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

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INTERNATIONAL CIVIL AVIATION ORGANIZATION

SUBJECT 5: COMMUNICATION

TOPIC 1: GENERAL INTRODUCTION

SUB-TOPIC 1.1: Introduction to communications

1.1.1	State the structure of the communication domain.	1	Voice communication, data communication.
1.1.2	State major substructures of the communication domain.	1	Air-ground, ground-ground, air-air communications.
1.1.3	State ATS requirements for safe communications.	1	Safety, reliability, availability, coverage, QoS, latency.
1.1.4	State the aeronautical communication services.	1	Mobile, fixed.

TOPIC 2: VOICE COMMUNICATION

SUB-TOPIC 2.1: Introduction to voice communications

2.1.1	Describe system architecture.	2	—
2.1.2	Explain the purpose, principles and role of voice communication systems in ATS.	2	e.g. Audio bandwidth, dynamic range, fidelity, routing, switching, lineside/deskside, coverage, communication chain between controller and pilot.

2.1.3	Describe the way in which voice communication systems function.	2	Analogue/digital comparisons, distortion, harmonics.
2.1.4	State methods used to route and switch voice communications.	1	e.g. Multichannels, multi-users, party lines, VHF/UHF linkage, HF, SELCAL.
2.1.5	State how systems interface to produce an integrated service to ATS.	1	—
2.1.6	State radio spectrum and frequency allocation constraints and procedures.	1	Spectrum, interference sources, commercial allocations, world radio conference, ITU, common aviation position, efficient utilization of frequency bands, channel spacing.
2.1.7	State voice recording systems in use.	1	e.g. Digital recording equipment, analogue recording.
2.1.8	State ICAO and local legal requirements regarding recording and retention of voice communications.	1	Regulatory requirements, incident recording and playback, recording equipment.
2.1.9	State the purpose of ATIS and VOLMET.	1	—

SUB-TOPIC 2.2: Air-ground communication

2.2.1	State the functions and basic operation of routing and switching equipment in use in the ATS environment.	1	Voice switching.
2.2.2	Describe the purpose and operation of the elements of a communication chain in use in the ATS environment.	2	Functionality, emergency systems, transmission/reception, CWP, on-board equipment e.g. channel spacing, antenna switching, CLIMAX, voting systems.
2.2.3	State ways of achieving quality of service.	1	e.g. Importance of coverage and redundancy of equipment, overlapping coverage, backup system, functional redundancy vs element redundancy.
2.2.4	Recognize the elements of the CWP that are used for air-ground communication.	1	Frequency selection, emergency, station selection, coupling, microphone, headset, loudspeaker, footswitch, PTT.
2.2.5	List future developments and techniques which may have an impact on ATS voice communications.	1	e.g. CPDLC, VDL Mode 2.

SUB-TOPIC 2.3: Ground-ground communication

2.3.1	State the functions and the basic operations of routing and switching equipment in use in ATS environment.	1	General architecture.
2.3.2	Describe how ground-ground systems interface to provide an integrated service to ATS environment.	2	International/national links, ACC interoperability, voice and data integration.
2.3.3	Describe the purpose and operation of the elements of a system.	2	Functionality, emergency systems, PTT interfaces e.g. MFC and ATS-Qsig, switching, local PABX equipment.
2.3.4	Recognize the elements of the CWP used for ground-ground communication.	1	Selection, emergency, loudspeaker, headset, microphone.
2.3.5	List developments in ground-ground technologies which may impact on ATS voice communication.	1	e.g. Protocols (TCP/IP, voice-over IP) future development.

TOPIC 3: DATA COMMUNICATIONS

SUB-TOPIC 3.1: Introduction to data communications

3.1.1	Explain the purpose, principles and role of data communication systems in ATS.	2	e.g. Terminology, principles and theory of networks, layering (e.g., OSI or TCP/IP), data links, LAN, WAN.
3.1.2	Define the concept of data transmission.	1	e.g. Packet switching, protocols, multiplexing, demultiplexing, error detection and correction, routing, switching, hops, cost, bandwidth/speed.
3.1.3	Describe the function of various elements of the data systems in use in the ATS environment.	2	Switch, router, gateways, end systems, redundancy.
3.1.4	Define protocols in current use.	1	e.g. TCP/IP, X.25, frame relay, asynchronous transfer mode.

SUB-TOPIC 3.2: Networks

3.2.1	State ATS requirements for safe data communications.	1	Reliability, availability.
3.2.2	Describe the different types of networks.	2	LAN, WAN, ATN, national network for ATM e.g. satellite-dedicated networks, AFTN.
3.2.3	State the functions of a network management system.	1	Priorities, rights e.g. SNMP.

SUB-TOPIC 3.3: Aviation specific networks, applications and ATM/ANS providers

3.3.1	Name a range of air-ground aviation related network concepts.	1	ATN e.g. Subnetworks: ATN air-ground subnetwork, AMSS, VDL, HFDL Protocols: ACARS Communication service providers: ARINC, SITA, States, LINK16.
3.3.2	Name a range of ground-ground aviation-related network concepts.	1	ATN, PENS e.g. Physical networks: PENS, AFTN/CIDIN, RAPNET e.g. Communication protocols: IP, X.25, ASTERIX, FMTP e.g. Communication service providers: SITA, ARINC, national carriers, ANSPs e.g. Applications: AMHS, AIDC, OLDI.



ATM/ANS
(IR + AMC/GM)

eRules

Appendix 2a – ATSEP Basic training – Streams

ATSEP UID (Unique Objective Identifier)	CORPUS	Tax	CONTENT
ATSEP.BAS.COM	COMMUNICATION		
ATSEP.BAS.COM_1	GENERAL INTRODUCTION		
ATSEP.BAS.COM_1.1	Introduction to Communications		
ATSEP.BAS.COM_1.1.1	State the structure of the communication domain	1	Voice communication, data communication
ATSEP.BAS.COM_1.1.2	State major substructures of the communication domain	1	Air-ground, ground-ground, air-air communications
ATSEP.BAS.COM_1.1.3	State ATS requirements for safe communications	1	Safety, reliability, availability, coverage, QoS, latency
ATSEP.BAS.COM_1.1.4	State the aeronautical communication services	1	Mobile, fixed
ATSEP.BAS.COM_2	VOICE COMMUNICATION		
ATSEP.BAS.COM_2.1	Introduction to Voice Communications		
ATSEP.BAS.COM_2.1.1	Describe system architecture	2	-
ATSEP.BAS.COM_2.1.2	Explain the purpose, principles and role of voice communication systems in ATS	2	e.g. audio bandwidth, dynamic range, fidelity, routing, switching, lineside/deskside, coverage, communication chain between controller and pilot
ATSEP.BAS.COM_2.1.3	Describe the way in which voice communication systems function	2	VoIP VCS, analogue/digital comparisons, distortion, harmonics
ATSEP.BAS.COM_2.1.4	State methods used to route and switch voice communications	1	e.g. multichannels, multi-users, party lines, VHF/UHF linkage, HF, SELCAL
ATSEP.BAS.COM_2.1.5	State how systems interface to produce an integrated service to ATS	1	-
ATSEP.BAS.COM_2.1.6	State radio spectrum and frequency allocation constraints and procedures	1	Spectrum, interference sources, commercial allocations, world radio conference, ITU, efficient utilisation of frequency bands, channel spacing
ATSEP.BAS.COM_2.1.7	State voice recording systems in use	1	e.g. digital recording equipment
ATSEP.BAS.COM_2.1.8	State ICAO and local legal requirements regarding recording and retention of voice communications	1	Regulatory requirements, incident recording and playback, recording equipment
ATSEP.BAS.COM_2.1.9	State the purpose of ATIS and VOLMET	1	-

Appendix 2a – ATSEP Basic training – Streams

ATSEP UID (Unique Objective Identifier)	CORPUS	Tax	CONTENT
ATSEP.BAS.COM_2.2	Air-Ground Communication		
ATSEP.BAS.COM_2.2.1	State the functions and basic operation of routing and switching equipment in use in the ATS environment	1	Voice switching
ATSEP.BAS.COM_2.2.2	Describe the purpose and operation of the elements of a communication chain in use in the ATS environment	2	Functionality, emergency systems, transmission/reception, CWP, on-board equipment e.g. channel spacing, antenna switching, CLIMAX, voting systems
ATSEP.BAS.COM_2.2.3	State ways of achieving quality of service	1	e.g. importance of coverage and redundancy of equipment, overlapping coverage, backup system, functional redundancy vs element redundancy
ATSEP.BAS.COM_2.2.4	Recognise the elements of the CWP that are used for air-ground communication	1	Frequency selection, emergency, station selection, coupling, microphone, headset, loudspeaker, footswitch, Push-To-Talk
ATSEP.BAS.COM_2.2.5	List techniques and future developments which have, or may have an impact on ATS voice communications	1	e.g. CPDLC, VDL Mode 2
ATSEP.BAS.COM_2.3	Ground-Ground Communication		
ATSEP.BAS.COM_2.3.1	State the functions and the basic operations of routing and switching equipment in use in ATS environment	1	General architecture
ATSEP.BAS.COM_2.3.2	Describe how ground-ground systems interface to provide an integrated service to ATS environment	2	International/national links, ACC interoperability, voice and data integration
ATSEP.BAS.COM_2.3.3	Describe the functionality of the elements of a ground-ground communication system	2	Main and emergency systems, interfaces to telecom providers e.g. MFC and ATS-Qsig, switching, local PABX equipment
ATSEP.BAS.COM_2.3.4	Recognise the elements of the CWP used for ground-ground communication	1	Selection, emergency, loudspeaker, headset, microphone
ATSEP.BAS.COM_2.3.5	Describe developments in ground-ground technologies which may impact on ATS voice communication	2	TCP/IP, voice-over IP e.g. protocols future development

Appendix 2a – ATSEP Basic training – Streams

ATSEP UID (Unique Objective Identifier)	CORPUS	Tax	CONTENT
ATSEP.BAS.COM_3	DATA COMMUNICATION		
ATSEP.BAS.COM_3.1	Introduction to Data Communication		
ATSEP.BAS.COM_3.1.1	Explain the purpose, principles and role of data communication systems in ATS	2	e.g. terminology, principles and theory of networks, layering (OSI or TCP/IP), data links, LAN, WAN
ATSEP.BAS.COM_3.1.2	Define the concept of data transmission	1	e.g. packet switching, protocols, multiplexing, demultiplexing, error detection and correction, routing, switching, hops, cost, bandwidth/speed
ATSEP.BAS.COM_3.1.3	Describe the function of various elements of the data systems in use in ATS environment	2	Switch, router, gateways, end systems, redundancy
ATSEP.BAS.COM_3.1.4	Define protocols in current use	1	e.g. TCP/IP, frame relay, asynchronous transfer mode
ATSEP.BAS.COM_3.2	Networks		
ATSEP.BAS.COM_3.2.1	State ATS requirements for safe data communications	1	Reliability, availability
ATSEP.BAS.COM_3.2.2	Describe the different types of networks	2	LAN, WAN, ATN, national network for ATM e.g. satellite-dedicated networks, AFTN Priorities, rights
ATSEP.BAS.COM_3.2.3	State the functions of a network management system	1	e.g. SNMP
ATSEP.BAS.COM_3.3	Aviation Specific Networks, Applications and ATM/ANS Providers		
ATSEP.BAS.COM_3.3.1	Name a range of air-ground aviation-related network concepts	1	ATN e.g. Subnetworks: ATN air-ground subnetwork, AMSS, VDL, HFDL Protocols: ACARS Communication service providers: ARINC, SITA
ATSEP.BAS.COM_3.3.2	Name a range of ground-ground aviation-related network concepts	1	ATN, PENS e.g. Physical networks: PENS, AFTN, RAPNET Communication protocols: IP, ASTERIX, FMTP Communication service providers: SITA, ARINC, national carriers, ANSPs Applications: AMHS, AIDC, OLDI
ATSEP.BAS.COM_3.3.3	Define SWIM	1	SWIM institutional framework and applications e.g. SWIM providers and users