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EUROPASS SUPPLEMENT TO THE DIPLOMA

TITLE OF THE CERTIFICATE (original language: ES)

Técnico Superior en mantenimiento aeromecánico de aviones con motor de turbina

TRANSLATED TITLE OF THE CERTIFICATE (English)

Diploma of Higher Education in the Aeromechanical Maintenance of Turbine Engine Aircraft

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PROFILE OF SKILLS AND COMPETENCES

The holder has acquired general skills relating to carrying out programmed and corrective maintenance of engines, airframe and mechanical, hydraulic, pneumatic and electrical systems of turbine engine aircraft, both on a line and in the hangar and workshop. He or she also participates 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 Aeromechanics).

The title holder:

- Measures basic parameters of different types of semiconductor diodes and thyristors, analysing their operation and application in circuits.
- Characterises the principles and use 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.
- Determines 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 operating principles of their component elements.

"Técnicas digitales y sistemas de instrumentos electrónicos en aviónica" (Digital Techniques and Electronic Instrument Systems in Aeromechanics).

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.
- Defines the constituent elements and operation of microprocessors, analysing the various data storage and transmission systems.
- 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.
– Materials, Equipment and Tools in Aeromechanics.
– Equivalence in credits

"Materiales, equipos y herramientas en aviónica" (Materials, Equipment and Tools in Aeronautics).

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.
– Repairs composite structures, interpreting the working procedures and applying the associated techniques.
– Repairs wooden structures and textile coverings, interpreting the working procedures and applying the associated techniques.
– Identifies defects produced by corrosion in aircraft structures, analysing the underlying causes and their correction processes.
– Characterises fastening devices used in aircraft, defining their characteristics, applications and specifications.
– Characterises the rigid pipes and flexible hoses used in aircraft, defining their characteristics, applications 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 con elementos mecánicos de la aeronave" (Maintenance Practices with Aircraft Mechanical Elements).

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.
– Applies tolerance adjustment and control methods, selecting types according to their use.
– Performs machining, assembly and maintenance operations on flexible pipes and tubes, selecting the procedures and working methods.
– Assembles and maintains springs and bearings, performing the operations required in each case.
– Performs inspection and maintenance operations on transmissions and cables, applying the established procedures.
– Joins elements by means of rivets or adhesives and performs machining operations on metallic and non-metallic composite materials, interpreting the working procedures.
– Performs disassembly, inspection, repair and assembly operations, selecting the appropriate techniques.

"Prácticas de mantenimiento con elementos mecánicos de la aeronave" (Maintenance Practices with Aircraft Avionics Elements and Services).

The title holder:

– Applies aircraft maintenance procedures, following quality criteria.
– Connects and splices electrical cables, using the appropriate tools and methods.
– Checks aircraft systems, using appropriate avionics testing equipment.
– Performs autogenous, hard and soft welding, selecting the procedures and using the appropriate tools.
– Calculates the mass and centring of aircraft, applying the procedures specified in the relevant documents.
– Performs aircraft stewardship and hangar tasks, following established procedures.
– Characterises the inspection processes of abnormal events, determining the consequences they may have on the navigability of an aircraft.

"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 y sistemas eléctricos y de aviónica de aviones con motor de turbina" (Aerodynamics, Electrical and Avionics Systems of Turbine Engines).

The title holder:

- Characterises analogue and digital cockpit instrumentation systems, interpreting their operation, types and layout on gas turbine engine aircraft, replacing them where necessary.
- Characterises avionics, autopilot, communications and navigation systems, interpreting their operation and layout on gas turbine engine aircraft, replacing elements when necessary.
- Characterises the electrical system of aircraft, interpreting the operation of the different parts, including the generation, regulation, distribution, inversion, transformation, rectification and protection involved in turbine engine aircraft.
- Characterises the different types of lights in aircraft, interpreting their operation, need and layout in turbine engine aircraft.
- Maintains electrical and lighting systems in turbine engine aircraft, interpreting standardised working procedures.
- Characterises the integrated modular avionics (I.M.A.) 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.
- Defines the units and components that provide entertainment and allow passengers to communicate inside the aircraft, describing their characteristics.
- Characterises the air traffic and information management system, defining its characteristics, architecture and performance.

"Aerodinámica, estructuras y sistemas de mandos de vuelo de aviones con motor de turbina" (Aerodynamics, Structures and Flight Control Systems of Turbine Engine Aircraft).

The title holder:

- Defines the operation of flight control systems and their aerodynamic effects on aircraft, analysing their constituent elements and associated operating systems.
- Defines the effects produced on the aerodynamic forces generated in the aircraft and their associated coefficients in high-speed flight, analysing air compressibility as a function of the flight Mach number.
- Identifies the constituent elements of the structure of an aircraft as well as the functionality and requirements required from its elements, analysing the airworthiness requirements of the same.
- Justifies aircraft construction processes, relating the required protection and safety measures to the assembly techniques used.
- Performs maintenance operations on an aircraft's structure and flight controls, applying the procedures established in the manuals and technical orders.
- Defines the anchoring and balancing conditions of different elements of the aircraft, describing the manufacturing and assembly techniques used.

"Aerodinámica, estructuras y sistemas hidráulicos, neumáticos y tren de aterrizaje del avión" (Aircraft Aerodynamics, Structures and Hydraulic, Pneumatic and Landing Gear Systems).

The title holder:

- 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 the aircraft's fuel system, describing the operation of its constituent elements.
- Maintains the aircraft's fuel system, applying the standards and procedures established in the specific manuals.
- 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.
- Describes the aircraft's pressurisation and air conditioning systems, specifying the function of their basic components.
- Maintains the aircraft's 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.

"Aerodinámica, estructuras y sistemas de oxígeno, aguas y protección de aviones" (Aircraft Aerodynamics, Structures and Oxygen, Water and Protection Systems).

The title holder:

- 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.
- Characterises security systems related to furniture and accessories, emergency systems, equipment layout, and cargo, describing their constituent elements and operation.
- Performs maintenance and repair operations on aircraft equipment and accessories, applying the procedures established in the manuals.

"Motores de turbinas de gas" (Gas Turbine Engines).

The title holder:

- Characterises the operation of gas turbine engines, relating the variation in their characteristics to their optimum operation.
- Identifies each of the parts that make up a gas turbine engine, relating them to the thermodynamic cycle.
- Characterises the different types of gas turbine engines that exist, including the power increase systems used, relating their performance to the reference thermodynamic cycle.
- Characterises the engine's lubrication and fuel supply control systems, describing the performance of their components.
- Characterises the systems used to supply pressurised air from the jet engine and the Auxiliary Power Unit (APU), and the start-up systems, specifying the performance of these systems.
- Performs verification and maintenance operations on jet engines and their main components, interpreting the procedures established in the specific manuals.
- Performs verification and maintenance operations on the components and accessory systems for the operation and control of the engine, interpreting the procedures established in the specific manuals.
- Carries out actions related to the maintenance and conservation of the engines on the ground, applying the procedures established in the specific manuals.

"Hélices" (Propellers).

The title holder:

- Characterises the constituent elements and operation of aircraft propellers, analysing their components and the functions they perform in the assembly.
- Calculates the aerodynamic forces generated in the propeller, applying the corresponding physical equations.
- Characterises the actions of the control and steering mechanisms of the propellers, relating the functions they perform to the flight requirements established in each case.
- Performs maintenance and installation operations on the propeller, interpreting the procedures used in accordance with the propeller's manufacturing system.
- Characterises the different defrosting systems and the procedures to be followed in the storage and conservation of idle propellers.

"Proyecto de mantenimiento aeromecánico de helicópteros con motor de turbina" (Project on the Aeromechanical Maintenance of Turbine Engine 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 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.
– Handles documentation relating to the maintenance and traceability of components, ensuring that the selected documentation is the latest revision or edition thereof.
– Performs operations related to programmed revisions of turbine engines or their accessories and control elements, applying procedures established in the maintenance manuals.
– Performs operations related to programmed revisions of turbine engine aircraft systems, applying procedures established in the maintenance manuals.
– Identifies faults in turbine engine aircraft, applying the procedure defined for each case.

RANGE OF OCCUPATIONS ACCESSIBLE TO THE HOLDER OF THE CERTIFICATE

The Holder of a Diploma of Higher Education in the Aeromechanical Maintenance of Turbine Engine 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:

- Turbine engine aeromechanical maintenance technician.
- Systems maintenance technician in a hangar or workshop.
- Turbine engine adjustment technician.
- Electrical and electronic equipment technician and fitter.
- Structural maintenance technician in a hangar or workshop.
- Non-destructive testing technician.
- 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 1445/2018, of 14 December, which establishes the diploma of Higher Education in the Aeromechanical Maintenance of Turbine Engine 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 Aeromechanics.	5
Digital Techniques and Electronic Instrument Systems in Aeromechanics.	6
Materials, Equipment and Tools in Aeromechanics.	6
Maintenance Practices with Aircraft Mechanical Elements.	11
Maintenance Practices with Aircraft Avionics Elements and Services.	5
Basic Aerodynamics.	3
Human Factors.	5
Aeronautical Legislation.	3
Aerodynamics, Electrical and Avionics Systems of Turbine Engines.	5
Aerodynamics, Electrical and Avionics Systems of Turbine Engines.	7
Aircraft Aerodynamics, Structures and Hydraulic, Pneumatic and Landing Gear Systems.	8
Aircraft Aerodynamics, Structures and Oxygen, Water and Protection Systems.	5
Gas Turbine Engines.	11
Propellers.	3
Project on the Aeromechanical Maintenance of Turbine Engine 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.

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INFORMATION ABOUT THE EDUCATION SYSTEM