



Agenda Item 6: Other topics

ATSEP COURSES/TRAINING

(Presented by GAELICAM)

SUMMARY

This Working Paper presents the strategy developed by GAELICAM for the training of ATSEP personnel in CNS/ATM composed of a Basic and Qualified Training. GAELICAM has also developed a specific training itinerary per each ATSEP type.

1. Introduction

1.1 GAELICAM Team has a very large experience developing and delivering CNS/ATM courses with a very clear ANSP orientation. This experience has been obtained during over 25 years working in multiple national and international projects regarding to Air Navigation systems.

1.2 GAELICAM comprises a group of CNS/ATM technology experts able to link the analysis of technology and the management of strategic issues with the management of ANSPs CNS/ATM programs.

1.3 GAELICAM has developed a strategy for the ATSEP personnel training in CNS/ATM composed of a Basic and Qualified Training.

2. Summary of training courses offered.

2.1 GAELICAM has developed a course titled ‘CNSATM-INITIAL: Basic Training’ that covers all the modules identified in the specification for Air Traffic Safety Electronics Personnel (ATSEP) training:

DOMAIN	BASIC COURSES
CNSATM-INITIAL Duration: 4-6 weeks	Module 1: Introduction to ATM (Air Traffic Management).
	Module 2: Familiarization with ATC (Air Traffic Control).
	Module 3: Aeronautical Information Services (AIS).
	Module 4: Meteorology.
	Module 5: CNS services.
	Module 6: Communications (C).
	Module 7: Navigation (N).
	Module 8: Surveillance (S).

DOMAIN	BASIC COURSES
	Module 9: Data processing (DP).
	Module 10: Monitoring and control of CNS/ATM system.
	Module 11: Maintenance procedures.
	Module 12: Energy and air conditioning.

2.2 GAELICAM has also developed several courses that covers the Qualification Training corresponding to the Initial Training in accordance with the specification for Air Traffic Safety Electronics Personnel (ATSEP) training.

2.3 These Qualification courses have been classified in the following domains (see sections below):

DOMAIN	QUALIFICATION COURSES	DURATION
COMMUNICATIONS	C-VOICE: ATS Voice over IP	1 week
	C-DATALINK: ATC and AOC Datalink services	1 week
	C-AMHS: ATS Message handling System	1 week
	C-DATA: Air Navigation Data Communications	1 week
	C-AFTN: the AFTN network	1 week
	C-TRANSMISSION: Transmission Means (Microwaves, Optical Fiber rings)	1 week
	C-RECORDER	1 week
NAVIGATION	N-GNSS: Global Navigation Satellite Systems (SBAS and GBAS)	1 week
	N-PBN: implementing Performance Based Navigation	1 week
SURVEILLANCE	S-GEN: Surveillance systems	1 week
	S-MLAT: Multilateration systems	1 week
	S-ASMGCS: Advanced-Surface Movement Guidance and Control System	1 week
	S-ADS: ADS systems	1 week
CNS/ATM	CNSATM-GEN: Air Navigation CNS/ATM systems	1 week
	CNSATM-DPS: Data processing systems in ATM	1 week
SAFETY, VERIFICATION, VALIDATION AND CERTIFICATION	SAF-SM: Safety Management	1 week
	CER-VVC: Verification, Validation and Certification processes	1 week

2.4 A description of the scope and objectives of each of these courses can be found in Annexes 1 to 5 of this document.

3. **ATSEP Training itinerary**

3.1 ATSEP personnel works in a wide variety of CNS/ATM systems and equipment, requiring each one of a specific training to acquire the abilities needed for an operational competence.

3.2 GAELICAM has developed a specific training itinerary per each ATSEP type identifying the GAELICAM courses that satisfy the qualification training requirements for ATSEPs.

3.3 In Annex 6 of present document, a table collecting the proposed training itinerary per each ATSEP type is proposed. The 'Domain', 'Subject' and 'Topic' columns of this table are used for this purpose. In this way, the GAELICAM courses that satisfy the Qualified Training requirements per each ATSEP type are identified with crosses (X) in the corresponding row of the mentioned table.

4. **Alternatives for the delivery of GAELICAM CNS/ATM Training courses**

4.1 GAELICAM courses can be delivered in Spanish and English in any of the following options:

4.2 OPTION 1: ON-SITE CLASSROOM TRAINING.

4.3 Your Organization is requesting GAELICAM for the delivery of any specific courses at your premises (Training Center, offices, ...). So, a well-trained and experienced GAELICAM professor is travelling for the delivery of the course to students belonging to your Organization.

4.4 The course material (student's workbooks, CDs, ...) is generated by GAELICAM and submitted to the students.

4.5 This approach has all the advantages of a face-to-face course (physical presence of the professor) but allowing cost savings since the travel costs of students could be significantly reduced.

4.6 OPTION 2: VIRTUAL CLASSROOM TRAINING.

4.7 Students are using the GAELICAM e-learning platform (videos, chats, videoconferences, messages, ...) with a synchronous approach. That is to say, the full learning activity is remotely conducted by the GAELICAM professor in the same way that if it was delivered in the classroom.

4.8 The course is started by all the students at the same time and the GAELICAM professor is fully managing remotely the course defining times for each activity (lessons, exercises, ...), arranging the corresponding tools (videos, chats, videoconferences, ...) for further explanations answering student's questions in real time.

4.9 The course material (student's workbooks, CDs, ...) is generated by GAELICAM and submitted to the students.

4.10 This approach has most of the advantages of a classical classroom course since the professor is managing all the learning activities very closely as in a face-to-face one but allowing significant cost savings since students do not need to travel.

4.11 This method also provides high flexibility to students helping to make compatible responsibilities of students in their Organizations with the learning activity.

4.12 OPTION 3: E- LEARNING TRAINING.

4.13 Students are using the GAELICAM e-learning platform (videos, chats, videoconferences, messages, ...) with an asynchronous approach. That is to say, each student can decide when to start, how long to dedicate each day giving full flexibility to the student to complete the learning activity.

4.14 In any case, the professor is always monitoring the activities of each student being able to use learning tools (videos, e-mails, chats, videoconferences, ...) under demand.

4.15 The course material (students workbooks, CDs, ...) could be generated by GAELICAM and submitted to the students.

4.16 This approach gives the maximum flexibility to make compatible students responsibilities in their Organizations with the learning activity so as not incurring in travelling expenses.

5. **GAELICAM customers**

5.1 Our customers include:

- ANSPs: AVINOR (Norway), Belgocontrol (Belgium), ONDA and Aviation Civile (Morocco), ENNA (Algeria), Skyguide (Switzerland), Ukraine, CORPAC (Peru).
- ICAO CAR/SAM Office in Lima (Peru).
- ICAO African Office (Kenya).
- ICAO Asian office in Bangkok (Thailand).
- EUROMED project.
- SITA.
- Frequentis.

6. **Points of contact**

6.1 For further information, please do not hesitate to get in touch with us:

- E-mail: info@gaelicam.com
- Webpage: www.gaelicam.com

7. **Actions by the meeting**

7.1 Meeting attendees are invited to:

- a) Take note of the content of this Information Paper and its annexes.

ANNEX 1: GAELICAM COMMUNICATIONS COURSES.

Aeronautical telecommunications are a core enabler for air traffic management.

Today, traditional voice communications are no longer sufficient to support modern operations. The introduction – in addition to voice – of a variety of data transfer systems for new and existing mobile and fixed communications systems, makes this a rapidly developing sector of the industry.

The courses offered provide a detailed understanding of current, short-term and future communications networks and applications, and also cover the planned migration steps as part of the ICAO strategies.

GAELICAM has developed the following communications courses:

C-VOICE: ATS Voice over IP.

This course provides a detailed view of aeronautical voice telephony and radio networks, largely focusing on the transition of current systems to the Voice over Internet Protocol (VoIP) based on EUROCAE WG67 standards.

It looks in detail at VoIP principles and its future use in aeronautical communications, including crucial migration issues for integrating VoIP into the ATM network architecture.

C-DATALINK: ATC and AOC Datalink services.

This course gives an overview on DATALINK understanding which are the main components of a Datalink system, which technologies support Datalink and what Datalink services are currently available and how they work.

The course explains the different technologies used to provide Datalink (FANS and ATN), addressing the differences between both technologies.

C-AMHS: ATS Message handling System.

This course covers AMHS messaging techniques and their applications in ATM. It provides a detailed explanation of how to migrate from the current AFTN/CIDIN to the new AMHS systems, and the latter's new capabilities from both technical and operational perspectives.

It also addresses related strategic developments in different ICAO Regions.

C-DATA: Air Navigation Data Communications.

This course provides a comprehensive overview of the data communication applications, technology and infrastructure used in ATM. The ATC IP Network Services are covered in detail, including Surveillance, OLDI/FMTP, Messaging, and others.

Related ICAO Global Air Navigation Plan issues are analysed, together with strategic developments.

C-AFTN: the AFTN network.

This course covers AFTN messaging techniques and their applications in ATM. It provides a detailed explanation of how to implement AFTN-based services from both technical and operational perspectives.

It also addresses related strategic developments in different ICAO Regions.

C-TRANSMISSION: Transmission Means (Microwaves, Optical Fiber rings).

This course provides a comprehensive overview of the transmission means that support communications relating to safety as the Aeronautical Fixed Services (AFS) and Aeronautical Mobile Services (AMS) defined by ICAO.

Regarding ISO model, these systems provides the physical layer for all Air Navigation communications covering such things as pulse amplitudes, line coding, transmission rates, modulation, electromagnetic spectrum, frequency bands, connectors, and anything else needed to transfer digits satisfactorily.

C-RECORDER.

This course covers different techniques to perform the ICAO Legal Recording in telephony and radio services for both legacy analogue voice and digital VoIP.

ANNEX 2: GAELICAM NAVIGATION COURSES.

The navigational performance of an aircraft is dependent on two main factors: the navigation aids, whether ground or space-based, that are used, their geometry relative to the aircraft and the capabilities of the aircraft's avionics.

The navigation domain addresses recent advances in navigation capabilities and the performance that can be delivered by the associated infrastructure. These advances include the development and introduction of performance-based navigation (PBN), which will enable improvements to be made in airspace design and will provide a far greater degree of flexibility in aircraft operations.

Ultimately, advanced navigation functionalities, with the support of appropriate ATM tools, will enable aircraft operators to conduct their flights in accordance with preferred trajectories, dynamically adjusted, in an optimum and cost-efficient manner.

GAELICAM has developed the following navigation courses:

N-GNSS: Global Navigation Satellite Systems (SBAS and GBAS).

This course explains GNSS systems comprising GPS, GLONASS, GALILEO and Beidou evolutions giving a general overview of signal processing in receiver, receiver performances (low-cost receiver vs. high-end receiver).

It also develops the signal structures and analyses system errors and augmentation.

N-PBN: implementing Performance Based Navigation.

Performance-based Navigation (PBN) is the most practical solution for the regulation of new navigation systems technology. This course explains the ICAO PBN concept and clarifies the differences between RNAV and RNP. PBN is based on Area Navigation, or RNAV, a method of navigation which permits aircraft operation on any desired flight path within coverage of station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these

It also provides detailed information on the 3 components of PBN: navigation applications, navigation specifications and navigation infrastructure. The course explains the concept, its enablers and provides detailed information on how to implement PBN.

ANNEX 3: GAELICAM SURVEILLANCE COURSES.

Surveillance is a key part of ATM. Radar, the mainstay of surveillance for many years, is now being supplemented by a variety of newer techniques such as ADS-B and multilateration. The key words for the future of surveillance are “performance” and “interoperability”.

GAELICAM offers courses covering the principles of both traditional and new surveillance techniques:

S-GEN: Surveillance systems.

This course provides an overview of all existing surveillance systems covering Primary Surveillance Radar (PSR), Secondary Surveillance Radar (SSR, MSSR), Surface Primary Radar (SMR), Mode-S radar, ADS and multilateration systems.

It also covers the Surveillance Data Distribution from detection to plot output.

S-ADS: ADS systems.

This course provides an overview of ADS systems (Automatic Dependent Surveillance) contract mode (ADS-C) and broadcast mode (ADS-B out and ADS-B in).

ADS-C systems are used to send automatically requested information (aircraft position, identification,...) using datalink communications while ADS-B information (collected from the avionics) is transmitted to ground systems and other aircrafts using the 1090 MHz extended squitter.

S-MLAT: Multilateration systems.

This course provides an overview of multilateration systems (cooperative independent surveillance) covering both existing techniques (Local Area Multilateration - LAM and Wide Area Multilateration – WAM and the associated Surveillance Performance.

S-ASMGCS: Advanced-Surface Movement Guidance and Control System.

This course provides an overview of A-SMGCS (Advanced-Surface Movement Guidance and Control System) systems and the associated Surveillance Performance.

A-SMGCS systems provides traffic information about vehicle position in the area and identity of the cooperative vehicles. It also maintains the airport in a safely operation mode in all visibility conditions and even during the night.

ANNEX 4: GAELICAM CNS/ATM AND DATA PROCESSING COURSES.

Gaelicam has developed the following CNS/ATM and data processing courses:

CNSATM-GEN: Air Navigation CNS/ATM systems.

This course provides a high level overview of all CNS/ATM systems used by the Air navigation Service providers (ANSPs). The course describes and explains the main role of communications, navigation, surveillance and data processing systems used for the provision of Air Navigation services.

CNSATM-DPS: Data processing systems in ATM.

This course provides a knowledge and understanding of the principles used in ATM data processing (flight data processing, surveillance data processing,...) and an overview of their use in ATM systems.

The data processing domain addresses all systems which process flight data and environment data in support of integrated ATM operations. The domain is therefore one of the enablers for the achievement of integration and interoperability between systems, and contributes to the strategic objectives of uniformity and capacity.

ANNEX 5: GAELICAM CERTIFICATION, VERIFICATION, VALIDATION AND SAFETY COURSES.

GAELICAM has developed the following certification, verification and safety related courses:

SAF-SM: Safety Management.

This training course addresses Safety from a wide perspective introducing the attendees the different concepts, policies and strategies to deal with this important matter. The training course starts with a general overview on Safety identifying the most important concepts, why Safety is so important and how it can be provided.

This training course pursues that attendees get familiarized with SAFETY concepts, ESSAR (Eurocontrol Safety Regulatory Requirement) requirements and SAM (Safety Assessment Methodology) to define a means for providing assurance that an Air Navigation System is safe for operational use.

The course also presents the attendees Safety Management Systems addressing global and key aspects like, for instance, Safety Policy and Objectives, Safety Assurance and implementation of Safety Management Systems.

It also covers the ICAO's vision on Safety through ICAO's Annex 19 and the Global Aviation Safety Plan.

CER-VVC: Verification, Validation and Certification processes.

The objective of this course is to introduce the attendees in the field of Validation and Verification within the ATM framework. The attendees will achieve a perfect understanding of the European Operational Concept Validation Methodology (E-OCVM). Additionally, the course will also focus on Certification allowing the attendees to understand and face any Certification process within his or her company.

ANNEX 6: TRAINING ITINERARY PER ATSEP TYPE.

	DOMAIN	SUBJECT	TOPIC	SUB-TOPIC	GAELICAM COURSES																			
					CNSATM-INITIAL	COM-AMHS	COM-DATALINK	COM-VOICE	COM-DATA	COM-AFTN	COM-TRANSMISSION	COM-RECORDER	NAV-GNSS	NAV-PBN	SUR-ADS	SUR-MLAT	SUR-ASMGCS	SUR-GEN	CNSATM-GEN	CNSATM-DPC	SAF-SM	CER-VVC		
ATSEP (Air Traffic Safety Electronics Personnel)	COMMUNICATION	VOICE	Air/Ground	Transmission/Reception	X			X									X							
				Radio Antenna Systems	X			X											X					
				Voice Switch	X			X											X					
				Controller Working Position	X			X											X					
				Radio Interfaces	X			X											X					
			Ground/Ground	Interfaces	X			X											X					
				Protocols	X			X											X					
				Switch	X			X											X					
				Communication Chain	X			X											X					
				Controller Working Position	X			X											X					
	DATA	ATC Networks	Introduction to networks	X				X									X							
			External Network Services	X				X									X							
			Measuring Tools	X				X									X							
			Troubleshooting	X				X									X							
			Protocols	X				X									X							

			National Networks	X					X										X				
			Network Technologies	X					X										X				
			Global networks	X					X										X				
			Ground/Ground applications	X					X										X				
			Air/Ground applications	X					X										X				
		Aeronautical Messaging networks (AFTN/AMHS)	Description of AFTN systems	X					X	X									X				
			AFTN addressing	X						X	X									X			
			AFTN routing	X						X	X									X			
			Description of AMHS systems	X	X					X										X			
			Types of AMHS users. Strategy for migrating AFTN users into AMHS	X	X					X										X			
			AMHS Management Tools	X	X					X										X			
			AMHS 'Off-line' Management Systems (AMC)	X	X					X										X			
			AMHS Common Infrastructure	X	X					X										X			
			AMHS Operational issues	X	X					X										X			
			Strategy migrating AFTN traffic flows into AMHS	X	X					X										X			
			Datalink	ATN Concept	X		X			X										X			
				ATN Applications within the CNS/ATM framework	X		X				X										X		
		VHF Datalink Mode 2		X		X				X										X			

				Techniques of ADS B	X											X				X	X								
				VDL Mode 4 (STDMA)	X														X				X	X					
				Mode S Extended Squitter	X														X				X	X					
				UAT	X														X				X	X					
				ASTERIX	X														X				X	X					
			ADS-C		Introduction to ADS-C	X													X				X	X					
					Techniques in ADS-C	X													X				X	X					
			HMI	HMI	ATCO HMI	X																	X	X					
					ATSEP HMI	X																	X	X					
					Pilot HMI	X																	X	X					
		Displays			X																	X	X						
		SURVEILLANCE DATA TRANSMISSION	Surveillance Data Transmission	Technology and Protocols	X																	X	X						
				Verification Methods	X																	X	X						
		Functional Safety	SAFETY ATTITUDE	Safety Attitude	X																	X	X			X	X		
			FUNCTIONAL SAFETY	Functional Safety	X																	X	X			X	X		
		ATSEP (Air Traffic Safety Electronics Personnel)	DATA PROCESSING	FUNCTIONAL SAFETY	FUNCTIONAL SAFETY	Functional Safety	X															X	X			X	X		
						Software Integrity and Security	X																	X	X			X	X
					SAFETY ATTITUDE	Safety Attitude	X																	X	X			X	X
				DATA PROCESSING SYSTEMS (DP)	USER REQUIREMENTS	Controller requirements	X																	X	X				
						Trajectories, Prediction and Calculation	X																	X	X				
Ground Safety Nets	X																					X	X						
Decision Support	X																					X	X						

			Alert and Error Messages to ATSEP	X															X	X		
			Alert and Error Messages to ATCO	X															X	X		
CONTROLLER				X															X			
PILOT				X															X			

Example: Minimum Training Itinerary for an ATSEP that is working with Transmission/Reception systems (Domain: Communications; Subject: Voice; Topic: Air/Ground) would be composed of the following courses:

- CNSATM-INITIAL (Basic Training)
- C-VOICE (Qualification Training)
- CNSATM-GEN (Qualification Training)

taken from the following ATSEP/Controller/Pilot Training Itinerary table:

DOMAIN	SUBJECT	TOPIC	SUB-TOPIC	GAELICAM COURSES																		
				CNSATM-INITIAL	COM-AMHS	COM-DATALINK	COM-VOICE	COM-DATA	COM-AFTM	COM-TRANSMISS	COM-RECORDER	NAY-GNSS	NAY-PBN	SUR-ADS	SUR-MLAT	SUR-ASMGCS	SUR-GEN	CNSATM-GEN	CNSATM-DPC	SAF-SM	CER-VVC	
			Transmission/Reception	X			X												X			
		Air/Ground	Radio Antenna Systems	X			X												X			
			Voice Switch	X			X												X			
			Controller Working Position	X			X												X			
	VOICE		Radio Interfaces	X			X												X			