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# **Guidelines for a Common Basic Level of Technical Training for Air Traffic Safety Electronics Personnel**

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HRS/TSP-002-GUI-03		<b>Edition Date:</b> 02.04.2004
<b>Abstract</b>		
<p>This document enables the creation of a basic training for Air Traffic Safety Electronics Personnel (ATSEP). The purpose is to start harmonisation of ATSEP training throughout the European Civil Aviation Conference (ECAC) area within the frame of the European Air Traffic Management Programme (EATMP), known simply as 'European Air Traffic Management (EATM)' since May 2003.</p> <p>The basic training is the initial phase of training for ATSEP and is a prerequisite for the commencing of the qualification training as described in the EATM 'Guidelines for a Common Qualification Level of Technical Training for ATSEP' (EATM, 2003 – T32).</p> <p>The structure of the basic training is as follows: Induction, Air Traffic Familiarisation, Communications, Data Processing, Meteorology, Navigation, Surveillance, Maintenance Procedures, Facilities, and System Monitoring and Control.</p> <p>The current edition of this document supersedes first edition entitled 'Guidelines for a Common Basic Level of Technical Training for ATM Technical Staff' published within the frame of the former European Air Traffic Control Harmonisation and Integration Programme (EATCHIP) in 1996.</p>		
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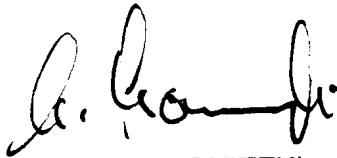

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## DOCUMENT APPROVAL

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## DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

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1.0	21.10.1996		First Edition: Released Issue <i>(titled 'Guidelines for a Common Basic Level of Technical Training for ATM Technical Staff')</i>	All
1.1	01.10.2003		Second Edition: Working Draft	All
1.2	10.11.2003		Second Edition: Draft	All
1.3	12.12.2003		Second Edition: Proposed Issue for HRS-PSG Meeting in January 2004 (document configuration and editorial changes)	All
2.0	02.04.2004	040201-06	Second Edition: Released Issue (agreed on 28-29.01.2004) (final configuration and editorial adjustments)	All

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## EXECUTIVE SUMMARY

This document is the final report of the Working Group of ATM Technical Staff (WGATMTS) created by the Training Sub-Group (TSG) of the EATCHIP/EATMP<sup>1</sup> Human Resources Team (HRT), today known as the Training Focus Group (TFG). It presents the training syllabus for Phase 1 of Air Traffic Safety Electronics Personnel (ATSEP) training called 'basic training'.

The training need is defined as a preparation to safety-related tasks performed in a non-exceptional manner by the ATSEP. Section 2 lists the required skills and defines the training.

The detailed specification of the basic training is in Section 3. It consists of a syllabus for each of the ten training subjects (Induction, Air Traffic Familiarisation, Communications, Data Processing, Meteorology, Navigation, Surveillance, Maintenance Procedures, Facilities, and System Monitoring and Control). Time scales are added as an example to illustrate the objectives.

The common basic level should be adaptable to Air Navigation Service Providers' (ANSPs) requirements. The choice of an objective-based description enables to consider that the entry level of the learner could vary. However, the time estimation is based on a two-year scientific university level.

A bibliography, a list of the abbreviations and acronyms used in this document, and the names of those who contributed to its development are provided at the end of the publication.

The current edition of this document supersedes first edition entitled 'Guidelines for a Common Basic Level of Technical Training for ATM Technical Staff' published within the frame of the former European Air Traffic Control Harmonisation and Integration Programme (EATCHIP) in 1996.

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<sup>1</sup> In 1999 the 'European Air Traffic Control Harmonisation and Integration Programme (EATCHIP)' was renamed 'European Air Traffic Management Programme (EATMP)'. Today it is known simply as 'European Air Traffic Management (EATM)'.

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## 1. INTRODUCTION

### 1.1 Background

The main objective of the EATMP Human Resources Programme (HRS) Stage 1 (see EATMP, 2000 – O3) is to further develop an ATM-specific human resources / human factors toolbox (concepts, methods and tools), which will:

- enable an adequate number of qualified staff to provide a harmonised and consistent service delivery;
- ensure the best use of new technology;
- provide for a smooth transition towards the evolving European ATM systems.

HRS Programme Stage 1 includes the Training Sub-Programme (TSP), defined as follows:

*To provide ANS Providers for all ATM areas with training material, methods and tools, in order to enable a common minimum standard of training which will evolve to meet the future introduction of system changes and will enable the implementation of regulatory requirements for ATM services personnel licensing.*

### 1.2 Working Group for ATM Technical Staff

Under the auspices of the EATCHIP Programme and later the EATM(P) Programme, the Human Resources Team (HRT) delegated responsibility for the Air Traffic Services (ATS) training to its Training Sub-Group (TSG), today known as the Training Focus Group (TFG).

First, TSG initiated the creation of an international task force which, in 1996, produced the 'Guidelines for a Common Basic Level of Technical Training for ATM Technical Staff'.

Then, in 1998 a second task force named 'Working Group for ATM Technical Staff (WGATMTS)' was created at the initiative of TSG. The words 'Air Traffic Safety Electronics Personnel (ATSEP)' replaced the words 'technical staff' to ensure consistency with other international working groups such as that one working under the auspices of the International Civil Aviation Organization (ICAO) on the ATSEP Training Manual.

WGATMTS then developed the 'Guidelines for a Common Qualification Level of Technical Training for Air Traffic Safety Electronics Personnel', published in October 2003 (see EATM, 2003 – T32).

Following the development of the 'qualification level' document it became apparent that the original 'basic level' document required updating and this is what TFG instructed WGATMTS to do. Work commenced in January 2003.

### 1.3 Air Traffic Safety Electronics Personnel (ATSEP) Principal Duties

The main duties of ATSEP are:

- a) maintaining preventively CNS/ATM system and equipment, which includes:
  - calibrating, flight and ground, radio navigation aids,
  - certification of CNS/ATM systems and equipment,
  - modification of operational CNS/ATM equipment;
- b) providing corrective maintenance on CNS/ATM system and equipment;
- c) installation of CNS/ATM systems and equipment;
- d) operational monitoring and control of CNS/ATM system and equipment.

Note: For the purpose of this document, the locutions 'technical staff' or 'engineering and technical personnel' are both used to describe the same personnel, frequently abbreviated by the acronym 'ATSEP'.

### 1.4 ESARR5 Version 2 Definitions

The following two definitions were included in Edition 2.0 of the fifth EUROCONTROL Safety Regulatory Requirement (ESARR 5): 'ATM Services' Personnel' (see SRC, 2002):

#### 1. **ATM Equipment Approved for Operational Use**

*All engineering systems, facilities or devices that have been operationally released to be used either by airspace users (e.g. ground navigation facilities) directly, or are used in the provision of operational air traffic management services.*

Note: *These comprise the systems, facilities and devices operated or supervised by the Operating Organisation and serving the purpose of air navigation, regardless of whether the products used to fulfil the tasks involved in air traffic management are generally available on the market or have been specifically developed to air traffic management requirements.*

## **2. Engineering and technical personnel undertaking operational safety-related tasks**

*Personnel who operate and maintain ATM equipment approved for operational use.*

*Note: This definition is not intended to cover other equipment-related functions such as design, testing, commissioning and institutional training.*

### **1.5 Training Phases in Technical Training**

The training was divided into the following two phases:

- Phase 1 initial training: basic training,
- Phase 2 initial training: qualification training.

A detailed description can be found in the document 'EATM Training Progression and Concepts' (EATM, 2004 – T38).

### **1.6 Structure of the EATM(P) Training Documentation**

The structure of the training documentation is defined in EATM (2004) – T38. It is based on the combined use of the objective-based training method, of a taxonomy and of commonly agreed definitions of media, method, rate of learning and modes of delivery.

#### **1.6.1 Syllabus**

A syllabus is a list of training objectives classified by subjects, topics and subtopics showing the training necessary to fill the training gap and achieve the course aim. An unstructured content helps to detail the objectives. Syllabus does not indicate times, training techniques nor order to achieve the training objective.

#### **1.6.2 Time scale**

Timetables are in hours.

Time scales have been included for guidance. However, the nature and format of the training, the entry level of the learners, and the addition of specific local subjects will vary considerably between the different organisations, and so we would expect there to be a large range of time scales.

### **1.7 Purpose of this Document**

The purpose of this document is to define the basic training for ATSEP.

The expected benefits are:

- the reduction of time and effort investment in the training development,
- the possible reuse of off-the-shelf training materials,
- the guidance for the demonstration of compliance with the guidelines.

To achieve these and according to the EATMP training documentation definition, this document includes:

- ten training syllabi respectively covering the following subjects: Induction, Air Traffic Familiarisation, Communications, Data Processing, Meteorology, Navigation, Surveillance, Maintenance Procedures, Facilities, and System Monitoring and Control;
- an organisation of the basic level training enabling the ATSEP to progress to qualification training in at least one of the following disciplines: Communications, Navigation, Surveillance or Data Processing.

## **2. DEFINITION OF BASIC TRAINING**

### **2.1 Introduction**

The basic training is the training needed to enable ATSEPs to begin to work in ATM environment. It is designed in such a way that it gives an overview not only of the CNS/ATM technical and operational environment and of the most important systems and equipment, but also of the role of all the operators within this complex environment.

To function safely and efficiently with any equipment in the operational ATM environment a 'general understanding and knowledge' of the whole ATM system is necessary. The basic training covers this requirement.

Most ATSEPs will then specialise in a given discipline and will use specific equipment. They will therefore need more advanced training, relevant to the chosen discipline (qualification training), and training specifically adapted to the type of equipment required for the chosen discipline (type rating).

The EUROCONTROL 'Guidelines for a Common Qualification Level of Technical Training for Air Traffic Safety Electronics Personnel' (EATM, 2003 – T32) categorise the qualification training for each of the four disciplines: Communications, Data Processing, Navigation and Surveillance. (In the qualification training the objectives have been organised in five domains: Communications, Data Processing, Navigation, Surveillance and Safety. Each qualification training always includes the corresponding domain and the Safety Domain, plus possibly elements of other domains. 'Safety' is therefore common to all domains.)

This document is structured the same way than the guidelines for qualification training, but the following six subjects, which do not enable progress to qualification training, are in addition: 'Induction', 'Air Traffic Familiarisation', 'Meteorology', 'Maintenance Procedures', 'Facilities', and 'System Monitoring and Control'.

### **2.2 The Basic Training Subjects**

The subjects that are included in the basic training are:

- Subject 1: INDUCTION,
- Subject 2: AIR TRAFFIC FAMILIARISATION,
- Subject 3: COMMUNICATIONS,
- Subject 4: DATA PROCESSING,
- Subject 5: METEOROLOGY,
- Subject 6: NAVIGATION,
- Subject 7: SURVEILLANCE,

- Subject 8: MAINTENANCE PROCEDURES,
- Subject 9: FACILITIES,
- Subject 10: SYSTEM MONITORING AND CONTROL.

Each subject is briefly described in Sections 2.2.1 to 2.2.10.

### **2.2.1 INDUCTION**

As this training is directed at *ab initio* ATSEPs, it is necessary to introduce the new ATSEPs to the structure and rules of the organisation that they work for. This includes the international organisations and regulations that control the aviation industry.

### **2.2.2 AIR TRAFFIC FAMILIARISATION**

An understanding of the ATM function is important to all ATSEPs. This enables them to appreciate the consequence of actions that they have to perform and decisions that they have to make in dealing with operational equipment. The air traffic controller is the end-user of most of the services provided by the ATSEPs. Appreciating the requirements and constraints of air traffic control allows the ATSEPs to understand the importance of the ATSEP's function in the ATM system.

### **2.2.3 COMMUNICATIONS**

The communication system is the most important technical element in the ATM system. All ATSEPs, regardless of specialisation, should be aware of the importance of the communication systems and have a good high-level appreciation of the communication system architecture.

### **2.2.4 DATA PROCESSING**

Data processing is increasingly important to all systems and domains that ATSEPs will have to work with. It is important to understand the nature of the quality management and configuration control that is core to the correct operation of data processing.

### **2.2.5 METEOROLOGY**

Meteorological information is central to ATM. All ATSEPs should be aware of the importance of timely accurate meteorological information. The terminology used in meteorology is very unique to that domain. A good understanding of it is therefore essential.

## **2.2.6 NAVIGATION**

All ATSEPs should be familiar with the navigation infrastructure, terminology, and developments. Performance requirements, quality assurance and developments are points of particular importance in the Navigation Domain.

## **2.2.7 SURVEILLANCE**

Surveillance is technologically the most complex area that ATSEPs are required to understand. A good high-level understanding of the nature of radar and other systems is required to appreciate the special nature of the surveillance systems. Therefore, an understanding of the equipment and data used in Surveillance is a requirement for all ATSEPs.

## **2.2.8 MAINTENANCE PROCEDURES**

For many ATSEPs maintenance is core to their daily working practice. Regardless of specialisation, appropriate understanding of the 'maintenance system' is a common requirement for these ATSEPs.

Other ATSEPs operate in a more abstract environment and do not have maintenance responsibilities. For those a thorough knowledge of the 'maintenance system' is essential because maintenance is part of the operating conditions and constraints of the system. If ATSEPs fail to understand the impact of maintenance they will also fail to understand that system is an operational context.

## **2.2.9 FACILITIES**

The provision of building services has a special requirement in the operational ATM system. The security, safety and reliability of power supplies, air conditioning, fire detection and fire fighting systems are critical to the safe and reliable provision of the ATM service. All ATSEPs have to interact with these systems even if they have no direct responsibility for these services.

## **2.2.10 SYSTEM MONITORING AND CONTROL**

System Monitoring and Control (SMC) - both the technical implementation, and the procedures and practices - is the core of the operational technical task. The SMC function influences the operational characteristics of all the technical services used in the ATM system. All ATSEPs need to understand what the SMC function is and how it operates. The SMC function would typically include dealing with exceptional occurrences as well as routine tasks. The hierarchy of responsibility and authority for operational services is also essential knowledge for all ATSEPs.

## **2.3 Conclusion**

The main purpose of the basic training is to prepare the learner to work in the ATM environment with due understanding of the different disciplines that constitute an ATM system. The learner is then ready to progress to qualification training and type rating as appropriate to his/her tasks.



### **3. SYLLABUS AND TIME SCALES**

#### **3.1 Introduction**

Separate syllabus and time scales are provided for each domain.

##### **3.1.1 Syllabus**

All the objectives of the syllabus are considered as prerequisite to further training (e.g. qualification, type rating).

Any reader who would be unfamiliar with the EATM Common Core Content concepts will find it useful, before going through the syllabus, to read the document entitled 'EATM Training Progression and Concepts' recently published (see EATM, 2004).

##### **3.1.2 Time scales**

For each subject the time scale indicates the duration of one exemplar training in periods of one hour. These indications have to be treated with caution. On average they include global provision for overheads such as:

- time for assessment,
- travel time,
- time buffer for constraints due to training equipment capacity.

They do not include time for extra training in areas such as aeronautical English or specific local training.

It is also important to note that the main purpose of the document is to display the objectives rather than explaining the way to attain them.

There are significant differences in the training regimes between the organisations. Significantly different pre-employment qualifications (and experience) are required for different recruitment intakes. It is expected that significantly different time scales are appropriate.

The teaching method used in basic training is not prescribed by this document. Time scales will also vary depending on the teaching method. For instance, classroom training would take less time than training as part of a work experience placement with On-the-Job-Training Instructor (OJTI).

<b>Basic training</b>	<b>Number of periods in the exemplar common core</b>
Subject 1: Induction	<b>19</b>
Subject 2: Air traffic familiarisation	<b>34</b>
Subject 3: Communications	<b>39</b>
Subject 4: Data processing	<b>31</b>
Subject 5: Meteorology	<b>12</b>
Subject 6: Navigation	<b>40</b>
Subject 7: Surveillance	<b>34</b>
Subject 8: Maintenance procedures	<b>9</b>
Subject 9: Facilities	<b>6</b>
Subject 10: System monitoring and control	<b>13</b>
<b>TOTAL</b>	<b>237</b>

### 3.2 Syllabus

#### Subject 1: INDUCTION

The general objective is:

To give the new entrant a broad general knowledge of the ATM work environment.

TOPIC SUBTOPIC	Objectives Students shall ...	L	CONTENT
<b>1 Induction</b>			
1.1 The National Organisation	1.1.1 Describe the history, organisational structure, purpose and functions of the national service provider(s) and regulatory structure  1.1.2 Describe the organisational structure and functions of the major departments within the national organisation  1.1.3 State appropriate accountabilities and responsibilities	2  2  1	Headquarters, control centres, training facilities, airports, outstations, civil/military interfaces  Organisation: handbook (plans, concepts and structure)  Impact of international requirements  Description of tasks, functions, national rules and regulations  Organisation, concepts and structure, regulator and service provider

<b>TOPIC SUBTOPIC</b>	<b>Objectives Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
1.2 The Workplace	1.2.1 Describe fire safety and first aid regulations and practices  1.2.2 Describe role of trade unions and professional organisations  1.2.3 State the function and use of relevant administrative procedures and associated documentation  1.2.4 Understand terms and conditions of employment	2   2  2  1	Requirements, rules and standards  Documentation-concept  Validation of requirements  International, European, national, local level  Impact on the different duties, roles and structures  Course aims, objectives, topics, methods of assessment, promotions, staff welfare, pensions  Pay and conditions of employment, attendance and leave, staff welfare, pensions
1.3 European/Worldwide Dimension	1.3.1 Explain the relationship between States and the relevance to ATC operations  1.3.2 Recognise the legal framework of international and national ATC regulations  1.3.3 Differentiate the roles and specific functions of the range of international bodies	2  1  2	Harmonisation, flow management, bilateral agreement, sharing of ATM relevant data, major studies, research programmes and policy documents  National concepts, studies timeframe and responsibilities  ICAO, ECAC, EUROCONTROL, FAA, EASA, JAA, RTCA, EUROCAE

<b>TOPIC SUBTOPIC</b>	<b>Objectives Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
1.4 International Standards And Recommended Practices	1.4.1 Develop an awareness of ATM engineering 'standards' and 'practices'	0	e.g. ICAO Annex 10, ICAO Doc 8071, available EUROCONTROL standards, guidance material on reliability, maintainability and availability
1.5 Personal Development	1.5.1 Be aware of human factors matters	0	Teamwork, initiative and self-confidence, interpersonal skills, leadership, negotiating skills, safety awareness, communication skills, individual responsibility
	1.5.2 Be aware of job and career development opportunities	0	Training, qualifications, etc.
1.6 Project Management	1.6.1 Explain the need for project planning, monitoring and control techniques	2	Project definition, user requirements, Information/communication of milestones, targets and deliverables Monitoring and control techniques Acceptance of project results
	1.6.2 State the need for testing and for quality assurance	1	Validation of requirements Evaluation criteria Statement of project work Methods of presentation Test scenario

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
	<p>1.6.3 Be aware of the role of various departments and individuals in the planning, financing and management of projects</p> <p>1.6.4 Define the meaning and use of the basic terminology in project planning, monitoring and control</p> <p>1.6.5 Recognise and explain the life cycle phases using a real project example</p>	<p>0</p> <p>1</p> <p>2</p>	<p>Preparation of equipment specifications, procurement procedures, factory and site acceptance tests, commissioning and facility transfer to operational status, modifications, civil works activities / land acquisition, planning applications, accommodation, quality assurance</p> <p>Project life cycle, life cycle costing, work breakdown structure / work packages, PERT/GANTT charts, cost effectiveness, cost analysis</p> <p>e.g. Preparation of equipment specifications, procurement procedures, factory and site acceptance tests, commissioning and facility transfer to operational status, modifications, civil works activities / land acquisition, planning applications, accommodation, quality assurance</p>
<p>1.7 Financial Environment in ATM</p>	<p>1.7.1 Recognise the roles and responsibilities of appropriate levels within the national organisation</p> <p>1.7.2 Demonstrate an appreciation of the way budgets are administered and funds generated</p>	<p>2</p> <p>2</p>	<p>Finance managers, accountants and administrators</p> <p>e.g. En-route ATS charges, terminal ATS charges, calculation of standard unit rate, cost recovery trace, CRCO, budgeting procedures, corporate plan, capital programme</p>

<b>TOPIC SUBTOPIC</b>	<b>Objectives Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
1.8 Security	1.8.1 Explain security policies and practices for physical security	2	Fire alarm, evacuation procedures Site access control, identification, e.g. interface to security/police, threat level
	1.8.2 Describe the training site security policy	2	Fire alarm, evacuation procedures Site access control, identification, e.g. interface to security/police, threat level
	1.8.3 Explain security policies and practices for information and data	2	Backup, storing, hacking, confidentiality, etc.
1.9 Quality Management	1.9.1 Explain the need for a quality management		e.g. ISO, EFQM
1.10 Safety Management	1.10.1 Be aware of the high level of safety required by the aeronautical activity	0	Safety policy and rules

**Subject 2: AIR TRAFFIC FAMILIARISATION**

The general objective is:

To provide an insight into the function and responsibilities of ATM operations.

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
<b>1 Air Traffic Familiarisation</b>			
1.1 Air Traffic Control (ATC)	1.1.1 Demonstrate an awareness of airspace organisation and the associated concepts  1.1.2 Describe the overall purpose of ATC 1.1.3 Describe the functions and services provided by ATC	2   2 2	Airways with national boundaries, flight levels, overflying, flow management, flight information region, area control centre, terminal manoeuvring area, sectorisation, control zone, upper air routes, oceanic regions, North Atlantic tracks; ICAO Annex 11, Doc 4444  Safety, separation standards Radar control, RAS, RIS, FIS, Area control, Terminal Control, Aerodrome control, Oceanic control
1.2 Air Traffic Management (ATM)	1.2.1 Demonstrate an appreciation of operational ATM tasks and procedures  1.2.2 Demonstrate an understanding of ATM terminology and concepts	2  2	The tasks of tower, approach, area and oceanic control, flow control, IFPS, CFMU, CNS concepts, weather, environment, special flights, military activities, emergencies, and search and rescue situations, reliability, redundancy, contingency, procedural backup, OLDI  Flight plans, flight strips, flight levels, AIRPROX, conflict alerting



<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
	1.2.3 Describe the operational importance of equipment and facilities provided for ATM  1.2.4 Be aware of future developments in systems and ATM practices which will impact upon services provided by ATM  1.2.5 Define the standard units used in aviation	2   0  2	Safety, safety significant events, separation standards, AGA communications, radar, navigation beacons, ATIS  Datalink, satellite augmentation, gate-to-gate, HIPS, ATC tools  Speed, distance, height, time, direction, pressure, etc.
1.3 Air Traffic Control (ATC) Tools	1.3.1 Describe use of ATC safety nets 1.3.2 Describe use of MTCA 1.3.3 State types of ground-based monitoring aids 1.3.4 State types of sequencing and metering tools	1 1 1 1	STCA, MSAW Outcome of trajectory prediction e.g. APW (SMF) Arrival and departure managers (compass, maestro, etc.), TLPD, EAT, workload monitoring
1.4 Familiarisation	1.4.1 Experience, through the use of simulators, some of the tasks of ATC 1.4.2 Explain the need for good communications between operational staff 1.4.3 State the purpose, function and role of various operational stations in relation to ATC operations 1.4.4 Be aware of the cockpit environment	3 2 1 0	ATC role simulations Handovers, coordination, MIL/CIV coordination, planner/tactical Site visits Pilot HMI, use of data and systems (e.g. by familiarisation flight where practicable)

<b>TOPIC SUBTOPIC</b>	<b>Objectives Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
1.5 Aeronautical Information Services (AIS)	1.5.1 Describe the position of AIS inside the national air traffic services  1.5.2 Describe AIP service    1.5.3 Describe the aeronautical charting service    1.5.4 Describe the international NOTAM office    1.5.5 Describe the ATS Reporting Office (ARO)    1.5.6 Describe the European AIS Database	2  2    2    2    2    2	Structure of the AIS and its area of responsibility  Data contents of AIP, SUP, AIC and types of publication: AIRAC, non-AIRAC, data collection and preparation, data format, distribution channels, supporting systems and tools  Types of aeronautical charts, operational use of charts, distribution channels, supporting systems and tools  Purpose and significance of NOTAM and SNOWTAM, data collection and preparation, distribution channels, storage and processing of incoming NOTAM and SNOWTAM, processing of other aeronautical messages (FLOWTAM, NAT tracks, etc.), contents and operational use of pre-flight information bulletins, supporting systems and tools  Purpose of flight plans and other ATS messages, types of flight plans (FPL and RPL), contents of flight plans and other ATS messages, distribution of flight plans and other ATS messages, supporting systems and tools  Paper/data, central single source, validated, redundancy, EAD structure

<b>TOPIC SUBTOPIC</b>	<b>Objectives Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
	1.5.7 Describe procedures for providing Communications, Navigation and Surveillance (CNS) data to AIS	2	Information of a permanent nature, information of a temporary nature, status report of NAVAIDs

**Subject 3: COMMUNICATIONS**

The general objective is:

To provide a basic foundation knowledge and understanding of the principles used in voice and Data Communications.

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
<b>1 Voice Communications</b>			
1.1 Introduction to Voice Communications	1.1.1 Describe system architecture and evolution 1.1.2 Explain the purpose and principles of voice communication systems 1.1.3 Describe, using an overall block schematic, the function and the performance of various speech and communication systems 1.1.4 Describe the basic principles, purpose and operation of a range of voice-communication systems, both air-ground and ground-ground 1.1.5 Describe the concepts and terminology in use, and the role of voice communications in ATC 1.1.6 Describe the functional elements of radio (sectorisation and frequencies, frequency spectrum and bands) and telephone system (intercom and interphone)	2 2 2 2 2 2	Bandwidth, fidelity, routing, switching, lineside/deskside Analogue/digital comparisons, distortion, harmonics Transmission thread, reception thread, sidetone Phraseology, readback, level, speed, direction Deskside elements, lineside elements

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
	<p>1.1.7 Describe methods used to route and switch voice communications, describe how systems interface to produce an integrated service to ATC</p> <p>1.1.8 State ICAO and local legal requirements regarding recording and retention of voice communications</p> <p>1.1.9 Describe frequency allocation constraints and procedures</p> <p>1.1.10 Describe frequency channelling and distribution system</p> <p>1.1.11 Describe multi-frequency code and Qsig</p> <p>1.1.12 Describe voice recording systems</p> <p>1.1.13 Describe ATIS and VOLMET</p>	<p>2</p> <p>1</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p>	<p>Multi-channels, multi-users, party lines, VHF/UHF linkage, HF</p> <p>Regulatory requirements, incident recording and playback</p> <p>Spectrum, interference sources, commercial allocations</p> <p>Channel spacing: 25 kHz, 8.33 kHz, etc.</p> <p>Move to ground-ground</p> <p>Digital recording equipment, analogue recording</p> <p>Purpose of ATIS, information available, location, recency</p>
<p>1.2 Air-Ground</p>	<p>1.2.1 State ATC requirements for secure voice communications</p> <p>1.2.2 State the functions and describe the basic operation of routing and switching equipment</p> <p>1.2.3 Describe, with the aid of a block diagram, the purpose and operation of the elements of a typical system</p>	<p>1</p> <p>1</p> <p>2</p>	<p>Safety, reliability, availability, coverage</p> <p>Voice switching</p> <p>Functionality, emergency systems, transmission/reception, antenna switching, 8.33 channel spacing, voting systems, CLIMAX</p>

TOPIC SUBTOPIC	Objectives Students shall ...	L	CONTENT
	<p>1.2.4 Describe the signal path from the Controller Working Position (CWP) to the aircraft</p> <p>1.2.5 Describe how continuity, integrity and Quality of Service (QoS) are achieved</p> <p>1.2.6 State the theory and practice which ensure efficient utilisation of available frequency bands</p> <p>1.2.7 List and recognise the elements HMI of CWP used for air-ground communication</p> <p>1.2.8 List future developments of voice communication techniques</p> <p>1.2.9 List future developments and techniques which may have an impact on ATC voice communications</p>	<p>2</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>CWP, switch, remote monitoring and control system, beam, PTT, radio station, RX/TX, on-board equipment</p> <p>Importance of coverage and redundancy of equipment, overlapping coverage, backup system</p> <p>International Frequency Bureau</p> <p>Frequency selection, emergency, station selection, coupling, microphone, headset, loudspeaker, short time recorder, footswitch, PTT</p> <p>VDL Mode 3, channel spacing, new modulations, satellite voice communications, digitised speech, etc.</p> <p>e.g. CPDLC, ADS, Mode S ,VDL Modes 2 and 4, etc.</p>
<p>1.3 Ground-Ground</p>	<p>1.3.1 State ATC requirements for secure voice communications</p> <p>1.3.2 Describe the functions and the basic operations of routing and switching equipment</p> <p>1.3.3 Describe how ground-ground systems interface to provide an integrated service to ATC operations</p>	<p>1</p> <p>2</p> <p>2</p>	<p>Safety implications, malicious interference, redundancy</p> <p>General architecture, digital/analogue, multiplex types, PCM 30, non-blocking switches</p> <p>WAN, AFTN, AIS, international links, inter-centre interoperability</p>

TOPIC SUBTOPIC	Objectives Students shall ...	L	CONTENT
	<p>1.3.4 Describe, with the aid of a block diagram, the purpose and operation of the elements of a typical system</p> <p>1.3.5 Recognise the elements of the CWP used for ground-ground communication</p> <p>1.3.6 List developments in ground-ground communication technologies which may impact on ATC</p>	<p>2</p> <p>1</p> <p>1</p>	<p>Functionality, emergency systems, switching, PTT interfaces, local PABX equipment, multi-frequency code and Qsig</p> <p>Selection, coupling, emergency, PTT, short time recorder, loudspeaker, headset, microphone</p> <p>e.g. networks (ATN, etc.), protocols (TCP/IP, voice over IP) future development, etc.</p>
<p><b>2 Data Communications</b></p>			
<p>2.1 Introduction to Data Communications</p>	<p>2.1.1 Explain the purpose and principles of data communication systems</p> <p>2.1.2 Describe the concepts of data transmission</p> <p>2.1.3 Describe, using an overall block schematic, the function and the performance of the systems in use</p> <p>2.1.4 Explain basic concepts of the connectivity of systems</p> <p>2.1.5 Describe basic associated software functions/applications</p>	<p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p>	<p>Terminology, principles and theory of networks, layering (e.g. OSI or TCP/IP), datalinks, LAN, WAN</p> <p>Packet switching, protocols, multiplexing, de-multiplexing, error detection and correction, routing, switching, hops, cost, bandwidth/speed</p> <p>Redundant routes, speed, reliability, error rates</p> <p>Terminology, principles and theory of networks, layering (e.g. OSI or TCP/IP), datalinks, LAN, topology, gateways, routers, repeaters, protocols</p>

<b>TOPIC SUBTOPIC</b>	<b>Objectives Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
	2.1.6 List protocols in current use	1	e.g. TCP/IP, X.25
2.2 Networks	2.2.1 Be aware of ATC specific requirements for data communications	0	QoS, security
	2.2.2 Describe the different types of networks	2	LAN, WAN, ATN, national network for ATM, e.g. satellite-dedicated networks
	2.2.3 Describe the functions of a network management system	2	Priorities, rights, e.g. SNMP
2.3 Aviation Specific Networks, Applications and Service Providers	2.3.1 List a range of air-ground aviation related network concepts	1	Sub-networks (ATN air ground sub-network, AMSS, VDL, HF DL, Mode S), protocols (ACARS), service providers (ARINC, SITA)
	2.3.2 List a range of ground-ground aviation related network concepts	1	Networks (AFTN/CIDIN, MOTNE, OLDI, RAPNET, ATN, AMHS), protocols (ASTERIX, etc.), service providers (ARINC, SITA)



**Subject 4: DATA PROCESSING**

The general objective is:

To provide a basic foundation knowledge and understanding of the principles used in data processing and an overview of their use in ATM operations.

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
<b>1 Data Processing</b>			
1.1 Introduction to Data Processing (DP)	1.1.1 Describe the system evolution and architecture  1.1.2 Describe, using an overall block schematic, the function and the performance of the systems  1.1.3 Describe how the systems interface with other systems  1.1.4 Define basic software functions/applications  1.1.5 List the different operating systems which support current DP systems  1.1.6 Be aware of legal aspects	2  2  2  1  1  0	ICAO, national law, recording  Generic FDP and RDP overall functional block diagrams  Outline interconnecting systems (radars, displays, CFMU, AFTN, recording, communications)  FDP (IFPS, route processing, code/callsign, code allocation, strip distribution, track labelling)  RDP (coordinate conversion, plot and track processing, MRP, STCA, track labelling)  e.g. AIX/UNIX, VMS, DOS/WIN, RMX  e.g. Copyright, configuration control, traceability and recording of data and actions

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
1.2 System Software and Hardware Principles	1.2.1 Demonstrate a knowledge of current hardware and operating system (possibly part of pre-entry education)	2	Driver, interfaces, specific systems, e.g. UNIX, VMS, etc.  Platforms (DEC Alpha, RISC6000, MBII, etc.)
1.3 Radar/Surveillance Data Processing (RDP)	1.3.1 State ATC requirements  1.3.2 Explain the principles of radar data message processing  1.3.3 Describe the functions of RDP  1.3.4 Describe the radar data inputs/outputs  1.3.5 List future developments  1.3.6 Describe the radar data monitoring functions (safety net, monitoring aids)	1  2  2  2  1  2	QoS, mandatory data recording, redundancy  e.g. Single, multi-, plot, track  Recording, plot processing, track processing, multi-radar, limits and accuracy of MRT  tracks, plots, messages, code/callsign, time, control and monitoring, conflict alerts, FDP interface, maps, adaptation  Mode S and ADS, ARTAS tracker, CORA  STCA, MTCD, MSAW
1.4 Flight Data Processing (FDP)	1.4.1 State ATC requirements  1.4.2 Explain the functions of FDP	1  2	QoS, unambiguous, accurate, error free, timely  Flight strip production, flight plan amendments, code/callsign correlation, flight progress monitoring, CIV/MIL coordination

<b>TOPIC SUBTOPIC</b>	<b>Objectives Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
	1.4.3 Describe the inputs and outputs	2	Flow control (CFMU/IFPS/FMP, ETFMS), flight strips / data displays, MRT, environmental data, static data, airspace adaptation, etc.
	1.4.4 Describe the basic software functions/ applications	2	FDP (IFPS, route processing, code/callsign, code allocation, strip distribution, track labelling)
	1.4.5 List future developments	1	Very advanced systems (MTCD)
	1.4.6 Describe FDP-RDP association, exchanges and updating	2	Code/callsign / flight plan correlation, message exchanges, information update
1.5 Operational Display System (ODS)	1.5.1 Describe the different display technologies	2	Random scan / raster scan, common graphic display interface, CRT/LCD
	1.5.2 Be aware of HMI aspects	0	EUROCONTROL Standard HMI (ODID4)
	1.5.3 Describe the information displayed to the ODS HMI	2	Country specific
1.6 Miscellaneous Information	1.6.1 List the categories of other data used by ATC	1	System status / backup systems, clock, meteorological data, NOTAM, interfacing with adjacent centres, additional information, e.g. VDF, electronic briefing, etc.
1.7 Analysis Tools	1.7.1 List analysis tools	1	e.g. Possible malfunctions (SASS-C, SASS-S, RAPS, track and noise monitoring tools)
1.8 Civil/Military (CIV/MIL) Coordination	1.8.1 State requirements for CIV/MIL coordination	1	National organisation/coordination Main interfaces and procedures

**Subject 5: METEOROLOGY**

The general objective is:

Learner shall be aware of the need of timely accurate meteorological information in ATM operations.

<b>TOPIC SUBTOPIC</b>	<b>Objectives Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
<b>1 Meteorology</b>			
1.1 Introduction to Meteorology	1.1.1 Explain the relevance of meteorology in the ATC environment 1.1.2 Describe the function and the performance of the weather measurement systems	2 2	Navigation, security of flight, landing conditions National, local (airport) systems
1.2 Impact on Aircraft and ATC Operation	1.2.1 Be aware of atmospheric conditions and the impact on aircraft operations 1.2.2 Define the impact of atmospheric conditions on ATC operations	0 1	e.g. Atmospheric circulation, wind, visibility, temperature/humidity, cloud base, lightening, storms/fronts/icing, windshear, rainfall water, dew point, runway condition (aquaplaning, etc.) Altimeter settings (QNH, QFE, flight level; transition altitude transition level), ATIS, approach minima
1.3 Meteorological Parameters, Tools and Documents	1.3.1 List the main meteorological parameters	1	Wind, visibility, temperature pressure

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ...</b>	<b>L</b>	<b>CONTENT</b>
	<p>1.3.2 Explain the main functions of the meteorological tools</p> <p>1.3.3 List meteorology documents (messages and charts)</p>	<p>2</p> <p>1</p>	<p>Meteorology sensors, anemometers, RVR meters, barometers, meteosat/airborne radar weather, meteorology network information, sensors distribution networks, weather balloon</p> <p>Meteorology messages (e.g. TAF, METAR, NOTAM, SNOWTAM)</p> <p>Weather codes, meteorology charts (SIGMET, wind, etc.), ATIS / flight meteorology broadcast (VOLMET)</p>



<b>TOPIC SUBTOPIC</b>	<b>Objectives Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
1.2 Ground-based Navigation(al) Aids (NAVAIDs)	1.2.1 Describe and explain the principles of the ground-based systems  1.2.2 Describe the performance level of each system  1.2.3 Explain the purpose of flight inspection	2  2  2	DF, NDB, VOR, DME, (e.g. TACAN) Loran C, ILS, MLS, including pilot interfaces  Operational use of the system, PA, NPA
1.3 Satellite-based Navigation	1.3.1 Describe the global architecture of the core satellite systems  1.3.2 Define ICAO concepts of GNSS  1.3.3 Demonstrate the advantages and disadvantages of GNSS	2  2  2	GPS, GLONASS and GALILEO overall block schematic  GNSS phase 1 (e.g. ABAS, SBAS, GBAS)  Wide area navigation, low visibility approach, CAT1/2/3, cost, aircraft avionics, ground infrastructure, interference (intentional/unintentional)

**Subject 7: SURVEILLANCE**

The general objective is:

To provide a basic foundation and understanding of the principles used in Primary and Secondary Radar and in the other Surveillance systems, and an overview of their use in ATM operations.

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
<b>1</b> <b>Surveillance</b>			
1.1    Introduction to Surveillance	1.1.1 List the various Surveillance domains 1.1.2 State the purpose and operation of the surveillance systems in current use by ATC 1.1.3 State future developments in Surveillance 1.1.4 Describe system architecture and evolution 1.1.5 Explain the purpose and principles of surveillance systems 1.1.6 Describe, using an overall block schematic, the function and performance of surveillance systems	1 1 1 2 2 2	Air-air, ground-air, ground-ground PSR and SSR, ADS-C, ADS-B, multi-lateration coverage, range, distance measurement, azimuth, sensitivity, propagation, safety procedures, relative system costs, ACAS, SMGCS, ASMGCS ADS, Mode S, etc. Primary detection and ranging, azimuth resolving, IFF-SSR Position verification, intruder detection, separation verification, TX/RX, MTI, MTD, plot extractor datalinks, tracking, data fusion, display, recording and analysis



TOPIC SUBTOPIC	Objectives Students shall ....	L	CONTENT
	1.1.7 State ICAO and local legal requirements regarding recording and retention of voice communications	1	SARPS, ICAO Annex 10, Vol IV
1.2 Primary Radar	1.2.1 Describe the requirements for and the use of primary radar in ATC  1.2.2 Describe the system architecture and evolution  1.2.3 Explain in principle the basic elements of a typical primary radar system  1.2.4 Describe, using an overall block schematic, the function and performance of the primary radar system	2  2  2  2	Non-cooperative detection (examples: control zone intrusion, etc.), probability of detection, cost, etc., types of PSR (Area, Terminal, SMR)  Detection, range measurement, azimuth indication, rotating antenna, etc.  Echo-based, power requirements, antenna characteristics, etc., environmental limitations (anaprop, weather), LoS, etc.  Antenna system, TX/RX, signal processing, plot-extraction, local tracking, data transmission
1.3 Secondary Radar	1.3.1 Describe ATC requirements for and the use of secondary radar  1.3.2 Describe the system architecture and evolution  1.3.3 Explain in principle the basic elements of a typical secondary radar system	2  2  2	In-flight safety, cooperative, probability of detection, identification, (code/callsign), SPI, pressure altitude, cost, emergency codes, code allocations  ICO-defined standard, IFF, Mode-A code limitations, Mode-S interrogator pollution, transponder capture  Up-link down-link frequencies and formats, power budget, antenna requirements (LVA)

TOPIC SUBTOPIC	Objectives Students shall ....	L	CONTENT
	1.3.4 Describe, using an overall block schematic, the function and performance of the secondary radar system	2	Interrogator, transponder, plot-extractor, local tracking, combiner, data transmission
1.4 Radar Message Format	1.4.1 Describe ATC requirements 1.4.2 Explain the need for harmonisation 1.4.3 Describe the techniques used for transmission of radar data 1.4.4 Describe formats in use	2 2 2 2	QoS, integrity, security, radar maps, radar data presentations, plots/tracks. Data sharing, common procurement, etc., standards Point to point, network, microwave, satellite ASTERIX, etc.
1.5 Automatic Dependent Surveillance (ADS)	1.5.1 Explain Surveillance-related Future Air Navigation Systems (FANS) concepts and their impact on ATC  1.5.2 Describe the basic principles of ADS contract and broadcast  1.5.3 Describe the datalink technologies proposed and the current situation of deployment	2  2  2	Sources of aircraft parameters (e.g. FMS outputs), communication mediums Principles of the message/signal path Application within oceanic and other non-radar airspace, avionics requirements (e.g. FMS), ATC requirements  Contract as a two-way data exchange with reporting rules, broadcast 'send and forget' not adaptable Advantages/disadvantages, standards, variants  VDL, HF, 1090 MHz, UAT, satellite Advantages/disadvantages, standards, variants

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
1.6 Weather Radar	1.6.1 Describe the use of ground weather radar in ATC  1.6.2 Describe the system options and data presentation  1.6.3 Describe airborne weather radar	2  2  2	Purpose and usage, example European installation, impact of adverse weather in dense airspace, primary, antenna, coverage, data processing, displays, polarisation, multi-elevation scanning  e.g. Integrated with surveillance data, separate PPI display, text only presentation  Use, range, coverage, HMI, etc.
1.7 Surface Movement Systems	1.7.1 Consider the ATC requirements  1.7.2 Describe the basic functionality and constraints of surface movement primary radar  1.7.3 Describe the use of SSR and derived systems for surface movement control  1.7.4 Describe other systems (ground movement)  1.7.5 Describe the integration and presentation of surface movement control surveillance information	2  2  2  2  2	Safety (aircraft and mobiles), landing clearance, runway clearance, low visibility, collision warnings, parameters, displays, mapping, data processing, range discrimination, aircraft identification, ground mobiles  Wavelength consideration for propagation resolution and antenna dimensions, high PRF, short pulse width, high data rate  SSR, monopulse, e-scan high-resolution SSR, multi-lateration, multi-static, ADS, Mode-S squitter  Acoustic, vibration, induction loop, video, infrared, ADS, etc.  Data fusion, ASMGCS, display systems, controller HMI

**Subject 8: MAINTENANCE PROCEDURES**

The general objective is:

To provide a full and comprehensive understanding of the maintenance process in both theory and practice.

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
<b>1 Maintenance Procedures</b>			
1.1 Maintenance Procedures	1.1.1 Be aware of precautions to take before handling equipment.  1.1.2 Explain the classifications of maintenance used in their organisation.  1.1.3 State the maintenance philosophy and rules that are in operation in their organisation  1.1.4 Explain the operational procedures involved in changing the configuration of an operational system	0   2  1        2	Isolation, protection devices, electrostatic sensitive devices, power supplies, heavy loads, high voltage.  e.g. Preventative, corrective, service configuration  Who sets the maintenance policy and what criteria are used to establish the appropriate practice?  Who plans the maintenance?  How is the maintenance coordinated?  Who is responsible for the execution of the maintenance?  What are the rules controlling deviation from planned maintenance?  Authority/permission to change a system  Station log books, CMS system log-in, control authorisations, documentation, etc.

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
	<p>1.1.5 Explain the procedures required to verify that a service is fit to be returned to operational service</p> <p>1.1.6 State the legal requirements, company requirements, station requirements and norms of practice involved in working with operational systems</p> <p>1.1.7 Be aware of the scope or responsibility of an authorised person</p>	<p>2</p> <p>1</p> <p>0</p>	<p>Service testing:- BITE, specific test procedures, manual verification of QoS</p> <p>Correct and clear notification of any 'observations' on the QoS duly documented</p> <p>e.g. ICAO-mandated recording of speech circuits and the holding of recordings for 30 days, etc.</p> <p>National law requires that safe working practice is followed</p> <p>ESARR as appropriate, company rules</p> <p>Station log books, CMS system log-in, control authorisations, documentation, correct equipment operation, etc.</p> <p>Safety of personnel (self and others including 'the public', e.g. crane carrying parts over a public footpath or road)</p> <p>Safety of service</p> <p>Safety of equipment.</p>

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
	<p>1.1.8 Report on the performance of a maintenance task</p> <p>1.1.9 State appropriate safety rules that apply in their organisation</p>	<p>2</p> <p>1</p>	<p>Observe a team which is performing maintenance task following the approved procedures and techniques</p> <p>e.g. Correctly gain access to the site, informing the appropriate authority</p> <p>Establish permission and authority to work on the equipment</p> <p>Safely remove the equipment from service, perform the requisite maintenance</p> <p>Establish the correct functioning of the equipment and negotiate for it return to service</p> <p>Ensure that all procedures and documentation have been correctly completed, etc.</p> <p>e.g. Never work on high-voltage systems without a second person present, always ensure that colleagues are aware of your working and travel arrangements, etc.</p>

**Subject 9: FACILITIES**

The general objective is:

Learner shall describe facilities and define the level of performance required

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
<b>1 Facilities</b>			
1.1 Power Supplies	1.1.1 Define the level of performance required from a power supply system in the ATM environment  1.1.2 Describe the main features of the current power supply systems  1.1.3 Be aware of safety regulations and procedures  1.1.4 Describe the power distribution system at a typical ATM site  1.1.5 Explain precautions to be taken when working on equipment  1.1.6 State any appropriate ICAO, European or local regulations in force  1.1.7 State the appropriate safety rules  1.1.8 Describe the monitoring control systems	1  2  0  2  2  1  1  2	Availability, quality, CoS, etc.  UPS systems, batteries and emergency generators, high voltage, earthing techniques, power provider(s)  Appropriate regulations of safety  Power distribution redundancy, input, output, protections, measurements and monitoring, block schematic  Low and high voltage earthing techniques, protection devices  ICAO regulations, local regulations and rules  Safe disposal of electronic components  System management

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
1.2 Air Conditioning	1.2.1 Describe, using an overall block schematic, the function, the appropriate terminology and the performance of current air conditioning systems in use  1.2.2 Describe methods employed to control operational environments  1.2.3 State the importance and criticality of maintaining a controlled environment  1.2.4 State the appropriate safety rules	2    2   1   1	Air conditioning, water cooling, humidity control, air filtering system, visit to stations    System management   Importance of good environment, importance of cooling system for electronic equipment   Safety tools characteristics
1.3 Health and Safety	1.3.1 Be aware of personal safety responsibilities in the work environment  1.3.2 Be aware of potential hazards to health and safety generated by equipment, or contained within, the work environment   1.3.3 State safety procedures for the persons working on or near such an equipment  1.3.4 State any applicable legal requirements  1.3.5 Define the fire alarm detection system  1.3.6 Describe main features and uses of the fire extinguishers	0       0       1      1   1   2	Safety statement, first aid, rules about climbing       Health consequences of electric shock and static discharges, precautions with chemical products (batteries), mechanical hazards (rotating machinery/antennas), toxic materials (beryllium), biological hazards, etc.       National, international regulations  Alarm system management



**Subject 10: SYSTEM MONITORING AND CONTROL**

The general objective is:

Learner shall define SMC function and describe its basic principles

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
<b>1 System Monitoring and Control (SMC)</b>			
1.1 Overview of System Monitoring and Control (SMC) Function	1.1.1 Describe the principles and purpose of the operational management of the technical services supporting the ATM system.	2	Service requirements, boundaries of responsibility. Strategic and tactical responsibility, and demarcation. e.g. The strategic decision that two radars have to be available for a given ATC practice to be performed and the judgement that given radars are adequate for this purpose. The tactical decision that, given the current availability of radars, a radar can be released for maintenance. Hierarchy of authority both for the technical and ATC structures, and their interface.

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
	<p>1.1.2 Describe the technical system architecture of the SMC function and its subordinate systems</p> <p>1.1.3 Describe the transfer of responsibility for a service</p>	<p>2</p> <p>2</p>	<p>List subordinate systems, e.g.</p> <p>RADAR: Radar stations, communications, processing, display, etc.</p> <p>COMMUNICATIONS: TX/RX, circuit management, networks, HMI, standby facilities, recording, etc.</p> <p>NAVIGATION: NDB, VOR, ILS, DF, etc.</p> <p>DP: FDPS, data communications, etc.</p> <p>FACILITIES: Power, generators, UPS, battery, environmental (heating, cooling), fire and security, etc.</p> <p>Operational and technical responsibility.</p> <p>Configuration and monitoring access and responsibility.</p>
<p>1.2 System Configuration</p>	<p>1.2.1 Describe the range of configurations that can be used</p> <p>1.2.2 Describe the techniques that are employed to make configuration changes</p>	<p>2</p>	<p>Equipment or channel switching, parameter setting (e.g. radar STC, polarisation, etc.), etc.</p> <p>HMI at high level on SMC, at low level on SMC, on subordinate HMI, physical switching.</p>

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
	1.2.3 Describe procedures required to implements a planned major system change		Major system change, e.g. Activate new version of software in a subordinate system, transfer a service to a new system, change a database, etc.  Authorisation, coordination, implementation plan, fallback strategies, etc.
1.3 Monitoring and Control Functions	1.3.1 Describe the monitoring functions that are available  1.3.2 Describe the control functions that are available  1.3.3 Describe the management and coordination of the maintenance of all subordinate systems	2  2  2	BITE, status, parameters, software and hardware watchdogs, etc.  Switching, parameters, set configurations, etc.  Planned and unplanned Locally and externally managed Preventive and corrective
1.4 Coordination and Reporting	1.4.1 Be aware of the coordination requirements to inform all relevant parties of all relevant information  1.4.2 Be aware or the information that has to be reported to other parties  1.4.3 Describe the formal and legal requirements in the documenting and recording of the reporting	0  0  2	Relevant parties, e.g. service providers, ATC, other centres, etc.  Relevant information, e.g. service failure, planed outage, loss of backup, software upgrade, etc.  Appropriate documents, and detailed information, e.g. NOTAM  e.g. Log books, NOTAMs, service statements, etc.

<b>TOPIC</b> <b>SUBTOPIC</b>	<b>Objectives</b> <b>Students shall ....</b>	<b>L</b>	<b>CONTENT</b>
1.5 Emergency Coordination	1.5.1 Be aware of all the appropriate authorities to be contacted in the event of appropriate emergency situations  1.5.2 Define the responsibilities and duties of all members of the SMC team	0  1	e.g. ATC supervisors (local and remote), ATSEP supervisors (local and remote), management, police, MIL, medical, accident investigation branch, etc.  e.g. Hijack, mayday, R/T fail, loss of aircraft, MIL action, fire, flood, security, terrorist threat or action, medical, 'special flights' (head of state, etc.), etc.  Hierarchy of distribution of duties
	1.5.3 Be aware of the succession of authorities and responsibilities in the event that the nominated person or function is not available	0	Hierarchy of responsibility
1.6 Equipment Operating	1.6.1 Define the principles and ergonomics of the HMI of the SMC central system and its subordinate systems  1.6.2 Be aware of the routine tasks required and the criticality of their completion and any legal requirements	1  0	Passwords, permissions, control tokens, ergonomic conventions (e.g. green is good or safe, red is fail or unsafe, etc.)  e.g. Audio circuit voice checking, audio tape checking and changing, VOLMET, etc.

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- *Volume I – Radio Navigation Aids*, 5<sup>th</sup> Edition, July 1996.
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- *Volume V - Aeronautical Radio Frequency - Spectrum Utilization*, 2<sup>nd</sup> Edition, July 2001.

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## ABBREVIATIONS AND ACRONYMS

For the purposes of this document the following abbreviations and acronyms shall apply:

ABAS	Aircraft-Based Augmentation System
ACARS	Aircraft Communications Addressing and Reporting System
ACAS	Airborne Collision Avoidance System
ADS	Automatic Dependent Surveillance
ADS B	ADS - Broadcast
ADS C	ADS - Contract
AFTN	Aeronautical Fixed Telecommunications Network
AGA	Aerodromes (Air routes and Ground Aids)
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation and Control
AIRPROX	<i>The code word used in air traffic incident report to designate aircraft proximity</i>
AIS	Aeronautical Information Services
AIX	Advanced IBM Unix
AMHS	Aeronautical Message Handling System
AMSS	Automatic Message Switching System
anaprop	anomalous propagation
ANS	Air Navigation Services
ANSP	ANS Provider
APV	Approach Procedure with Vertical guidance
APW	Air Proximity Warning
ARINC	Aeronautical Radio incorporated

ARO	ATS Reporting Office
ARTAS	ATC Radar Tracker and Server
ASMGCS	Advanced SMGCS
ASTERIX	All purpose Structured EUROCONTROL Radar Information exchange
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
ATSEP	Air Traffic Safety Electronics Personnel
BITE	Built In Test Equipment
CFMU	Central Flow Management Unit
CIDIN	Common ICAO Data Interchange Network
CIV	Civil
CLIMAX	<i>Multi-station carrier offset mode, with voting override</i>
CNS/ATM	Communication Navigation and Surveillance/Air Traffic Management
CoS	Cost of Service
CPDLC	Controller-Pilot Datalink Communications
CRCO	Central Route Charges Office ( <i>EUROCONTROL Brussels</i> )
CRT	Cathode Ray Tube
CWP	Controller Work Position
DEC	Digital Equipment Corporation
DF	Direction Finding
DME	Distance Measuring Equipment
DOS	Disk Operating System



DP	Data Processing
EAD	European Aeronautical Database
EAT	Expected Approach Time
EATCHIP	European ATC Harmonisation and Integration Programme ( <i>now EATM(P)</i> )
EATM(P)	European ATM (Programme) ( <i>formerly EATCHIP</i> )
ECAC	European Civil Aviation Conference
EFQM	European Foundation for Quality Management
EGPWS	Enhanced Ground Proximity Warning System
ESARR	EUROCONTROL Safety Regulatory Requirement(s) ( <i>SRC</i> )
ET	Executive Task ( <i>EATCHIP</i> )
ETFMS	Enhanced Tactical FMS
EUROCAE	European Civil Aviation Electronics
EUROCONTROL	European Organisation for the Safety of Air Navigation
FAA	Federal Aviation Administration ( <i>US</i> )
FANS	Future Air Navigation Systems
FDP	Flight Data Processing
FDPS	FDP System
FIS	Flight Information Service
FLOWTAM	F series NOTAMs, relating to flow
FMS	Flight Management System
FPL	(Filed) Flight Plan
GALILEO	<i>Satellite radio navigation system</i>
GBAS	Ground-Based Augmentation System
GLONASS	Global Navigation Satellite System
GNSS	Global Navigation Satellite System

GPS	Global Positioning System
GUI	Guidelines ( <i>EATCHIP/EATM(P)</i> )
HF	High Frequency
HFDL	High Frequency Datalink
HIPS	Highly Interactive Problem Solver
HMI	Human-Machine Interface
HRS	Human Resources Programme ( <i>EATM(P)</i> )
HRT	Human Resources Team ( <i>EATCHIP/EATM(P)</i> )
HUM	Human Resources (Domain) ( <i>EATCHIP/EATMP</i> )
Hz	Hertz
IANS	Institute of Air Navigation Services ( <i>EUROCONTROL, Luxembourg</i> )
ICAO	International Civil Aviation Organization
IFATSEA	International Federation of Air Traffic Safety Electronics Associations
IFF	Identification Friend/Foe
IFPS	(Integrated) Initial Flight Plan Processing System
ILS	Instrument Landing System
IP	Internet Protocol
ISO	International Standards Organisation
JAA	Joint Aviation Authorities
kHz	Kilo Hertz
LAN	Local Area Network
LCD	Liquid-Crystal Display
LoS	Loss of Service
METAR	Meteorological Actual Report
MFC	Multi-Frequency Coding
MHz	Megahertz

MIL	Military
MLS	Microwave Landing System
MOTNE	Meteorological Operational Telecommunications Network Europe
MRP	Multi-radar Processing
MRT	Multi-radar Tracker
MSAW	Minimum Safe Altitude Warning
MSSR	Mono-pulse SSR
MTCA	Medium-Term Conflict Alert
MTCD	Medium-Term Conflict Detection
NAV	Navigation
NAVAID	Navigation(al) Aid
NDB	Non-Directional Beacon
NOTAM	Notice to Airmen
NPA	Non-Precision Approach
ODS	Operational Display System
OJTI	On-The-Job-Training Instructor
OLDI	On-Line Data Interchange
OSI	Open System Interconnection
PA	Precision Approach
PABX	Private Automatic Branch Exchange
PCM	Pulse Code Modulation
PDF	Portable Document Format ( <i>Adobe Acrobat</i> )
PERT	Programme Evaluation and Review Technique
PM	Programme Manager ( <i>EATM(P)</i> )
PPI	Plan Position Indicator
PRF	Pulse Repetition Frequency

PSG	Programme Steering Group ( <i>EATM(P), HRS</i> )
PSR	Primary Surveillance Radar
PSU	Power Supply Unit
PTT	Post, Telephone and Telegraph ( <i>generic term to identify the provider</i> )
QFE	<i>Q-code designation for atmospheric pressure at aerodrome elevation</i>
QNH	<i>Q-code designation for atmospheric pressure at mean sea level</i>
QoS	Quality of Service
Qsig	Quality of signal
RAPNET	(European) Regional Aeronautical Packet switched Network ( <i>CBN + DAKOS</i> )
RAPS	Recording, Analysis, Playback and Simulation system for radar data ( <i>COMSOFT</i> )
RAS	Radar Advisory Service
RDP	Radar Data Processing
RIS	Radar Information Service
RMS	Root Mean Square
RMXs	Reliable Multicast proxies ( <i>Intel system software</i> )
RNAV	Area Navigation
RNP	Required Navigation Performance
RPL	Repetitive Flight Plan
R/T	Radiotelephony
RTCA	Radio Technical Commission for Aeronautics
RVR	Runway Visual Range
RX	Receiver
SARPS	Standards And Recommended Practices
SASS	Surveillance Analysis Support System

SASS-C	SASS - Centre
SASS-S	SASS - Sensor
SBAS	Space/Satellite-Based Augmentation System
SD	Senior Director, EATM Service Business Unit ( <i>EUROCONTROL Headquarters</i> )
SIGMET	Significant Meteorological Information
SITA	Société Internationale de Télécommunications Aéronautiques ( <i>France</i> )
SMC	System Monitoring and Control
SMF	Separation Monitoring Function
SMGCS	Surface Movement Guidance and Control System
SMR	Surface Movement Radar
SNOWTAM	NOTAM on Snow conditions
SNMP	Simple Network Management Protocol
SPI	Special Pulse Identification or Special Position Identification Pulse ( <i>SSR</i> )
SRC	Safety Regulation Commission ( <i>EUROCONTROL</i> )
SSR	Secondary Surveillance Radar
ST	Specialist Task ( <i>EATCHIP</i> )
STC	Sensitivity Time Control
STCA	Short-Term Conflict Alert
SUP	Supplement (to an AIP)
TACAN	UHF Tactical Air Navigation aid
TAF	Terminal Area Forecast
TCAS	Transponder Collision Avoidance System
TCP	Transmission Control Protocol
TDH Unit	Training Development and Harmonisation Unit ( <i>EUROCONTROL, IANS</i> )

TFG	Training Focus Group ( <i>EATM, HRT; formerly known as 'TSG'</i> )
TLPD	Traffic Load Prediction Device
TLS	Target Level of Safety
TSG	Training Sub-Group ( <i>EATCHIP/EATMP, HRT; today known as 'TFG'</i> )
TSP	Training Sub-Programme ( <i>EATM(P), HRS</i> )
TX	Transmitter
UAT	Universal Access Transceiver
UHF	Ultra High Frequency
UNIX	<i>Computer operating system, trademarked bell labs</i>
UPS	Uninterrupted Power Supply
VC	Virtual Classroom
VCS	Voice Communication System
VDF	VHF DF station
VDL	VHF Digital/Datalink
VHF	Very High Frequency
VMS	Virtual Memory ( <i>operating system copyright DEC</i> )
VOLMET	Meteorological Information for Aircraft in Flight
V-NAV	Vertical Navigation
VOR	VHF Omnidirectional Radio Range
WAN	Wide Area Network
WGATMTS	Working Group ATM Technical Staff ( <i>EATCHIP/EATM(P), HRT, TSG/TFG</i> )
WGS84	World Global System 84
WIN	Windows
X25	<i>Packet switched data network protocol</i>

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