/project/operations managers.

2.3 AMHS Operational Staff Prerequisites and Operational Knowledge at recruitment

2.3.1 Introduction

2.3.1.1 The aim of this paragraph is to describe AMHS Operational Staff entry-level skills (trainee entry-level) required before starting the training path for AMHS. Alternatively, the entry-level requirements could be fulfilled by the Basic training.

2.3.1.2 Also, "good to know" material will be mentioned, for a more spherical and expandable approach to the AMHS.

2.3.2 Common entry level requirements

- Knowledge of aeronautical communications and AFS in particular
    - ATS requirements for safe communications (general performance, safety and security requirements for the AFS set by ATS, AIS, MET and SAR)
    - Annex 10 messaging principles

2.3.3 AMHS System Administration/Supervision - ASS

2.3.3.1 Initial Level

- Knowledge of communication and network protocols.
- Knowledge of communication and network equipment.
- Knowledge of communication data links
- Knowledge of operating systems, basic reconfiguration activities, software installation
- Ability on troubleshooting, failure analysis and solving
- Ability to work in teams, ability to work under pressure
- Basic ATM Systems Safety principles
- Ability to work under pressure

2.3.4 AMHS System Operation - ASO

2.3.4.1 Initial Level

- Knowledge of communication and network protocols.
- Basic Knowledge of communication and network equipment.
- Knowledge of operating systems, basic reconfiguration activities
- Ability in troubleshooting
- Ability to work under pressure

2.3.5 AMHS System Maintenance - ASM

2.3.5.1 Initial Level

- Knowledge of electronic equipment (personal computers or workstations, main components, routers, switches, servers, modems)
- Knowledge of communication and network protocols.
- Knowledge of communication and network equipment.
- Knowledge of communication data links and networking
- Knowledge of operating systems, basic reconfiguration activities, software installation
- Ability on troubleshooting, failure analysis and solving
- Basic ATM Systems Safety principles
- Ability to work under pressure

2.3.6 AMHS End System Operation - AEO

2.3.6.1 Initial Level

2.3.6.1.1 The competence of end system (UAs) users is related to the operational environment (COM station, TWR, ACC, ARO, etc) they belong to.

2.3.6.1.2 Besides the AFTN know-how prerequisite, the entry-level requirements could vary. In any case, it would be useful if the personnel had knowledge of:

- Main OS
- Internet browser use

- Basic Terminal (PC, printer, modem) connectivity and application level configuration

2.4 AMHS Operational Staff Job Description

2.4.1 Introduction

2.4.1.1 This section explains the job description and tasks to be performed by operational staff when trained.

2.4.2 AMHS Staff Operational Tasks

2.4.2.1 The aim of this paragraph is to match AMHS Staff Operational Tasks to the competence macro areas described in 2.2.

2.4.3 AMHS System Administration/Supervision (ASS) Operational tasks

- Accounting Management:
    - Capacity planning
    - Analysis of statistics
    - Budgeting, charging issues
- Operation oversight:
    - Oversight of the operation of the AMHS System
- Configuration Management:
    - Planning for international connectivity
    - Handling of national service upgrades
    - Promulgation of changes
    - Setting of system operational parameters
    - Technical documentation management
    - Review/update system configuration according to international procedures (AMC, Doc 7910)
- Performance Management:
    - Monitoring the performance of the system and tuning
    - Evaluation of statistics and metrics
    - Long term and international planning

- Failure Management:
    - Establishment of fault handling processes
    - Long term fault rectification
    - Fault recording
    - Communication with manufacturers for further support
    - Planning of preventive maintenance
    - 2nd level management
- Security Management
    - Control the privileges and the user profiles of the staff within the system
    - Maintenance of security log files (access data, modifications data, etc)
    - Tracing of security incidents
    - Promulgate security warnings

2.4.4 AMHS System Operation (ASO) Operational tasks

- Operation
    - AMHS application operation
    - Managing incoming and outgoing traffic
    - Managing queues of non forwarded messages
    - Handling undelivered messages
    - Managing Address Directory Database
    - Legal Recording
- Configuration Management:
    - Co-ordination of routings
    - Updating of addressing and routing data
    - Recording of system and user changes
- Performance Management:
    - Monitoring utilisation, queues, connections
    - Proposals for operational parameters adjustment

- Failure Management:
    - Alarm monitoring and notification
    - 1st line reaction
    - Recording of actions
    - Fault, detection, isolation and recovery actions
    - Coordination of unexpected system outages
- Security management
    - Follow security procedures (login, logout, event log files, etc.)
    - Reporting of security incidents
- Accounting Management:
    - Production of statistics
    - Provision of helpdesk support to end users

2.4.5 AMHS System Maintenance (ASM) Operational tasks

- Configuration Management:
    - Planning of system upgrades
    - Activation of modifications
    - Maintenance of system back-up
    - Configuration tools
- System's hardware:
    - Fault tolerant architecture
    - Cluster architecture
- Communications hardware:
    - Network devices
    - Leased line devices
- Software:
    - Basic Software (Operating Systems, Data Bases, Communication Protocols)
    - Specific Software. Software specific of the application

- Client Software

- Performance Management:
  - Monitoring of processor, disk etc. utilisation
  - Maintaining acceptable levels of system performance
  - Monitoring of connections quality

- Failure Management:
  - Corrective maintenance
  - Second level support
  - Resetting, restarting
  - Coordination with traffic management in order to solve any unexpected incident
  - Third level technical maintenance escalation of repetitive incidents

- Security Management
  - Establishment of firewalls
  - Controlling remote access and physical access of third parties to the system

- Preventive maintenance
  - Performing procedures described in the local documentation according with the planned frequency

- Accounting Management:
  - Production and analysis of system data
  - Provision of helpdesk support to end users

2.4.6 AMHS End System Operation (AEO) Operational tasks

- Operation
  - AMHS UA operation
  - Application AFTN/AMHS messaging formats, procedures and practices
  - Handling of local and incoming message traffic
  - Access to address directory/list
  - Recording of traffic

- Configuration Management:
    - Setting UA basic configuration
    - Maintaining system back-up
- Performance Management:
    - Monitoring of utilisation
- Failure Management:
    - Alarm Monitoring
    - Resetting application
    - Rectification of faults
- Security Management
    - Follow security procedures (login, logout, event log files, etc.)
    - Report security incidents
- Accounting Management:
    - Production of statistics

3 Training Modules baseline

3.1 Training Types

3.1.1 Due to the complexity of the ATM environment and based on [11], six training types are defined so that staff to reach and maintain the suitable level of theoretical and operational knowledge:

- **Basic Training** mainly deals with fundamental knowledge and skills appropriate to the discipline to be pursued in the CNS/ATM environment. Completion of all BT objectives is not a pre-requisite to starting Qualification Training.

- **Qualification Training** provides profile-related knowledge and skills appropriate to the discipline to be pursued in the operational environment. At the end of this module the student should have the ability to understand the particular ATM system (e.g. AMHS).

- **System/Equipment Competence Training** designed to impart System/Equipment knowledge and skills leading to recognized competency. It also includes the On-the-Job Training (OJT), which is the practical integration of previously acquired knowledge and skills, under the supervision of a qualified On-the-Job-Training Instructor (OJTI), in an operational environment.

- **Continuation Training** designed to refresh and augment existing knowledge and skills with emphasis to safety and emergency training. It also concerns any new developments and advanced functions that might be implemented in the future of the ATM system evolution.

- **Development Training** (also known as conversion training) designed to provide knowledge and skills demanded by a change in job profile.

3.1.2 Figure 1 provides the schematic presentation of the above concepts.

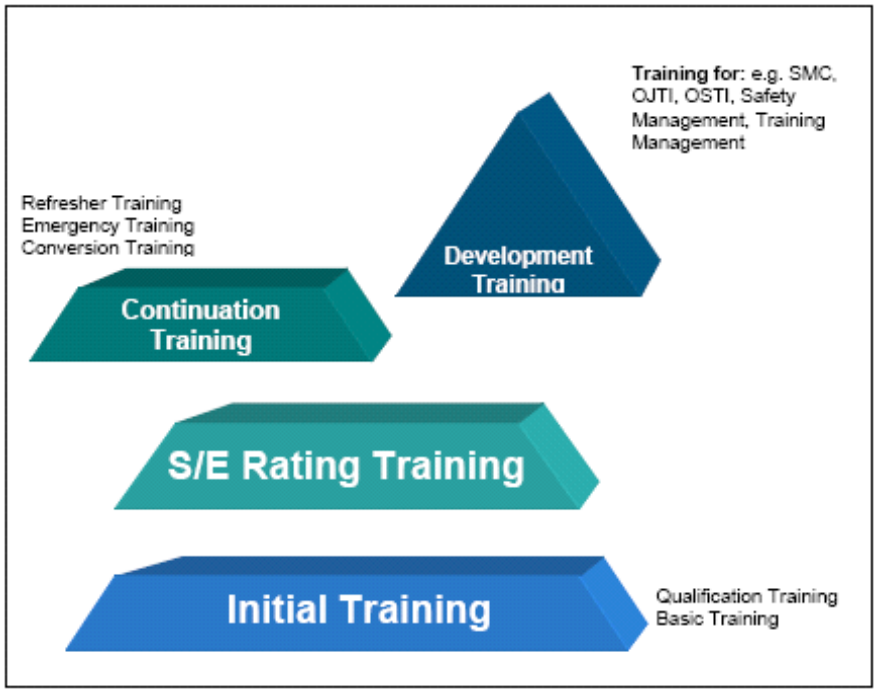

Figure 1 – Training types

3.1.3 The present training document focuses on Basic, Qualification and System/Equipment Competence Training considered necessary for the operation of AMHS enabled COM Centres.

3.1.4 The precise structure, duration and composition of the training courses should be decided by ANSPs in co-operation with their training providers. Consultation with the particular system manufacturer is also advised.

3.1.5 Formal assessment shall be undertaken and results shall be recorded for individual trainees to verify that the training objectives have been met. To this end, knowledge is best tested by oral or written exams; skills are best tested by performance tests under real or simulated conditions.

3.2 Training Objectives and proposed syllabus

3.2.1 This section provides general training objectives that should be covered by each course and a corresponding syllabus. ANSPs should establish their AMHS Training Plan based on an analysis of their particular training needs and operating practices. The proposed syllabus is not meant to be constraining and it remains at the discretion of the ANSPs to adjust and implement it as appropriate. The various categories of training indicate training for distinct tasks and are not meant to imply the need to establish various categories of personnel.

3.2.2 Furthermore, each ANSP will have their own entry level requirements for various categories of recruited employees, which may, in the case of personnel involved in COM Centre operations and technical support, include some type of technical training/degree and English language proficiency. Also some general introductory training may be foreseen.

3.2.3 Such training is considered out of scope for the purposes of the present document.

3.2.4 On the Job Training constitutes a standard practice for ANSPs, and, as such, it also applies to the operation and technical support of a COM Centre. Such training is considered out of scope for the purposes of the present document.

3.2.5 As with every ANS system, a COM Centre Switch is subject to maintenance in line with the strategy and processes set out by the ANSP, so that the performance, reliability, availability and maintainability requirements are met. In any case, maintenance responsibilities should be clearly defined and assigned, personnel should be trained accordingly and procedures of cooperation between the operation and the maintenance entities, when different, should be in place. When some levels of maintenance are assigned to third parties, the responsibilities on each side including training/qualification profiles for the third party personnel should be specified in the appropriate agreements.

3.2.6 The function of system management and control and the function of COM Centre supervision are two particular functions, usually performed by a small number of personnel with managerial status. For these functions some indicative training guidelines are provided – however it's up to the ANSPs to specify the experience, general training, in-depth training and managerial training that may be required for the execution of these higher-level functions.

3.2.7 On the basis of the above, and bearing in mind that the main focus of the training proposed should be to enable smooth AMHS deployment, the following comprehensive training is proposed.

3.3 Training Overview

3.3.1 In the following paragraphs there is a baseline Training list that after attending it, the AMHS staff will reach operational level.

a. **Common Basic COM Training (C.1)**: Intended as prerequisite for all those involved in the operation and maintenance of AFS systems. This training is not necessary if the student satisfies the entry level requirements defined in section 2.3, but it could serve as a reminder course of related general knowledge that will assist in better comprehending the main training.

b. **Common AMHS general training (C.2**): Intended to provide fundamental knowledge on AMHS.

c. **COM Centre Operation (O.1)**: Intended to provide the theoretical knowledge and practical skills and know how to operate a conventional COM Centre. This training is not necessary if the trainee has experience in AFTN/CIDIN operations.

d. **AMHS COM Centre Operation (O.2)**: Training on an AMHS system, composed of a theoretical part and the demonstration of the system (OJT), intended to provide the practical integration of previously acquired knowledge, under the supervision of qualified mentors, in an operational environment and on operational procedures.

e. **Use of UAs (O.3)**: Intended to provide equipment familiarisation and knowledge to use the application.

f. **System Maintenance -H/W (M.1)**: Intended to provide the necessary knowledge for the installation, tuning, maintenance and upgrade of the system in terms of hardware.

g. **System Maintenance - S/W (M.2)**: Intended to provide the necessary knowledge for the installation, adjustment, maintenance, upgrade of the system in terms of software.

h. **COM Centre Supervision (S.1)**: Advanced training intended to provide the skills and competencies for the management and supervision of a COM Centre and the network.

i. **System Monitoring and Control (S.2)**: Advanced training intended to provide the skills and competencies for the administration and technical support of the system.

Module Name	Type	ASS	ASO	ASM	AEO
C.1	Basic training	X	X	X	
C.2	Qualification training	X	X	X	X
O.1	Qualification training	X	X		X
O.2	System/equipment competence training	X	X		
O.3	System/equipment competence training		X		X
M.1	System/equipment competence training			X	
M.2	System/equipment competence training			X	
S.1	System/equipment competence training	X	X		
S.2	System/equipment competence training	X			

Table 2 – AMHS training modules

3.4 Analytical proposed training syllabus

3.4.1 C.1 Common Basic Communications Training

Objective	To understand principles of Data Communications
Audience	Personnel involved in COM Centre operation and technical support
Media	CBT, WBT
Data Communications	
Introduction to Data Communications	Purpose, principles and role of data communication systems in ANS Concept of data transmission Function of various elements of the data systems in use in the ANS environment. ANS requirements for safety and their impact on data communications. ANS requirements for security and their impact on data communications. ANS requirements for legal recording.
Fundamental Theory	Principles of communication protocol layers Principles of the addressing strategy Principles of the routing strategy
Protocols	Description protocols in general Analysis of specific protocols in use
Networks	Different types of networks Functions of a network management system
Aviation Specific Networks, Applications and Service Providers	Air-ground aviation related network concepts Ground-ground aviation related network concepts Aeronautical Fixed Service Role of an international Communication Centre
National Networks	National networks to which the organisation is connected Types of transmission paths and interfaces. Interfaces between national and international networks
Regional, multinational and global aeronautical networks	Current and Emerging Network Concepts and Technologies Outline of PENS, ATN and SWIM
Remarks	Basic communications training, prerequisite for all those involved in the operation and maintenance of AFS systems.

References	Basic communication and networking training documents EUROCONTROL Specification for ATSEP Common Core Content Initial Training ICAO Annex 10

3.4.2 C.2 Common AMHS general training

Objective	General overview of the ATS Message Handling System. Provision of information and skills that will enable practical AMHS deployment plans.
Audience	Personnel involved in AMHS operation and technical support
Media	CBT, WBT or classroom
AMHS Overview	
MHS capabilities	Capabilities and potential Differences from AFTN philosophy
Standards Development	X.400 fundamentals Basic and Extended Services ATSMHS EUR AMHS
System Design Criteria	AMHS profile (to be) implemented AMHS components (MTA, UA, MS, AU, AFTN/AMHS Gateway) Protocol stacks including underlying network
User Types	Types of Users Interfaces to existing and planned users, systems and networks
Com Centre Architecture	Description of the COM Centre Architecture
Testing and migration	Description of the AMHS testing requirements Description of procedures for migration to AMHS
Remarks	Prerequisites: -C.1 or equivalent
References	ICAO EUR AMHS Manual ICAO Doc 9880 “Manual on detailed technical specifications for the ATN using ISO/OSI systems and protocols”

3.4.3 O.1 COM Centre Operation

Objective	To understand the store and forward messaging component of the AFS
Audience	Personnel involved in COM Centre operation
Media	CBT, WBT
Introduction to the AFS	
Introduction to the ICAO AFS	Role of the AFS in support of aviation. Requirements for the AFS stemming from Annexes 3(MET), 11(ATS), 12(SAR) and 15(AIS) and the EUR ANP and the SUPPs. Description of ATS messaging in terms of traffic types, formats, flows and patterns. Concepts and contents of DOCs 7910 and 8585 and use thereof. Safety and legal aspects for ATS messaging. QoS requirements for ATS messaging
AFTN	Description the procedures of Annex 10, Volume II Basic information on COM Centre, routing concepts and AFTN networking as per ICAO Doc 8259. Handling of AFTN level alarms
CIDIN	Description the CIDIN (layers 3b and 4) CIDIN operational procedures and routing concepts Description of AFTN-CIDIN interfacing. Handling of CIDIN alarms (layers 3b and 4)
AMC	On line network management functions Off-line management and use of AMC Statistics
Reporting	Recording of significant operational occurrences Description of incident reporting procedures Familiarisation with contingency plans Familiarisation with SMS requirements
Remarks	Prerequisites: -C.1 and C.2 -Any other requirements as defined by the ANSP Typically this knowledge is available for personnel already performing COM Centre operation.

References	ANSP internal documentation ICAO Annex 10 ICAO Training Guideline Courses 172 and 176 ICAO Doc 7192 Part E-2 (advance 1st edition 2009) "Training Manual – ATSEP" ICAO Doc 8259 "Manual of Planning and Engineering of the AFTN" ICAO EUR CIDIN Manual ICAO EUR ATS Messaging Management Manual

3.4.4 O.2 AMHS COM Centre Operation

Objective	To provide the necessary knowledge to operate AMHS
Audience	Personnel involved in AMHS operation
Media	CBT, WBT or classroom
AMHS messaging	Fundamentals (envelop, body parts etc.) Naming and addressing schemes Submission, transfer, delivery for messages Role of probes and reports Use of FTBP-DIR-SEC (in detail if implemented)
AMHS in a COM Centre	Parameters – default and recommended values, configuration Types of associations – configuration Types of transport level connections – configuration Addressing, mapping tables, routeing functions Distribution lists Tracing and repetition facilities Traffic and queue management facilities Production of statistics Handling of exceptions and related alarms Cooperation procedures with personnel involved in maintenance (where applicable) Monitoring of connections
AFTN/AMHS gateway	Gateway functions Successful conversion and relay procedures Unsuccessful conversion and relay procedures

	Handling of exceptions and related alarms
AMC	Functions of the AMC in the frame of AMHS management Description of on-line management tasks in AFTN/CIDIN/AMHS environment
AMHS testing	For those participating in AMHS testing: -familiarisation in detail with test procedures and test cases -familiarisation in detail with test tools, traffic generators etc.
Remarks	Prerequisites: -O.1
References	ENRD ANSP internal documents System Operation training documents System Operation Manuals ICAO EUR AMHS Manual ICAO EUR ATS Messaging Management Manual

3.4.5 O.3 Use of UAs

Objective	Understand the UA application and manage ATS messages
Audience	AMHS End System Users
Media	CBT, WBT or classroom
Use of UA application	
Messages	Categories of messages Message priorities Message formats Relation to AFTN messages
UA application	UA HMI UA features Control panel Configuration of parameters ATS messages management Probe and report management Application troubleshooting AMHS addressing-Address lists Legal records Types of Users

	FTBP – DUA – SEC (in detail where applicable)
UA Equipment	UA system physical components Connectivity of UA modules and system Operation & performance monitoring Start, Reset, Restart Cooperation procedures with personnel involved in maintenance (where applicable)
Reporting	Description of how occurrences and maintenance activities are recorded Description of incident reporting procedures Familiarisation with contingency plans Familiarisation with SMS requirements
Remarks	Prerequisites:
References	Internal ANSP documents, System Operation Manual ICAO EUR AMHS Manual ICAO Annex 10

3.4.6 M.1 System Maintenance – H/W

Objective	Understand general maintenance strategy and procedures Describe facilities and define the level of performance required
Audience	Personnel involved in COM Centre maintenance –H/W
Media	
Maintenance Procedures	
1. Maintenance Procedures	Handling precautions to be taken to ensure equipment protection ANSP maintenance strategy and rules Classifications of maintenance Cooperation procedures with personnel involved in operations (where applicable) Cooperation procedures with personnel involved in the provision of network connectivity. Cooperation procedures with the SMC (where applicable) Detailed description of system architecture Actual preventive and corrective maintenance procedures

	per system, sub-system, unit, module. Appreciation of the impact of the replacement of components Reactions to specific alarms and malfunctions Use of special fault tracing, isolation and maintenance tools and procedures System self test and diagnostics Monitoring of RAM values
2. Reporting	Description of how occurrences and maintenance activities are recorded Description of incident reporting procedures Familiarisation with contingency plans Familiarisation with SMS requirements
Facilities	
Power supply	Definition of performance requirements Description of main features Appreciation of impact of loss
Cabling	Description of main features
Environment	Definition of requirements / awareness of impact
Remarks	The level of training required for H/W maintenance is directly related to the maintenance strategy of the ANSP. Recommended prerequisites: -C.1 and C.2 -Any other requirements as defined by the ANSP
References	ANSP internal documents System Maintenance Training documents System Maintenance Manuals

3.4.7 M.2 System Maintenance - S/W

Objective	Understand general maintenance strategy and procedures Describe facilities and define the level of performance required
Audience	Personnel involved in COM Centre maintenance - S/W
Media	
Maintenance Procedures	
Maintenance Procedures	ANSP S/W maintenance strategy and rules

	Detailed description of system architecture Description of System S/W Description of Application S/W Description of HMI Description of data flows Procedures and tools used for S/W installation/upgrades Procedures for setting/modifying system parameters Appreciation of the impact of S/W failure Procedures and tools used for S/W checks Procedures for system generation Procedures for system initialisation/reset/restart/shut-down Procedures and tools for HMI tailoring Cooperation procedures with personnel involved in operations (where applicable) Cooperation procedures with personnel involved in H/W maintenance (where applicable) Running system local and remote diagnostics
Reporting	Description of how occurrences and maintenance activities are recorded Description of incident reporting procedures Familiarisation with contingency plans Familiarisation with SMS requirements
Remarks	The level of training required for S/W maintenance is directly related to the maintenance strategy of the ANSP. Prerequisites: -C.1 and C.2 -Any other requirements as defined by the ANSP
References	ANSP internal documents System Maintenance Training documents System Maintenance Manuals

3.4.8 S.1 COM Centre Supervision

Objective	Provide knowledge necessary for COM Centre Supervision
Audience	Personnel involved in COM Centre Supervision
Media	

COM Centre Management	Working positions Feasibilities, Accesses, Privileges, Security
Network management	Network configuration in detail AMC - CCC functions Procedures for integration of an AMHS COM Centre to the operational network Import of routing tables (where applicable) Use of Directory Services (where applicable)
Statistics	Statistics analysis Export of statistics to AMC (where applicable) Traffic pattern analysis Performance monitoring Determination of need for modifications/upgrades
Testing	In depth knowledge of test procedures and test cases
Working environment	Familiarisation with working arrangements in place internally, with local and remote users of the ANSP and third parties. Familiarisation with international environment and activities Personnel coordination
Remarks	Prerequisites: -O.2 -Any other requirements as defined by the ANSP
References	ENRD ANSP internal documents ICAO EUR AMHS Manual ICAO Training Guideline Courses 172 and 176 ICAO EUR ATS Messaging Management Manual

3.4.9 S.2 System Monitoring and Control

Objective	Provide knowledge necessary for administration, control and monitoring of the system
Audience	Personnel involved in system administration (SMC function)
Media	
SMC	

SMC Functions	Key aspects of system management capabilities Description of available functions (e.g. SNMP) Use of SMC to coordinate maintenance activities
System Configuration	System parameters Feasibilities, Accesses, Privileges, Security Management of devices, alarms
Monitoring and Control Functions	Monitoring of performance of working positions Monitoring of system performance - capacity and processing capabilities Dealing with degradation of service Study of statistics Determination of need for modifications/upgrades to the system
Working environment	Familiarisation with working arrangements in place internally, with local and remote units of the ANSP and third parties. Interface with central ANSP CMS (where applicable) Personnel coordination
Remarks	Prerequisites: -M.2 -Any other requirements as defined by the ANSP
References	ANSP internal documents, System Management Manual

Appendix A: Glossary

Air traffic management. The aggregation of the airborne functions and ground-based functions (air traffic services, airspace management and air traffic flow management) required to ensure the safe and efficient movement of aircraft during all phases of operations.

Approved training. Training conducted within an approved training organization under special curricula approved by a Contracting State.

Approved training organization. An organization approved by a Contracting State in accordance with the requirements of Annex 1, paragraph 1.2.8.2 and Appendix 2 to perform training and operating under the supervision of that State.

ATM services personnel. Persons assigned to perform duties directly in connection with the provision of Air Traffic Management Services.

Attitude. Attitude is understood as behaviors that are acceptable or not in a given context. Attitudes are component part of the required trainees' performance that is described in the intermediate objective. Attitudes are taught to reflect the values and beliefs that students should hold to behave in an acceptable way.

Basic training. Fundamental knowledge and skills appropriate to the discipline to be pursued in the ATS environment.

Certification. The process of determining competence, qualification, or quality on which an aviation document is based.

Competency. The combination of knowledge, skills and attitude to perform a task to the required standards in accordance with the State regulatory requirements.

Domain. Is a set of elements of a discipline that are studied in the qualification training.

Equipment. Portion of a system that performs a function that contributes to a systems output(s).

Intermediate objectives. What a trainee is expected to accomplish in terms of skills, knowledge and attitude, at specified points in a training course. For example, be able to use a piece of test equipment, or solder a joint. Sometimes also referred to as enabling objectives, as they lead up to, or enable, a specific terminal objective.

Job performance objectives. The desired level of job performance in terms of tasks to be performed and standards to be achieved.

Knowledge. A person's range of information, familiarity gained by experience or repetition, understanding. Knowledge is understood as storage of information in the student's mind that can be retrieved when necessary, and understanding of concepts and performances. Knowledge is component part of the expected trainees' performance that is described in the intermediate objective.

Level of complexity. Refers to the taxonomy of verbs used to describe the trainees' expected performance in a training objective.

Licensing authority. The authority designated by a contracting state responsible for the licensing of personnel.

Qualification training. Job category related knowledge, attitude and skills appropriate to the discipline to be pursued in the ATS environment.

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

Rated ATSEP. An ATSEP holding the qualification appropriate to the privileges to be exercised.

Service. A function and/or data critical to the system/user, provided directly or indirectly, either individually, or as part of an overall function or output.

Skill. Practical or intellectual ability, ease in doing something, dexterity. Skills are classified as either intellectual or physical. Intellectual skills are those related to the use of intellect, like the abilities of classifying, rule-using, discriminating, problem-solving or cognitive strategy (the most complex of all). Physical skills are those that enable a person to make coordinated movements, perform manual tasks, and carry out physical activities. The skills are component part of the expected trainees' performance that is described in the intermediate objective.

System. One or more types of electronic equipment and ancillary devices functioning to provide a service.

Terminal objectives. What a trainee is expected to accomplish upon completion of training. For example, "when the trainee completes training, he will be able to troubleshoot and repair a piece of XYZ equipment in twenty minutes, using standard tools and test equipment." (Objectives are best stated in terms of accomplishments.) Also called end-of-course performance objectives or behavioral objectives.

System/equipment rating training. System/equipment knowledge, attitude and skills leading to recognized competency.

Appendix B: List of abbreviations

ACC	Area Control Centre	**FTBP**	File Transfer Body Parts
AEO	AMHS End System Operation	**HMI**	Human-Machine Interface
AFS	Aeronautical Fixed Service	**H/W**	Hardware
AFTN	Aeronautical Fixed Telecommunications Network	**ICAO**	International Civil Aviation Organisation
AIS	Aeronautical Information Service	**ISO**	International Standards Organisation
AMC	ATS Messaging Management Centre	**MET**	Aeronautical Meteorology
AMHS	ATS Message Handling System	**MS**	Message Store
ANP	Air Navigation Plan	**MTA**	Message Transfer Agent
ANS	Air Navigation Services	**OJT**	On the Job Training
ANSP	Air Navigation Service Provider	**OS**	Operating System
ARO	ATS Reporting Office	**OSI**	Open Systems Interconnection
ASM	AMHS System Maintenance	**PC**	Personal Computer
ASO	AMHS System Operation	**PENS**	Pan-European Network Services
ASS	AMHS System Administration/Supervision	**RAM**	Reliability-Availability-Maintainability
ATM	Air Traffic Management	**SAR**	Search and Rescue
ATN	Aeronautical Telecommunication Network	**SEC**	Security Services
ATS	Air Traffic Services	**SMC**	System Monitoring and Control
ATSEP	Air Traffic Services Electronics Personnel	**SMS**	Safety Management System
AU	Access Unit	**SNMP**	Simple Network Management Protocol
BT	Basic Training	**SUPPs**	Regional Supplementary Procedures
CBT	Computer Based Training	**S/W**	Software
CCC	Co-operating Communication Centre	**SWIM**	System Wide Information Management

CIDIN	Common ICAO Data Interchange Network	**TWR**	Aerodrome Control Tower
CNS	Communications, Navigation, Surveillance	**UA**	User Agent
COM	Communications	**WBT**	Web Based Training
DIR	Directory Services		
DOC	ICAO Document		
ENRD	EUR/NAT Routeing Directory		
ESARR	European Safety regulatory Requirement		
EU	European Union		

End of document