GAELICAM

CNS/ATM Training Portfolio

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1. PRESENTATION OF THE COMPANY: GAELICAM

1.1. GAELICAM TEAM EXPERTISE

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 30 years working in multiple national and international projects regarding to Air Navigation systems in the following areas:

- ATM data communications: surveillance (radar, multilateration LAM/WAM, ADS-C, ADS-B), OLDI, EGNOS, Galileo, CFMU, EAD, PENS, Voice over IP (VoIP), Voice Communications Systems (VCSs), Flight Plan Data Processors (FPDPs), ATIS, VOLMET, communications protocols (IPv4, IPv6, X.25, FR, ATM), ...
- Datalink systems: ATN concept, Air/Ground sub-networks based on VDL2, FANS Accommodation (Front-End Processors), CPDLC, ADS-C, ADS-B, D-ATIS, D-VOLMET, …
- Aeronautical Messaging Networks (AFTN/AMHS).
- ATM satellite communications projects: European Space Agency program ARTES 10 called Iris program (HERMES consortium), …
- Communications Transmission means: microwaves and optical fiber rings.
- Navigations systems: Performance-based Navigation (PBN) clarifying differences between RNAV and RNP, Global Navigation Satellite Systems (GNSS) and Ground Based Augmentation System (GBAS), traditional navigations systems (VOR, DME, ILS,...).
- Surveillance systems: ADS-B, ADS-C, Mode-S radar, Multilateration (LAM, WAM), A-SMGCS (Advanced-Surface Movement Guidance and Control System), TIS-B, …
- ATM Data Processing domain addresses all systems which process flight data and environment data in support of integrated ATM operations.
- System Monitoring and Control domain assessing technologies (SNMP, others…) in order to identify pros and cons of each one.
- Verification and Validation activities: Interoperability Regulation and Certification activities, European Operational Concept Validation Methodology (E-OCVM), …
- Safety activities: ESSAR (Eurocontrol Safety Regulatory Requirement), SAM (Safety Assessment Methodology), ICAO's Annex 19 and the Global Aviation Safety Plan, Safety Management System (SMS), …
- Security activities learning how to perform a security risk assessment and identifying best practices from ISO/IEC 27001 and NIST standards.

Our team 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.

We have identified as follows a series of critical competencies to be staffed for your CNS/ATM Training project:

- Understanding of the ANSP business.

- Understanding of ATM / CNS.
- Understanding of the ATM communications business (legacy and VoIP).
- Large experience delivering CNS/ATM courses to ANSPs.
- Understanding of SESAR-related regulations, plans and objectives.
- Understanding of Safety and Certification issues.

Our team members covers collectively and individually these requirements in a very comprehensive and exhaustive way:

- Our team members have an extensive expertise and experience of the world-wide CNS/ATM environment.
- Our team members have extensive knowledge of the economic and technological issues associated with the evolution of CNS/ATM in different ICAO regions.
- Our team members have a detailed and extensive understanding of the management of technologies relevant to aviation.
- Our team members have a comprehensive knowledge about regulatory issues associated with CNS/ATM, and more specifically with the SES-II legislative package.
- Our team members have extensive and successful experience of supporting and advising strategic managers in the aviation domain.

They bring comprehensive experience of the management of technology in the CNS/ATM domain.

	Confirmed experience in performing...			Large experience delivering CNS/ATM courses to ANSPs.	Understanding of SESAR-related regulations	Understanding of Safety and Certification issues
	Understanding of the ANSPs	Understanding CNS/ATM	Understanding ATM communications			
GAELICAM Team	***	***	***	***	***	***

Table 1 - Skills, ability, knowledge and expertise for our team-members

1.2. CNS/ATM TRAINING.

GAELICAM Team has a very large experience developing and delivering other CNS/ATM courses with a very clear ANSP orientation and fully aligned with the training objectives collected in ICAO Doc 10057 ('Manual on Air Traffic Safety Electronics Personnel Competency-based Training and Assessment') and Regulation (EU) 2017/373 'common requirements for providers of air traffic management/air navigation services':

- Development and delivery of the IANS (Institute of Air Navigation Services) COM-AMHS ('Aeronautical Message Handling systems') course at IANS since 2006.
- Development and delivery of the 'PENS module' of the IANS COM-DATA (Aeronautical Communications) course at IANS since 2010.
- Development and delivery of current IANS COM-VOICE course ('Towards Voice over IP in Aeronautical Communications') at IANS since 2013.
- Contributions to the IANS 'COM-DATALINK' course.
- Development and delivery of the "ATC COMMUNICATIONS FOR AIR NAVIGATION SYSTEMS" course for SENASA (Spanish Air Navigation Training Centre) since 2005 with the objective of training ENAIRE's Engineering and Maintenance personnel covering all the range of ATC communications.
- Development and delivery of the course titled "AIR NAVIGATION CNS/ATM SYSTEMS" with the objective of performing the training of ENAIRE's staff (Engineering, Technical and/or Maintenance) involved in ATM business on current and future Air Navigation CNS/ATM systems ('Communications, Navigation, Surveillance / Air Traffic Management').
- Other more specific courses developed by GAELICAM team for different aeronautical stakeholders have been:
    - Air Navigation Data Communications.
    - Air Navigation Voice communications.
    - Strategy for the evolution of CNS/ATM systems.
    - AFTN network.
    - Transmission Means (Microwaves, Optical Fiber rings).
    - Satellite Navigation Systems.
    - Navigation and Surveillance Systems.
    - Recorders.
    - Surveillance: ADS systems.
    - Surveillance: Multilateration systems.

- Surveillance: A-SMGCS (Advanced-Surface Movement Guidance and Control System).
- Surveillance: Mode S radar.

- Contributions for the development of some IANS courses such as:
  - COM-Intro: a basic introduction to telecommunication and networking technologies for air/ground voice and data, and ground/ground voice and data communications
  - COM-DATA: an overview of all COM technologies and applications used in ATC;
  - COM-ATN-I: An in-depth technical overview of ATN and ICAO mobile sub network technologies
  - COM-ATN-Overview: An overview of ATN technology
  - COM-OPS: AN operational overview of all ATC applications using ACARS and ATN based technologies
  - NAV-GNSS: An in depth presentation of navigation technologies and satellite navigation technologies used in the ATC world;
  - SUR-Mode S: An in depth overview of the Mode S technology:
  - ATM-GEN-INTRO: A contribution presenting the CNS technologies used in ATM systems
  - ATM-GEN-FUT: A contribution presenting European CNS Strategy to meet future ATM needs.

1.3. CUSTOMERS

Our customers include:

- EUROCONTROL Aviation Learning Center (ALC), former EUROCONTROL IANS Institute (Luxembourg).
- Spanish Air navigation Training Centre (SENASA) in Madrid.
- ANSPs:
    - ENAIRE (Spain)
    - AVINOR (Norway)
    - Belgocontrol (Belgium)
    - ONDA and Aviation Civile (Morocco)
    - ENNA (Algeria)
    - Skyguide (Switzerland)
    - ENNA Angola Air Navigation Services.
    - Ghana Air Navigation Services.
    - Ukraine.
- ICAO CAR/SAM Office in Lima (Peru).
- ICAO African Office (Kenya).
- ICAO Asian office in Bangkok (Thailand).
- SITA.
- Frequentis.
- Nucleo Duro Felguera.
- Amper.

2. POINTS OF CONTACT

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

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

3. DELIVERY OF GAELICAM COURSES.

3.1. LANGUAGES.

GAELICAM courses are developed and delivered in English by default. Nevertheless, GAELICAM courses can be also delivered in other languages: French and Spanish.

3.2. TRAINING DELIVERY ALTERNATIVES.

GAELICAM courses can be delivered following any of the following alternatives:

3.2.1. OPTION 1: ON-SITE CLASSROOM TRAINING.

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.

The course material (students workbooks, CDs, …) is generated by GAELICAM and submitted to the students.

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.

3.2.2. OPTION 2: VIRTUAL CLASSROOM TRAINING.

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.

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 students questions and making polls in real time.

The course material (students workbooks, CDs, …) is generated by GAELICAM and submitted to the students.

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.

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

3.2.3. OPTION 3: E- LEARNING TRAINING.

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.

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.

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

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.

4. TRAINING SPECIFICATION FOR AIR TRAFFIC SAFETY ELECTRONICS PERSONNEL (ATSEP).

4.1. INTRODUCTION.

This section collects the specification for Air Traffic Safety Electronics Personnel (ATSEP) training. The term ATSEP is used to describe "engineering and technical personnel undertaking operational safety related tasks".

This training programme has been developed following ICAO Doc 10057 ('Manual on Air Traffic Safety Electronics Personnel Competency-based Training and Assessment') and Regulation (EU) 2017/373 'common requirements for providers of air traffic management/air navigation services'.

Note – the term "learner" is the generic term for the person performing a learning activity without any reference to his/her status.

ATSEP training is divided into three phases:

- **Initial Training**: Training that precedes the System/Equipment Rating Training. It includes Basic Training and Qualification Training.
- **System/Equipment Rating Training**: Training designed to impart system/equipment-related knowledge and skills leading towards operational competence.
- **Continuation Training**: Training designed to augment existing knowledge and skills and/or to prepare for new technologies. This training is given to operationally competent personnel and it includes Refresher, Emergency and Conversion training.

The Progression of ATSEP Training is shown in the following figure:

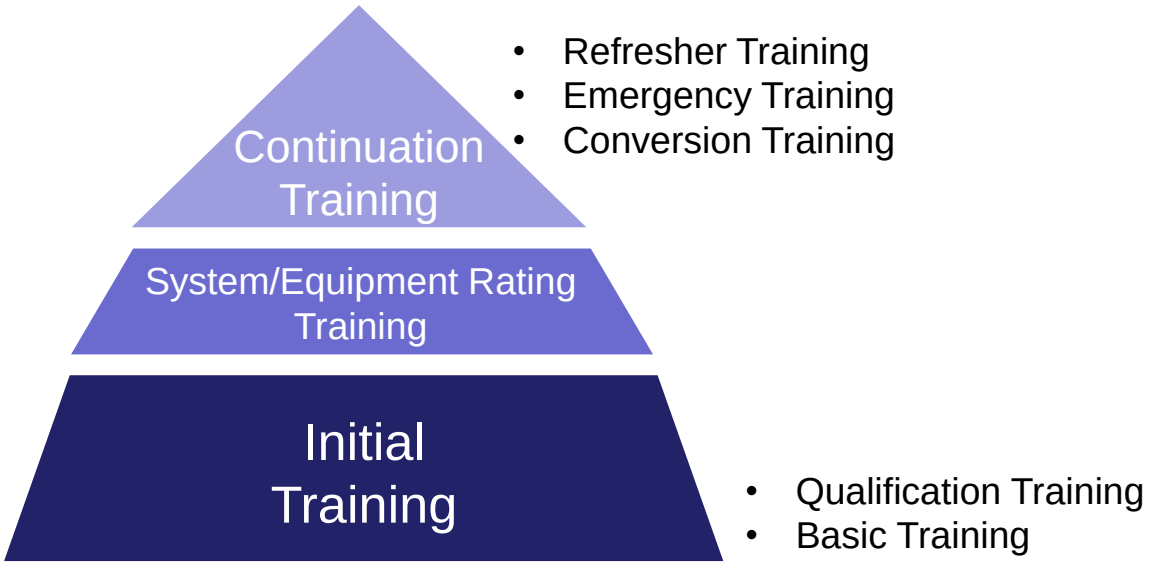


Figure 1: Progression of ATSEP Training

4.2. INITIAL TRAINING.

Initial Training precedes the System/Equipment Rating Training. It includes Basic Training and Qualification Training.

4.2.1. Basic Training.

Training designed to impart fundamental knowledge of the CNS/ATM environment and skills applicable to all learner ATSEPs.

4.2.2. Qualification Training.

Training designed to impart domain related knowledge and skills appropriate to the qualification stream to be pursued in the CNS/ATM environment.

Four specialised domains have been identified. They are Communication, Navigation, Surveillance and Data Processing. In addition a group of generic subjects were identified that are applicable to all ATSEPs.

13 streams have been identified and represent generic profiles built according to the ATSEP roles.

Note: - A stream is a cluster of training objectives that support a particular area of work within a domain.

The streams described in this document are:

- COM – Voice Stream
- COM – Data Stream
- NAV – Performance Based navigation Stream
- NAV – NDB Stream
- NAV – DF Stream
- NAV – VOR Stream
- NAV – DME Stream
- NAV – ILS Stream
- NAV – GNSS Stream
- SUR – PSR Stream
- SUR – SSR Stream
- SUR – ADS Stream
- SUR – Multilateration Stream
- SUR – A-SMGCS (Advanced-Surface Movement Guidance and Control System) Stream
- DAT – Data Processing Stream
- SMC – System Monitoring and Control Stream
- INF – CNS/ATM Infrastructure Stream
- ENG – CNS/ATM Engineering Stream
- SAF – Safety, verification, validation and certification Stream
- SEC – CNS/ATM Security Stream

In a minimum of one specialized technical domain, ATSEPs are trained for one or more streams that correspond with the system/s and equipment that they will eventually work with.

At the end of Qualification Training a learner ATSEP shall have the ability to identify and solve generic but realistic problems related to an area of expertise. The learner ATSEP should be able to act efficiently when faced with a set of scenarios. These scenarios are mastered because the ATSEP has acquired the required knowledge and the ability to use this knowledge at an appropriate time and in a relevant manner.

4.3. SYSTEM/EQUIPMENT RATING TRAINING.

Training designed to impart system/equipment-related knowledge and skills leading towards operational competence.

This training is normally delivered by the manufacturer of a system/equipment.

With respect to the ATSEP role/s, training progression is performed through the completion of Initial Training and the series of actions described as S/E Rating training (additional academy or manufacturer training, On-site Training, mentoring and consolidation of experience).

4.4. CONTINUATION TRAINING.

Training designed to augment existing knowledge and skills and/or to prepare for new technologies. This training is given to operationally competent personnel and it includes Refresher, Emergency and Conversion training.

4.4.1. Refresher Training.

Training designed to review, reinforce or upgrade existing knowledge and skills (including team skills).

4.4.2. Emergency Training.

Training designed to broaden knowledge, skills and behaviour in the case of an emergency, unusual or degraded situation. Most of the training will be site-specific or may make use of incident or accident analysis.

4.4.3. Conversion Training.

Training designed to provide knowledge and skills appropriate to a change in domain (new stream or new S/E rating), environment (new procedures, new location) or system (system upgrade or change).

5. GAELICAM CNS/ATM TRAINING PORTFOLIO.

As commented, the specification for Air Traffic Safety Electronics Personnel (ATSEP) training identifies three phases:

- **Initial Training**: Training that precedes the System/Equipment Rating Training. It includes Basic Training and Qualification Training.
- **System/Equipment Rating Training**: Training designed to impart system/equipment-related knowledge and skills leading towards operational competence.
- **Continuation Training**: Training designed to augment existing knowledge and skills and/or to prepare for new technologies. This training is given to operationally competent personnel and it includes Refresher, Emergency and Conversion training.

GAELICAM courses have been developed by our specialists following this specification for Air Traffic Safety Electronics Personnel (ATSEP) training. Consequently, some specific courses have been developed for each of the training phases.

5.1. INITIAL TRAINING – BASIC TRAINING.

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

Table 2: CNSATM-INITIAL course modules

5.2. INITIAL TRAINING – QUALIFICATION TRAINING.

GAELICAM has 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.

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	2 week
DATA PROCESSING	**CNSATM-DPS**: Data processing systems in ATM	2 weeks
SYSTEM MONITORING AND CONTROL	**CNSATM-SMC**: System Monitoring and Control	2 weeks
INFRASTRUCTURE	**CNSATM-INF:** Infrastructure	2 weeks
ENGINEERING	**CNSATM-ENG:** Engineering	2 weeks
SAFETY, VERIFICATION, VALIDATION AND CERTIFICATION	**SAF-SM**: Safety Management	1 week
	CER-VVC: Verification, Validation and Certification processes	1 week
CNS/ATM SECURITY	**CNS/ATM-SEC:** CNS/ATM Security	1 week

Table 3: GAELICAM Qualification courses

5.2.1. 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:

5.2.1.1. 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.

5.2.1.2. 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.

5.2.1.3. 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.

5.2.1.4. 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.

5.2.1.5. 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.

5.2.1.6. 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.

5.2.1.7. 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.

5.2.2. 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:

5.2.2.1. 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.

5.2.2.2. 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.

5.2.3. GAELICAM SURVEILLACE 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:

5.2.3.1. S-GEN: Surveillance systems.

This course provides and 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.

5.2.3.2. 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.

5.2.3.3. 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 Are Multilateration – WAM and the associated Surveillance Performance.

5.2.3.4. 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.

5.2.4. GAELICAM CNS/ATM AND DATA PROCESSING COURSES.

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

5.2.4.1. 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.

5.2.4.2. 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.

5.2.5. GAELICAM SYSTEM MONITORING AND CONTROL courses.

GAELICAM has developed the following CNS/ATM system monitoring and control courses:

5.2.5.1. CNSATM-SMC: System Monitoring and Control.

This course provides a knowledge about the Monitorization and Supervision of CNS/ATM systems.

Different technologies (SNMP, others…) are identified and assessed in order to identify pros and cons of each one and to be able to take decisions about which is the most convenient technology to be used in each case.

To highlight the importance of making supervision integration between different aeronautical systems based on the same protocol, facilitating the tasks of supervisors.

A complete integration of supervisions of CNS/ATM systems and underlying network devices providing IP connectivity can be achieved. In this way, there is a trend to promote the use of centralized monitoring and supervision systems.

5.2.6. GAELICAM INFRASTRUCTURE courses.

GAELICAM has developed the following CNS/ATM infrastructure courses:

5.2.6.1. CNS/ATM-INF: infrastructure.

ATSEP normally maintains for their Air Navigation Services Provider (ANSP)

- Communication,
- Navigation,
- Surveillance and
- AirTraffic Management (ATM) systems/equipments.

However, other infrastructure is also often maintained by them, such as Power Supplies or Meteo systems and sensors.

This course provides a description of the maintenance activities to be performed to maintain this kind of infrastructure that is very essential for the correct work of any kind of CNS/ATM system.

5.2.7. GAELICAM SYSTEM ENGINEERING courses.

GAELICAM has developed the following CNS/ATM engineering courses:

5.5.7.1 CNS/ATM-ENG: engineering.

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.

5.2.8. GAELICAM CERTIFICATION, VERIFICATION, VALIDATION and SAFETY courses.

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

5.2.8.1. 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.

5.2.8.2. 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.

5.2.9. GAELICAM CNS/ATM SECURITY courses.

GAELICAM has developed the following CNS/ATM courses:

5.2.9.1. CNS/ATM-SEC: CNS/ATM Security.

This training course addresses Security 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 CNS/ATM Security identifying the most important concepts, why Security is so important and how it can be provided.

This training course pursues that attendees get familiarized with a security management system that is compliant with European Commission Implementing Regulation EU 373/2017 'Common Req. Provision ANS' and for the whole scope of services provided by ANSP operating an ATC IP network.

The following deliverables have been identified within the scope of the CNS/ATM Security Plan to be developed:

- Best practices for the Security requirements related to the CNS/ATM solution collecting the best practices regarding implementation of security on CNS/ATM systems.
- Best practices for ISO/IEC 27001 and NIST compliance related to the CNS/ATM solution, collecting the ISO/IEC 27001 International Standards requirements for establishing, implementing, operating, monitoring, reviewing, maintaining and improving a documented Information Security Management System (ISMS) within the context of the organization's overall business risks.
- Security risk assessment of CNS/ATM systems developing a complete Security Risk Assessment (SRA) with the objective of capturing the evidence that the overall CNS/ATM systems can meet the security objectives.
- Template for the CNS/ATM Acceptance security report related to the CNS/ATM solution providing a template with a checklist of security features to be activated in CNS/ATM systems during the Site Acceptance procedure.

5.3. SYSTEM/EQUIPMENT RATING TRAINING.

System/Equipment Rating Training has to be designed to impart system/equipment-related knowledge and skills leading towards operational competence.

This training is normally delivered by the manufacturer of the different CNS/ATM systems since the objective is to have the ATSEP personnel with the technical and operational competences to run one specific system in operation.

5.4. CONTINUATION TRAINING.

The continuation training is designed to augment existing knowledge and skills and/or to prepare for new technologies. This training is given to operationally competent personnel and it includes Refresher, Emergency and Conversion training.

GAELICAM courses developed and described in the ‘Qualification Training’ section of this document applied perfectly to cover also the ‘Continuation training’ requirements.

6. ATSEP TRAINING ITINERARY.

6.1. APPLICABILITY OF THE MINIMUM TRAINING REQUIREMENT.

This section first explains the complexities involved in determining an Initial Training minimum training requirement and then describes who this minimum training requirement shall apply to.

ATSEPs work on a wide range of CNS/ATM systems and equipment, each of which requires training to achieve specific skills that will eventually lead to operational competence.

However, the ways in which ATSEP functions and/or tasks are defined and assigned to individuals, will vary from one organisation to another.

These differences in the way the ATSEP job is characterized makes it impractical to prescribe a “one-size-fits-all” minimum training requirement that will satisfy all the various different organisational arrangements and, at the same time achieve a relevant and valid range of competences for all.

What is agreed is that all ATSEPs achieve a minimum required level of operational competence that allows them to perform safety related tasks with the specific equipment or systems they will be working with. These competencies apply to all ATSEPs, irrespective of the organisation they work for, their location or the composition of their functions. This competence is achieved at the end of S/E Rating Training. Initial Training is the phase prior to S/E Rating Training; therefore the minimum training received during Initial Training will not be sufficient to permit operational competence. It will however, be sufficient to prepare a learner to start the S/E Rating Training.

Furthermore, the minimum training requirement, as described in this document does not encompass all the possible roles and responsibilities that engineers and technicians may eventually be in involved with. It is acknowledged that in some organisations, ATSEPs may have additional responsibilities that are outside the scope and applicability of this Specification.

For the purposes of this Specification, the term ATSEP is used to describe “engineering and technical personnel undertaking operational safety related tasks”, that is to say, personnel who operate and maintain ATM equipment approved for operational use.

ATM equipment approved for operational use is defined as 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.

The minimum training requirement, contained within the Initial Training, shall apply to all learner ATSEPs. This minimum training requirement (and how it is put into practice) is defined in the following section.

6.2. ATSEP MINIMUM TRAINING REQUIREMENTS.

The minimum training requirement is the minimum that learner ATSEPs shall satisfy.

The following sub-sections describe the minimum training requirement for the Initial Training i.e. Basic + Qualification Training.

In some instances, particularly where the learner ATSEPs have previously obtained technical or engineering-related qualifications (e.g. engineering degrees and/or other diplomas), the objectives contained within this Specification need not be re-taught. If it can be verified and/or demonstrated that a learner ATSEP has already satisfied the performance requirements of the appropriate objectives, then these need not be retaught. The verification and/or demonstration of performance requirements shall be recorded.

6.2.1. Basic Training.

The training objectives contained in the Basic Training syllabus are common to all learner ATSEPs undergoing Initial Training.

Completion of all Basic Training objectives is not a pre-requisite to starting Qualification Training. Basic Training objectives shall be satisfied by the end of Initial Training.

Nonetheless, for pedagogical reasons, it is recommended that the sequence of Basic then Qualification training is respected.

The basic training is composed of the following modules that compose the GAELICAM 'CNSATM.INITIAL' course:

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

6.2.2. Qualification Training.

The minimum training requirement is applied to learner ATSEPs during Qualification Training by determining which equipment and system/s the ATSEP will ultimately be working with. 'Domain', 'Subject' and 'Topic' columns in the Table 4 ' ATSEP/Controller/Pilot Training Itinerary' represented as follows are going to be used for this purpose. Then, GAELICAM courses that satisfy the qualification training requirements for each ATSEP are identified with crosses (X) in the corresponding row of Table 4.

An ATSEP whose tasks and activities will require him/her to work with a combination of systems and/or equipment shall, during the Qualification Training, satisfy all the objectives in all the relevant streams.

	DOMAIN	SUBJECT	TOPIC	SUB-TOPIC	GAELICAM COURSES																						
					CNSATM-INITIAL	C-VOICE	C-DATALINK	C-AMHS	C-DATA	C-AFTN	C-TRANSMISSION	C-RECORDER	N-GNSS	N-PBN	S-GEN	S-ADS	S-ASMGCS	S-MLAT	CNSATM-GEN	CNSATM-DPS	CNSATM-DPS	CNSATM-SMC	CNSATM-INF	CNSATM-ENG	SAF-SM	CER-VVC	CNS/ATM SECURITY
ATSEP (Air Traffic Safety Electronics	COMMUNICATION	VOICE	Air/Ground	Transmission/Reception	X	X													X					X			X
				Radio Antenna Systems	X	X													X					X			X
				Voice Switch	X	X													X					X			X
				Controller Working Position	X	X													X					X			X
				Radio Interfaces	X	X													X					X			X
			Ground/Ground	Interfaces	X	X													X					X			X
				Protocols	X	X													X					X			X
				Switch	X	X													X					X			X
				Communication Chain	X	X													X					X			X
				Controller Working Position	X	X													X					X			X
		DATA	ATC Networks	Introduction to networks	X				X										X					X			X
				External Network Services	X				X										X					X			X
				Measuring Tools	X				X										X					X			X
				Troubleshooting	X				X										X					X			X
				Protocols	X				X										X					X			X

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

				ATN Applications within the CNS/ATM framework	X		X		X										X					X			X
				VHF Datalink Mode 2 (VDL2) Deployment	X		X		X										X					X			X
				Datalink Service Provision (ATN and FANS)	X		X		X										X					X			X
				Services: CM, CPDLC, FIS, ADS	X		X		X										X					X			X
				ATN Roadmap	X		X		X										X					X			X
		Transmition Path	Lines	Digital Transmission	X						X								X					X			X
				Types of Lines	X						X								X					X			X
			Specific links	Microwave Link	X						X								X					X			X
				Satellite	X						X								X					X			X
				Optical Fiber	X						X								X					X			X
		Recorders	Legal recorders	Regulations	X							X							X					X			X
				Principles	X							X							X					X			X
		Safety	Functional safety	Functional safety	X														X			X		X	X	X	X
ATSEP (Air Traffic	**NAVIGATION**	Performance based navigation	NAV concepts	Operational Requirements	X								X						X					X			X
				Performance based navigation	X								X						X					X			X
				Area Navigation Concept (RNAV)	X								X						X					X			X
				NOTAM	X								X						X					X			X
		Ground-based system: NDB	NDB/Locator	Use of the system	X														X					X			X
				Ground station architecture	X														X					X			X

			Transmitter and antena subsystems	X														X					X			X
			On-board equipment	X														X					X			X
	Ground-based system: DF	DF	Use of the system	X														X					X			X
			VDF/DDF equipment architecture	X														X					X			X
			Receiver and antena subsystems	X														X					X			X
			Monitoring and control subsystems	X														X					X			X
	Ground-based system: VOR	VOR	Use of the system	X														X					X			X
			Fundamentals of CVOR and/or DVOR	X														X					X			X
			Ground Station Architecture	X														X					X			X
			Transmitter Sub-system	X														X					X			X
			Antenna Sub-system	X														X					X			X
			Monitoring and Control Sub-system	X														X				X	X			X
			On-board Equipment	X														X					X			X
			System Check and Maintenance	X														X				X	X			X
	Ground-based system: DME	DME	Use of the system	X														X					X			
			Fundamentals of the DME	X														X					X			X
			Ground Station Architecture	X														X					X			X
			Receiver Sub-system	X														X					X			X
			Signal Processing	X														X					X			X
			Transmitter Sub-system	X														X					X			X

			Antena Sub-system	X														X					X				X
			Monitoring and Control Sub-system	X														X					X				X
			On-board Equipment	X														X					X				X
			System Check and Maintenance	X														X					X				X
	Ground-based system: ILS	ILS	Use of the system	X														X					X				X
			Fundamentals of the ILS	X														X					X				X
			2F-Systems	X														X					X				X
			Ground Station Architecture	X														X					X				X
			Transmitter Sub-system	X														X					X				X
			Antena Sub-system	X														X					X				X
			Monitoring and Control Sub-system	X														X			X		X				X
			On-board Equipment	X														X					X				X
			System Check and Maintenance	X														X			X	X	X				X
	Global Navigation Satellite System	GNSS	General view	X								X						X					X				X
	On-board equipment	On-Board Systems	On-Board Systems	X														X					X				X
		AUTONOMOUS NAVIGATION	Inertial Navigation	X														X					X				X
		Vertical Navigation	Vertical Navigation	X														X					X				X
		Safety Attitude	Safety Attitude	X														X			X	X	X	X	X		X

		Functional Safety	Functional Safety	Functional Safety	X																						
ATSEP (Air Traffic Safety Electronics Personnel)	**SURVEILLANCE**	Primary	ATC SURVEILLANCE	Use of PSR for Air Traffic Services	X																						
				Antenna (PSR)	X										X												
				Transmitters	X										X												
				Characteristics of Primary Targets	X										X												
				Receivers	X										X												
				Signal Processing and Plot Extraction	X										X												
				Plot Combining	X										X												
				Characteristics of Primary Radar	X										X												
			SMR	Use of SMR for Air Traffic Services	X										X												
				Radar Sensor	X										X												
			TEST AND MEASUREMENT	Test and Measurement	X										X												
		Secondary	SSR AND MSSR	Use of SSR for Air Traffic Services	X										X												
				Antenna (SSR)	X										X												
				Interrogator	X										X												
				Transponder	X										X												
				Receiver	X										X												
				Signal Processing and Plot Extraction	X										X												
				Plot Combining	X										X												
				Test and Measurement	X										X												

		Mode S	Introduction to Mode S	X										X				X				X				X
			Mode S System	X										X				X				X				X
		Multilateration (MLAT)	MLAT in use	X										X			X	X				X				X
			MLAT Principles	X										X			X	X				X				X
		A-SMGCS	A-SMGCS	X										X		X		X				X				
		SSR Environment	SSR Environment	X										X				X				X				X
	ADS	GENERAL VIEW ON ADS	Definition of ADS	X										X	X			X				X				X
		ADS-B	Introduction to ADS-B	X										X	X			X				X				X
			Techniques of ADS B	X										X	X			X				X				X
			VDL Mode 4 (STDMA)	X										X	X			X				X				X
			Mode S Extended Squitter	X										X	X			X				X				X
			UAT	X										X	X			X				X				X
			ASTERIX	X										X	X			X				X				X
		ADS-C	Introduction to ADS-C	X										X	X			X				X				X
			Techniques in ADS-C	X										X	X			X				X				X
	HMI	HMI	ATCO HMI	X										X				X		X		X				X
			ATSEP HMI	X										X				X		X		X				
			Pilot HMI	X										X				X		X		X				X
			Displays	X										X				X		X		X				X
	SURVEILLANCE DATA TRANSMISSION	Surveillance Data Transmission	Technology and Protocols	X										X				X				X				X
			Verification Methods	X										X				X				X				X
	Functional Safety	SAFETY ATTITUDE	Safety Attitude	X										X				X		X	X	X	X	X	X	X

		FUNCTIONAL SAFETY	Functional Safety	X										X				X			X	X	X	X	X	X	X
ATSEP (Air Traffic Safety Electronics Personnel)	DATA PROCESSING	FUNCTIONAL SAFETY	FUNCTIONAL SAFETY	Functional Safety	X														X	X	X	X	X	X	X	X	X	X
				Software Integrity and Security	X														X	X	X	X	X	X	X	X	X	X
			SAFETY ATTITUDE	Safety Attitude	X														X	X	X	X	X	X	X	X	X	X
		DATA PROCESSING SYSTEMS (DP)	USER REQUIREMENTS	Controller requirements	X														X	X			X					X
				Trajectories, Prediction and Calculation	X														X	X			X					X
				Ground Safety Nets	X														X	X			X					X
				Decision Support	X														X	X			X					X
			SYSTEM COMPONENTS	Data Processing Systems	X														X	X			X					X
				Flight Data Processing Systems	X														X	X			X					X
				Surveillance Data Processing Systems	X														X	X			X					X
		PROCESS	SOFTWARE PROCESS	Middleware	X														X	X			X					X
				Operating Systems	X														X	X			X					X
				Configuration Control	X														X	X			X					X
				Software Development Process	X														X	X			X					X
			HARDWARE PLATFORM	Equipment Upgrade	X														X	X			X					X
				COTS	X														X	X			X					X
				Interdependence	X														X	X			X					X
				Maintainability	X														X	X			X					X
			TESTING	Testing	X														X	X			X					X

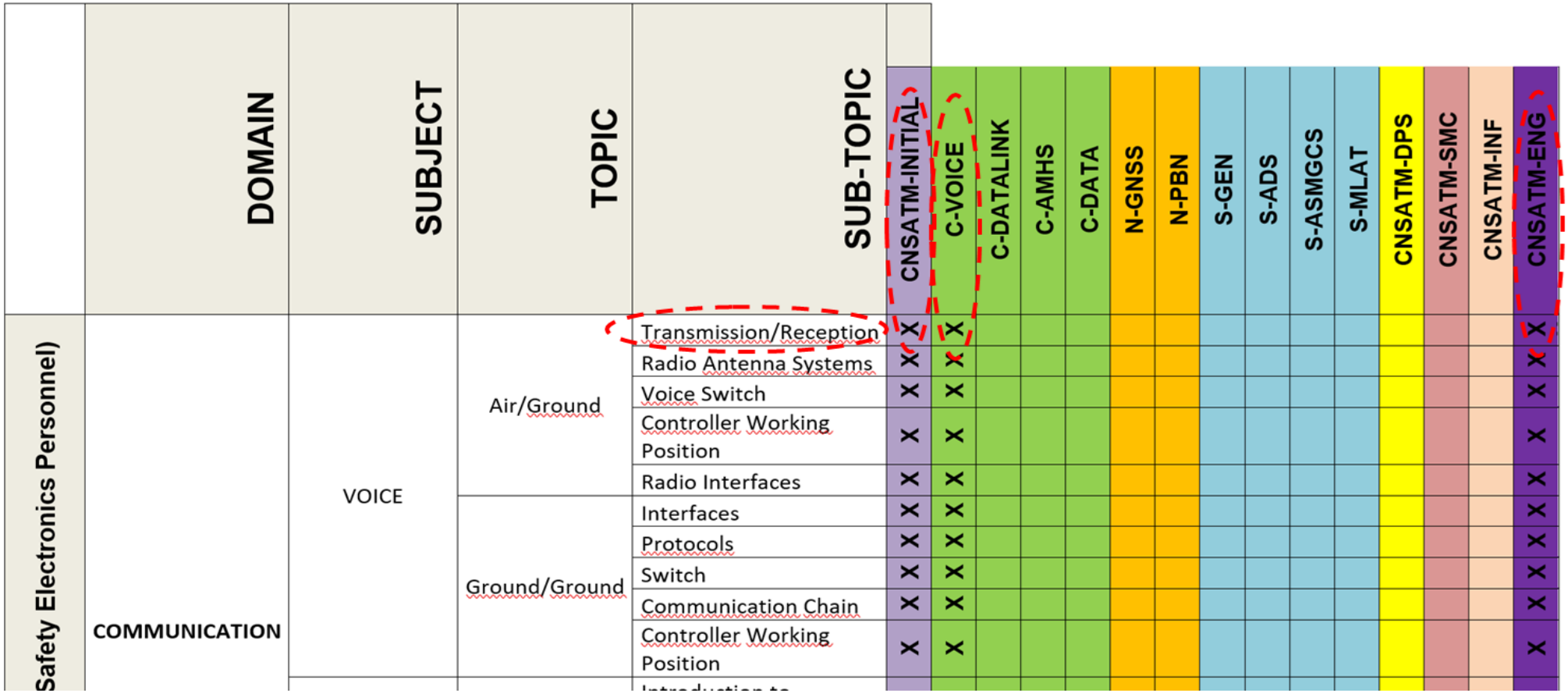
		DATA	DATA ESSENTIAL FEATURES	Data Significance	X														X	X	X			X			X
				Data Configuration Control	X														X	X	X			X			X
				Data Standards	X														X	X	X			X			X
			ATM DATA - DETAILED STRUCTURE	System Area	X														X	X	X			X			X
				Characteristic Points	X														X	X	X			X			
				Aircraft Performances	X														X	X	X			X			X
				Screen Manager	X														X	X	X			X			X
				Auto-coordination Messages	X														X	X	X			X			X
				Configuration Control Data	X														X	X	X			X			X
				Physical Configuration Data	X														X	X	X			X			X
				Relevant Meteo Data	X														X	X	X			X			X
				Alert and Error Messages to ATSEP	X														X	X	X			X			X
				Alert and Error Messages to ATCO	X														X	X	X			X			X
CONTROLLER					X														X								
PILOT					X														X								

Table 4: ATSEP/Controller/Pilot Training Itinerary

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	CNSATM-INITIAL	C-VOICE	C-DATALINK	C-AMHS	C-DATA	N-GNSS	N-PBN	S-GEN	S-ADS	S-ASMGCS	S-MLAT	CNSATM-DPS	CNSATM-SMC	CNSATM-INF	CNSATM-ENG
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
				Introduction to															

7. PILOT AND CONTROLLER TRAINING ITINERARY.

Pilots and Controllers need to receive a general training about CNS/ATM domains as an essential part of their whole training process to obtain the corresponding license.

For this purpose, the pilots and controllers training itinerary in CNS/ATM is composed of two courses identified in Table 4 'ATSEP/Controller/Pilot Training Itinerary':

COURSE 1: 'CNSATM.INITIAL' composed of the following modules:

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

COURSE 2: 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.

8. BROCHURES OF GAELICAM COURSES.

CNS/ATM INITIAL

C-VOICE: ATS VOICE OVER IP (TELEPHONY AND RADIO)

C-DATALINK

C-AMHS: ATS MESSAGE HANDLING SYSTEM

C-DATA: GROUND DATA NETWORK IN ATC

N-GNSS: GLOBAL NAVIGATION SATELLITE SYSTEM

N-PBN: PERFORMANCE BASED NAVIGATION

S-GEN: SURVEILLANCE SYSTEMS

S-ADS: AUTOMATIC DEPENDENT SURVEILLANCE

S-MLAT: MULTILATERATION SYSTEMS

S-ASMGCS: ADVANCED SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEMS

CNSATM-GEN: AIR NAVIGATION CNS/ATM SYSTEMS

CNSATM-DPS: DATA PROCESSING SYSTEMS

CNSATM-SMC: SYSTEM MONITORING AND CONTROL

SAF-SM: SAFETY

CER-VVC: VERIFICATION & VALIDATION&CERTIFICATION

CNS/ATM SECURITY

9. GAELICAM/MERIDEAM REFERENCES.

Item Description	Detail
Legal name of bidder	MERIDEAM CONSULTING AND TRAINING, SL
Legal Address, City, Country	CALLE JOSE SOLANA, 3. E-28660 – BOADILLA DEL MONTE. MADRID (SPAIN)
Website	Click or tap here to enter text.

Previous relevant experience:				
Name of previous contracts	**Client & Reference Contact Details**	**Contract Value**	**Period of activity**	**Types of activities undertaken**
Development and deployment of the virtual "advanced AMHS course" (2021)	ICAO Francisco Almeida TF: +51 977 814 722 Email: falmeida@icao.int	10.500 USD	2021	Development and deployment of the virtual "advanced AMHS course"
Development and deployment of the virtual "advanced AMHS course" (2020)	ICAO Francisco Almeida TF: +51 977 814 722 Email: falmeida@icao.int	10.000 USD	2020	Development and deployment of the virtual "advanced AMHS course"
Development and deployment of the "advanced AMHS course" at the Chile training center in Lima (2018)	ICAO Francisco Almeida TF: +51 977 814 722 Email: falmeida@icao.int	10.000 USD	2018	Development and deployment of the virtual "advanced AMHS course"
Development and deployment of the "advanced AMHS course" at the ICAO SAM region training center in Lima (2013)	ICAO Francisco Almeida TF: +51 977 814 722 Email: falmeida@icao.int	10.000 USD	2013	Development and deployment of the virtual "advanced AMHS course"
Development and delivery of the IANS (Institute of Air Navigation Services) COM-AMHS ('Aeronautical Message Handling	EUROCONTROL (IANS) Philippe Sacre TF: +32 477 86 34 15 Email: philippe.sacre@eurocontrol.int	15.000 €/year	2006-2022	Development and delivery of the IANS (Institute of Air Navigation Services) COM-AMHS ('Aeronautical

systems') course at IANS since 2006				Message Handling systems') course
Development and delivery of the IANS (Institute of Air Navigation Services) AMC/EDS ('ATS Management Center / European Directory Services') course at IANS since 2010	EUROCONTROL (IANS) Philippe Sacre TF: +32 477 86 34 15 Email: philippe.sacre@eurocontrol.int	5.000 €/year	2010-2022	Development and delivery of the IANS (Institute of Air Navigation Services) AMC/EDS ('ATS Management Center / European Directory Services') course
Development and delivery of current IANS COM-VOICE course ('Towards Voice over IP in Aeronautical Communications') at IANS since 2013	EUROCONTROL (IANS) Philippe Sacre TF: +32 477 86 34 15 Email: philippe.sacre@eurocontrol.int	15.000 €/year	2013-2022	Development and delivery of current IANS COM-VOICE course ('Towards Voice over IP in Aeronautical Communications')
Development and delivery of the 'PENS module' of the IANS COM-DATA (Aeronautical Communications) course at IANS since 2010.	EUROCONTROL (IANS) Philippe Sacre TF: +32 477 86 34 15 Email: philippe.sacre@eurocontrol.int	10.000 €/year	2010-2022	Development and delivery of the 'PENS module' of the IANS COM-DATA (Aeronautical Communications) course
Development and delivery of the "ATC COMMUNICATIONS FOR AIR NAVIGATION SYSTEMS" course for SENASA (Spanish Air Navigation Training Centre) since 2005 with the objective of training Aena's Engineering and Maintenance personnel covering all the range of ATC communications.	SENASA Antonio Peláez TF: +34 660 08 81 51 Email: apelaez@senasa.es	5.000 €/year	2005-2022	Development and delivery of the "ATC COMMUNICATIONS FOR AIR NAVIGATION SYSTEMS" course for SENASA (Spanish Air Navigation Training Centre) since 2005 with the objective of training Aena's Engineering and Maintenance personnel covering all the range of ATC communications.
Development and delivery of the course titled "AIR NAVIGATION CNS/ATM	SENASA Antonio Peláez TF: +34 660 08 81 51	10.000 €	2005-2022	Development and delivery of the 'PENS module' of the IANS COM-DATA (Aeronautical

SYSTEMS" with the objective of performing the training of Aena's staff (Engineering, Technical and/or Maintenance) involved in ATM business on current and future Air Navigation CNS/ATM systems ('Communications, Navigation, Surveillance / Air Traffic Management').	Email: apelaez@senasa.es			Communications) course
Development and delivery of COM-AMHS and COM-DATA courses at Tunisian ANSP (OACA) premises.	OACA (Tunisia) Imed Heni TF: +216 58 379 862 Email: imed.heni@oaca.nat.tn	10.000 €/year	2015-2022	Development and delivery of COM-AMHS and COM-DATA courses
Development and delivery of COM-AMHS and COM-DATA courses at Algerian ANSP (ENNA) premises.	ENNA (Algeria) Nadira Amira Boubekeur TF: +213 21 67 12 07 Email: nadira-boubekeur@enna.dz	10.000 €/year	2015-2022	Development and delivery of COM-AMHS and COM-DATA courses
Development and delivery of COM-AMHS and COM-DATA courses at Moroccan ANSP (ONDA) premises.	ONDA (Morocco) Youssef Lazar TF: +212 660 100097 Email: y.lazar@onda.ma	10.000 €/year	2015-2022	Development and delivery of COM-AMHS and COM-DATA courses
Development and delivery of COM-AMHS course at Norweigan ANSP (AVINOR) premises.	AVINOR Erling Bergersen TF: +47 901 24 038 Email: erling.bergersen@avinor.no	5.000 €	2015	Development and delivery of COM-AMHS course

Development and delivery of COM-AMHS course at Swiss ANSP (Skyguide) premises.	Skyguide Giorgo Vagni TF: Email: giorgo.vagni@swisscontrol.com	5.000 €	2018	Development and delivery of COM-AMHS course
Development and delivery of COM-AMHS and COM-DATA courses at Nucleo (Spanish ATM systems company) premises.	NUCLEO Sara Cristóbal TF: +34 616 390 824 Email: sara.cristobal@nucleocc.com	10.000 €	2018 and 2020	Development and delivery of COM-AMHS and COM-DATA courses

10. GLOSSARY.

ADS	Automatic Dependant Surveillance
ADS-B	Automatic Dependant Surveillance Broadcast
ADS-C	Automatic Dependant Surveillance Contract
AFTN	Aeronautical Fixed Comunication Network
AMC	AMHS 'Off-line' Management Systems (AMC)
AMHS	Aeronautical Message Handling System
ANSP	Air Navigation Services Providers
AOC	Aeronautical Operational Control
APP	Approach Control Centre
ATCO	Air Traffic Control Operator
ATSEP	Air Traffic Safety Electronics Personnel
A-SMGCS	Advanced-Surface Movement Guidance and Control System
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATM	Asynchronous Transfer Mode
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
bps	Bits per second
CFMU	Central Flow Management Unit
CIDIN	Common ICAO Data Interchange Network
CM	Context Management
CNS	Commmunications, Navigation and Surveillance
COTS	Commercial off-the-shelf
CPDLC	Controller-Pilot Data Link Communications
CPU	Central Processing Unit
dB	Decibels
DME	Distance Measuring Equipment

DP	Data Processing
DVOR	Doppler VOR
EAD	European AIS Database
EGNOS	European Geostationary Navigation Overlay Service
EUROCONTROL	European Organisation for the Safety of Air Navigation
FANS	Future Air Navigation System
FIS	Flight Information Service
GHz	Gigahertz
GNSS	Global Navigation Satellite System
HF	High Frecuency
HFDL	High Frequency Data Link
HMI	Human Machine Interfaz
Hz	Hertz
ICAO	International Civil Aviation Organization
ILS	Instrument Landing System
IP	Internet Protocol
ISO	International Standards Organization
ITU	International Telecommunications Union
kbps	Kilobits per second
KHz	Kilohertz
LAN	Local Area Network
Mbps	Megabits per second
MHz	Megahertz
MLAT	Multilateration
NDB	Non-Directional Beacon
NAV	Navigation
NOTAM	Notice To Airmen
OLDI	On Line Data Interchange
OSI	Open Systems Interconnection
PENS	Pan-European Nerwork Service

PSR	Primary Surveillance Radar
RNAV	Area Navigation Concept
RX	Receptor o Recepción
SCV	Sistema de Comunicaciones Voz
SELCAL	Selective Calling
SITA	Société Internationale de Télécommunications Aéronautiques
SMR	Surface Movement Radar
SSR	Secondary Surveillance Radar
TCP	Transmission Control Protocol
TX	Transmitter
UAT	Universal Access Transceiver
UHF	Ultra High Frecuency
VCS	Voice Communications System
VDF	VHF Direction Finder
VDL	VHF Digital Link
VGS	VDL Ground Station
VHF	Very High Frecuency
VoIP	Voice over Internet Protocol
VOR	Very High Frequency Omnidirectional Range,