

EUROPASS SUPPLEMENT TO THE DIPLOMA

TITLE OF THE CERTIFICATE (original language: ES)

Técnico Superior en mantenimiento de sistemas electrónicos y aviónicos en aeronaves

TRANSLATED TITLE OF THE CERTIFICATE (English)

Diploma of Higher Education in the Maintenance of Electronic and Avionics Systems in Aircraft

PROFILE OF SKILLS AND COMPETENCES

The holder has acquired general skills relating to carrying out programmed and corrective maintenance of the aircraft's electrical, electronic and avionics systems and their components, both on a line and in the hangar and workshop. Also, the line maintenance of engines, airframe, and mechanical, hydraulic and pneumatic systems, as well as participating in the manufacturing and assembly processes of components, applying the regulations in force and the required quality in accordance with the technical documentation, complying with specific aeronautical regulations, the occupational risk prevention and environmental protection plans, and participating in maintenance management.

Within this framework, each PROFESSIONAL MODULE includes the following LEARNING RESULTS that the holder acquires.

“Fundamentos de electricidad” (Fundamentals of Electricity).

The title holder:

- Characterises the fundamentals and basic concepts of electricity applying and interpreting the laws and rules that govern it.
- Characterises the operation of components and elements of direct current circuits, describing their characteristics, types, applications and the methods used to produce electricity.
- Calculates direct current electric circuits, applying the necessary laws and rules for their resolution.
- Calculates alternating current electric circuits, applying the laws and principles that characterise it.
- Characterises the basic principles of electromagnetism, describing the properties of magnetic fields and the interaction between fields and electrical conductors.
- Characterises direct current machines, describing their constituent elements, characteristics and operation.
- Characterises alternating current machines, describing their constituent elements, characteristics and operation.
- Calculates the operating parameters of transformers, applying the basic principles that govern their operation.

“Fundamentos de electrónica en aviónica” (Fundamentals of Electronics in Avionics).

The title holder:

- Defines the characteristics of PN joints in semiconductors, describing their behaviour in different polarisation conditions.
- Measures basic parameters of different types of semiconductor diodes and thyristors, analysing their operation and application in circuits.
- Characterises the fundamentals and mounts applications for the use of different types of transistors, describing their operation.
- Characterises linear integrated circuits, operational amplifiers and logic circuits used in avionics equipment, interpreting their operation from the block diagram.
- Checks the use of printed circuit boards in electronic equipment used in avionics, describing the manufacturing techniques and their constituent elements.
- Defines the operation of systems based on servomechanisms, describing the detailed operation of their components.

“Técnicas digitales y sistemas de instrumentos electrónicos en aviónica” (Digital Techniques and Electronic Instrument Systems in Avionics).

The title holder:

- Carries out different conversion operations between different numbering systems and between analogue and digital functions analysing their characteristics.
- Characterises the operation of data buses in aircraft systems, identifying the protocols and formats of ARINC signals, as well as other specifications.
- Builds logic circuits using different integrated circuits, interpreting their applications and symbology.
- Stores data on computers, describing their constituent elements and maintenance.
- Characterises different types of integrated circuits used for aircraft encoders, decoders and multiplexers, identifying their functionality and applications.
- Defines the process of data transmission by optical fibre and its application in aircraft systems, analysing its development.

- Characterises the behaviour of electronic display devices used in aircraft, analysing their characteristics.
- Identifies the effects of electrostatic charges and the influence of the electromagnetic environment on aircraft in devices that are sensitive to them, analysing their causes.
- Determines the effects produced by unapproved software changes on the airworthiness requirements of an aircraft, evaluating the software management control system.
- Characterises the general layout of typical electronic/digital systems, their associated equipment (BITE) on the aircraft, describing their location in the cockpit and in the enabled compartments.

“Materiales, equipos y herramientas en aviónica” (Materials, Equipment and Tools in Avionics).

The title holder:

- Characterises metallic materials used in aircraft structures, describing their physical and mechanical properties and the tests that define them.
- Characterises composite and non-metallic materials, other than wood, used in aircraft structures, describing their properties and constituent elements.
- Characterises the process of corrosion in metallic aircraft structures describing their chemical basis and the consequences they have on the structure of an aircraft.
- Characterises the fastening devices used in aircraft, describing and relating each element to the corresponding specification.
- Characterises the rigid pipes and flexible hoses used in aircraft, defining their characteristics and specifications.
- Characterises the structural layout and operation of the mechanisms used to transmit movement in aircraft, describing the physical laws on which they are based and their constituent elements.
- Characterises the constituent elements of the electrical cables and connectors used in aircraft, describing their construction and identification code.

“Prácticas de mantenimiento en aviónica”(Avionics Maintenance Practices).

The title holder:

- Applies usage criteria and safety regulations to the activities carried out in the workshop, analysing the work to be done.
- Carries out operations with tools and testing equipment used in aircraft maintenance, identifying the operating characteristics of the tools and measuring equipment used.
- Reads plans, diagrams and schemes, interpreting the rules of representation and associated symbols.
- Performs disassembly, inspection, repair and assembly operations, interpreting procedures for the correct adjustment and control of tolerances.
- Applies aircraft maintenance and inspection procedures, following quality criteria.
- Connects and splices electrical cables and performs soft soldering, selecting the methods and using the appropriate tools.
- Checks aircraft systems, using appropriate avionics testing equipment.
- Performs aircraft stewardship and hangar tasks, following established procedures.

“Aerodinámica básica” (Basic Aerodynamics).

The title holder:

- Calculates aerodynamic performance by interpreting equations and their applications in aerodynamics.
- Defines the phenomena that originate around a body immersed in an air current, interpreting the principles and equations that govern them.
- Defines lift and drag coefficients in an aerodynamic profile, analysing the physical principles that govern the behaviour of profiles immersed in an air current.
- Characterises the generation of vortices and their aerodynamic effects on wings, analysing the behaviour of the wing when it is immersed in a current of air.
- Defines the characteristics and parameters of flight in different situations, applying equations of dynamics and related aerodynamic concepts.
- Defines the concept of aerodynamic stability of an aircraft, interpreting its performance in flight in relation to the selected reference axes.

“Factores humanos” (Human Factors).

The title holder:

- Determines the factors that affect the performance of a maintenance technician in his or her work, relating their effects to the human limitations they cause.
- Defines the role of social psychology in the working environment, describing its applications.
- Assesses the influence of the characteristics of the physical environment on the performance of maintenance tasks, analysing their impact on the technician.
- Characterises the effects of communication on the performance of work in aircraft maintenance, analysing its possibilities.
- Selects the causes that promote human error in the workplace, interpreting their study models.
- Proposes measures to prevent occupational risks in the workplace, applying existing regulations to the aircraft maintenance environment.
- Selects employment opportunities, identifying the different possibilities of insertion and lifelong learning alternatives.

- Exercises the rights and complies with the obligations derived from labour relations, recognising them in the different employment contracts.
- Determines the protective action of the Social Security system in the face of the different contingencies covered, identifying the different types of benefits.

“Legislación aeronáutica” (Aeronautical Legislation).

The title holder:

- Characterises the international and European normative framework, interpreting the established regulations.
- Selects the instructions that regulate the operation and organisation of the different areas that affect aircraft maintenance, analysing the European regulations.
- Selects the instructions that regulate the operation and organisation of commercial air transport activities, analysing the European regulations.
- Defines the regulatory procedures to be followed by an aircraft design and manufacturing organisation, describing the instructions of the regulations that affect it.
- Defines types of reports and controls that are carried out in the aircraft maintenance environment, by selecting those parts of the regulations that are relevant to it.

“Aerodinámica, estructuras, sistemas de mandos de vuelo, potencia hidráulica, tren de aterrizaje y célula de aeronaves” (Aerodynamics, Structures, Flight Control Systems, Hydraulic Power, Landing Gear and Airframe).

The title holder:

- Characterises the aerodynamic operation of aircraft, interpreting the physical laws that govern the principles of flight and the functionality of their construction elements.
- Characterises the structural distribution of aircraft, interpreting the functionality of their construction elements.
- Characterises the operation of the components and elements that make up aircraft flight controls, interpreting the functionality of the system and describing its constituent elements.
- Maintains structural systems and control cables in airframes, interpreting standardised working procedures.
- Characterises the operation of an aircraft landing gear system, describing the function of each of its constituent elements.
- Maintains aircraft landing gear systems, interpreting the procedures set out in specific manuals and the application of standards.
- Characterises aircraft hydraulic power generation systems, analysing their operation and applications.
- Maintains hydraulic power generation systems in accordance with the standards and procedures established in the specific manuals.

“Aerodinámica, estructuras y sistemas neumáticos, combustible, de oxígeno, aguas y protección de aeronaves” (Pneumatic Aerodynamics, Structures and Systems, Fuel, Oxygen, Water and Aircraft Protection).

The title holder:

- Maintains aircraft fuel systems in accordance with the standards and procedures established in the specific manuals.
- Describes aircraft pressurisation and air conditioning systems, specifying the function of their basic components.
- Maintains aircraft pressurisation and air conditioning systems in accordance with the rules and procedures set out in the specific manuals.
- Maintains pneumatic and vacuum systems in accordance with the standards and procedures established in the specific manuals.
- Characterises aircraft oxygen systems, analysing their components and the precautions to be taken.
- Characterises fire extinguishing and warning systems, and flame, smoke and over-temperature detection systems, carrying out testing and verification operations.
- Carries out maintenance operations on ice and rain protection systems, selecting the procedures established in the technical documentation.
- Characterises water supply, distribution, storage, maintenance and drainage systems in aircraft, describing their constituent elements and operation.
- Performs maintenance and repair operations on aircraft equipment and accessories, applying the procedures established in the manuals.

“Aerodinámica, estructuras y sistemas de instrumentación, generación eléctrica, luces y mantenimiento a bordo de aeronaves” (Instrumentation Aerodynamics, Structures and Systems, Power Generation, Lighting and Aircraft Maintenance).

The title holder:

- Characterises air, gyro and magnetic data instrumentation systems in aircraft cockpits, interpreting their functionality and constituent elements.
- Characterises engine data, fuel and electronic warning and alert systems in aircraft cockpits, interpreting their functionality and constituent elements.
- Maintains analogue and digital instrumentation systems and the extraction and insertion of LRUs, interpreting established maintenance and safety procedures.
- Characterises the operation of the components and elements that make up aircraft's electrical systems,

interpreting the different generation, regulation, distribution, inversion, transformation, rectification and protection parts that are present in aircraft.

- Characterises the different types of lights in aircraft, interpreting their operation, need and layout in them.
- Maintains electrical and lighting systems in aircraft, interpreting standardised working procedures.
- Characterises and maintains the integrated modular avionics (I.M.A.) simulator system, interpreting the overall network system, the network components, and the functions of the modules that can be connected.
- Characterises the maintenance systems on board aircraft, interpreting their operation, need and applications.
- Maintains aircraft equipment and accessories, interpreting the functionality of the constituent elements in accordance with maintenance manuals.

“Aerodinámica, estructuras y sistemas de comunicación, cabina de pasaje e información de aeronaves” (Aircraft Aerodynamics, Structures and Communication Systems, Passenger Cabin and Information).

The title holder:

- Defines the fundamentals of radio wave propagation, relating the operation of antennas and transmission lines to the communication between a receiver and a transmitter.
- Characterises the fundamentals of voice transmission communication systems installed in aircraft, describing their characteristics and operation.
- Defines aircraft audio communications, location and voice recording systems, analysing their characteristics and operation.
- Performs maintenance operations with communications test equipment, applying the protocols established in the manuals.
- Characterises passenger cabin entertainment and communication units and components, analysing their operation.
- Performs maintenance operations with cabin system test equipment, applying the protocols established in the manuals.
- Characterises the air traffic and information management system, interpreting its characteristics, architecture and performance.
- Performs maintenance operations and repairs breakdowns in the information system, applying the protocols established in the manuals.
- Handles aeronautical documentation relating to the maintenance of communications, cabin and information systems, interpreting their use and applications.

“Aerodinámica, estructuras y sistemas de comunicación, cabina de pasaje e información de aeronaves” (Aircraft Aerodynamics, Navigation and Automatic Flight Structures and Systems).

The title holder:

- Characterises the principles of dependent and hyperbolic navigation systems in aircraft, interpreting their constituent elements and functionality.
- Characterises the principles of autonomous, telemetric and support systems in aircraft, interpreting their constituent elements and functionality.
- Performs maintenance operations with navigation test equipment, applying the protocols established in the manuals.
- Characterises the functionality of basic automatic flight systems, analysing the foundations and theoretical principles on which they are based.
- Characterises automatic flight management systems (FMS-AFS) in current automatic flight systems, describing their fundamentals and characteristics.
- Characterises automatic flight management systems (FMS-AFS) in current automatic flight systems, describing their fundamentals and characteristics.
- Performs maintenance operations on automatic flight systems, applying the protocols established in the manuals.
- Handles aeronautical documentation relating to the maintenance of navigation and automatic flight systems, interpreting their use and applications.

“Propulsión” (Propulsion).

The title holder:

- Characterises the structural layout and operation of turbine engines used in aircraft, describing the physical laws on which they are based and the functionality of their constituent elements.
- Characterises the Full Authority Digital Engine Control (FADEC) electronic fuel control system of turbine engines, identifying their elements and describing their function in the system.
- Identifies faults and proposes solutions in the electronic fuel control systems of aircraft turbine engines, relating the technical documentation to the operation of the system.
- Characterises engine indication instruments, describing their constituent elements and operation.
- Characterises turbine engine indication systems, describing their constituent elements and operation.
- Identifies faults and proposes solutions in the turbine engine indication systems of aircraft, relating the technical documentation to the operation of the system.
- Performs verification and maintenance operations on engine start-up and ignition systems, interpreting the procedures established in the specific manuals.

“Proyecto de mantenimiento de sistemas eléctricos, electrónicos y aviónicos en aeronaves” (Maintenance Project for Electrical, Electronic and Avionics Systems in Aircraft).

The title holder:

- Identifies needs in the productive sector, relating them to standard projects that can satisfy them.
- Designs projects related to the skills expressed in the diploma, including and developing its component phases.
- Plans the implementation or execution of the project, determining the intervention plan and associated documentation.
- Defines the procedures used to monitor and control the execution of the project, justifying the selection of variables and instruments used.

“Empresa e iniciativa emprendedora” (Company and Entrepreneurial Initiative).

The title holder:

- Recognises skills associated with entrepreneurship, analysing requirements derived from jobs and business activities.
- Defines the opportunity to create a small company, assessing its impact on the environment and incorporating ethical values.
- Carries out activities for the incorporation and start-up of a company, selecting the legal form and identifying the associated legal obligations.
- Carries out administrative and financial management activities for an SME, identifying the main accounting and tax obligations and filling in documentation.

“Formación en centros de trabajo” (Workplace Training).

The title holder:

- Identifies the structure and organisation of the company, relating them to the type of service it provides.
- Applies ethical and labour habits in the development of his or her professional activity, in accordance with the characteristics of the job and the procedures established in the company.
- Classifies documentation relating to the aircraft and its components, taking into account their traceability and ensuring that the selected documentation is the latest revision or edition thereof.
- Performs operations related to programmed revisions in electrical power systems, instrumentation and lights, applying procedures established in the maintenance manuals.
- Performs operations related to programmed revisions in communications and information systems, applying procedures established in the maintenance manuals.
- Performs operations related to programmed revisions in navigation and automatic pilot systems, applying procedures established in the maintenance manuals.
- Performs operations related to avionics systems breakdown analysis, applying self-checking processes in accordance with the procedures established in the maintenance manuals.
- Disassembles, assembles and adjusts avionics equipment and components, applying the procedures established in the manufacturer's maintenance manuals.

RANGE OF OCCUPATIONS ACCESSIBLE TO THE HOLDER OF THE CERTIFICATE

The Holder of a Diploma of Higher Education in the Maintenance of Electronic and Avionics Systems in Aircraft mainly works in the aircraft maintenance departments of the different airlines or companies dedicated to both passenger and freight transport or to other activities, performing line inspections and line and hangar/workshop maintenance operations.

The following are the most relevant occupations and jobs:

- Avionics systems maintenance technician.
- Electronic and avionics systems maintenance technician in a hangar or workshop.
- Electrical and electronic equipment technician and fitter.
- Line mechanic.
- Mechanical and electrical systems maintenance technician for flight simulators.
- Element and component manufacturing and assembly technician.

OFFICIAL BASIS OF THE CERTIFICATE

Name and status of the body awarding the certificate: The Ministerio de Educación (the Ministry of Education) or the Autonomous Communities in the area of their own administrative responsibility. The degree has academic and professional effects that are valid throughout the entire State.

Official duration of the Diploma: 2,540 hours.

Level of the certificate (national or international)

- NATIONAL: Non-university higher education.
- INTERNATIONAL:
 - Level 5b of the International Standard Classification of Education (ISCED 5b).
 - Level 5 of the European Qualifications Framework (EQF 5).

Entry requirements: A Bachelor's Degree or a Certificate of having passed the corresponding access test.

Access to the next level of education or training: The holder will be able to access any university degree course.

Legal basis. Rules and regulations on which the Diploma is based:

Minimum teaching requirements established by the State: Royal Decree 1448/2018, of 14 December, which establishes the diploma of Higher Education in in the Maintenance of Electronic and Avionics Systems in Aircraft, and which lays down the corresponding minimum education requirements.

Explanatory note: This document is intended as supplementary information to the Diploma in question, but on its own it does not have any legal validity.

COURSE STRUCTURE OF THE OFFICIALLY RECOGNISED DIPLOMA

| PROFESSIONAL MODULES OF THE DIPLOMA ESTABLISHED IN THE ROYAL DECREE | ECTS CREDITS |
|---|---------------|
| Fundamentals of Electricity. | 6 |
| Fundamentals of Electronics in Avionics. | 5 |
| Digital Techniques and Electronic Instrument Systems in Avionics. | 9 |
| Materials, Equipment and Tools in Avionics. | 6 |
| Avionics Maintenance Practices. | 9 |
| Basic Aerodynamics. | 3 |
| Human Factors. | 5 |
| Aeronautical Legislation. | 3 |
| Aerodynamics, Structures, Flight Control Systems, Hydraulic Power, Landing Gear and Airframe. | 5 |
| Pneumatic Aerodynamics, Structures and Systems, Fuel, Oxygen, Water and Aircraft Protection. | 6 |
| Instrumentation Aerodynamics, Structures and Systems, Power Generation, Lighting and Aircraft Maintenance. | 9 |
| Aircraft Aerodynamics, Structures and Communication Systems, Passenger Cabin and Information. | 9 |
| Aircraft Aerodynamics, Navigation and Automatic Flight Structures and Systems. | 9 |
| Propulsion. | 5 |
| Maintenance Project for Electrical, Electronic and Avionics Systems in Aircraft. | 5 |
| Company and Entrepreneurial Initiative. | 4 |
| Workplace Training | 22 |
| | TOTAL CREDITS |
| | 120 |
| OFFICIAL DURATION OF THE DIPLOMA (HOURS) | 2,540 |

* 55% of the minimum education requirements of the diploma reflected in the above table is of an official nature and is valid throughout the national territory. The remaining 45% is specific to each Autonomous Community and may be reflected in **Annex I** to this supplement.

INFORMATION ABOUT THE EDUCATION SYSTEM

