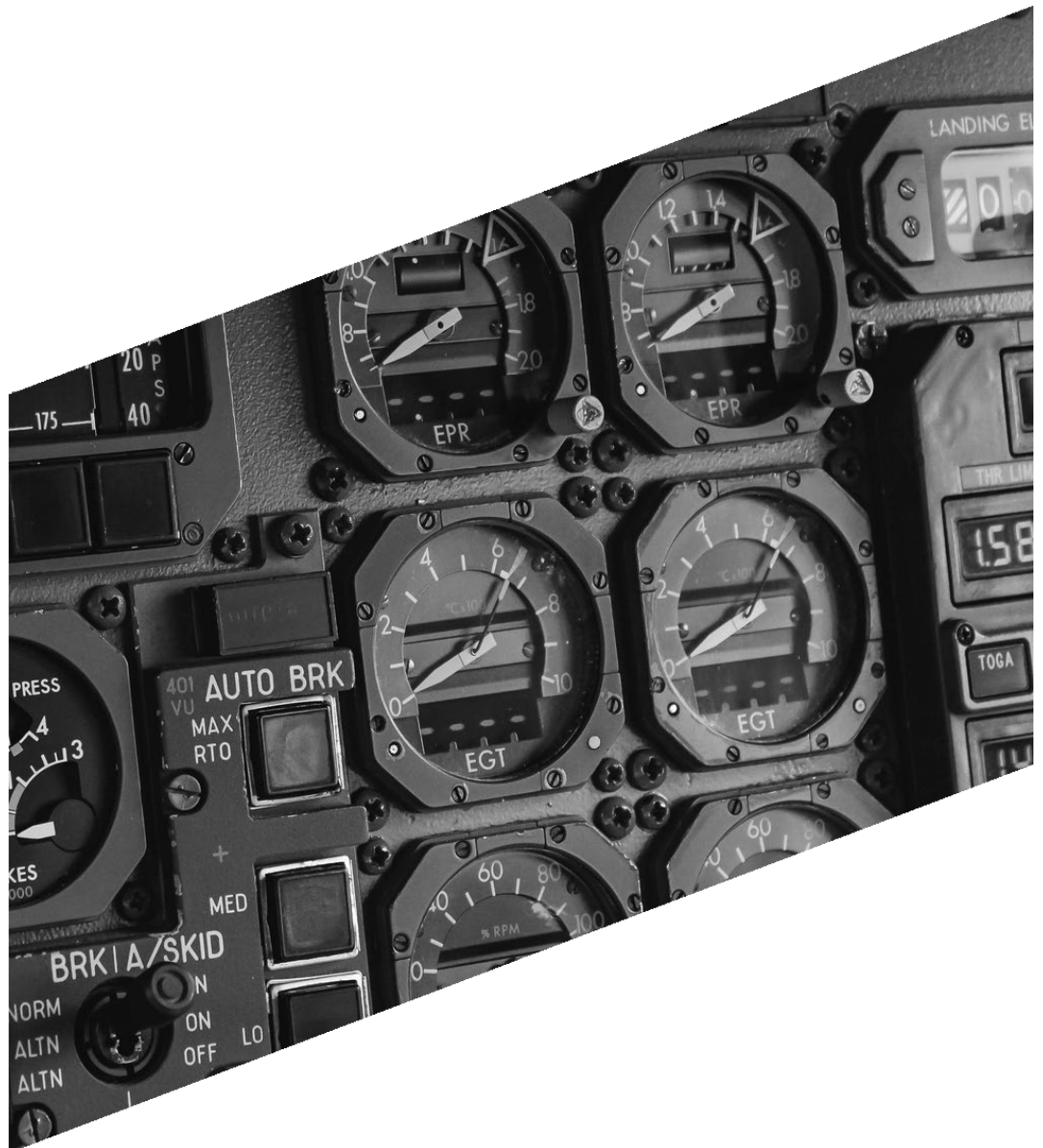


PROJECT RESULT NO.4

DEVELOPMENT OF THE FIRST “EUROPEAN AVIATION
AEROSPACE MECHATRONICS PASSPORT - EAAMP”



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Abstract and users' guide to the document

The development of the first “European Aviation Aerospace Mechatronics Passport – EAAMP”, represents the fourth and final result of the AM TECH project¹ – Development of an aviation aerospace mechatronics technician curriculum.

The specific content and outline of Project Result 4 (henceforth, PR4) is informed by the evidences and results compiled by partners throughout the previous cycles of project's implementation: a) the transnational needs assessment for identification of trends and dynamics in the aviation aerospace industry, and related in-demand competences for employability and professional development in the industry; b) the consolidation of a comprehensive, holistic and systemic VET curriculum addressing the education and training areas of interest to access and operate in the job market(s) of advanced air mobility (AAM), unmanned aerial vehicles (UAV) and unmanned aircraft systems (UAS).

Full access to the curriculum (learning areas of interest, Goals, Professional competences to be achieved and outline of education and training content) is available via the official OER (Open Education Resource) platform of the project: <https://www.amtechtraining.eu/training.php>

The content of these document provides for three (3) additional resources:

- ESCO-compliant profiling of the AM TECH curriculum – extrapolation and benchmarking from the ESCO platform of competences that complements the proposed curriculum and provide for specific descriptors of the associated skills and knowledge. The linkages will allow for greater transparency and transferability of the curriculum in the EU labour market, while setting a common “dictionary” of reference for the qualification at transnational level of this professional profile.
- EURES-based narrative definition of the new profile and occupation – consolidating the interoperability of the AM TECH' specialist and its description within the EURES system. The intervention of the project on the EURES dimension allows employers to crystalize the specific terminology bridging the dynamics of supply and demand, and ease the engagement of talents
- EUROPASS-standardised description of the AM TECH' specialist – valorisation and promotion of the AM TECH-inspired professional profile in a standard CV format for job-seeking and employability.

Altogether, these three separate deliverables contribute to ease the into-action operationalisation of the AM TECH' profile, and most importantly, the effectiveness and efficiency of matching dynamics between supply and demand within the relevant job market(s).

¹ An initiative co-founded by the Erasmus+ Programme of the European Commission that saw the involvement of seven (7) different organisations from six (6) Members States. To know more about the background of the project, please visit: www.amtechtraining.eu



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ESCO-compliant profiling of the AM TECH curriculum

ESCO is the multilingual classification of European Skills, Competences, and Occupations and as of right now represents the most comprehensive effort to classify, identify and categorise skills, competences and occupation that are relevant for the EU labour market and education & training pathways aimed at supporting the employability and professional development (i.e., competence building) of citizens and workers.

ESCO is further breakdown into three big branches (formally known and defined by the platform as Pillars):

- **OCCUPATIONS**, a total of 3008 occupations is mapped by the platform. For each there is available a concise and comprehensive description and the list of knowledge, skills and competences considered relevant for its full profiling
- **SKILLS**, a total of 13890 skills is mapped by the platform. The skills pillar is further sub-divided into:
 - Knowledge
 - Language skills and knowledge
 - Skills
 - Transversal skills
- **QUALIFICATIONS**, recognised as formal outcome of assessment and validation process of certain competences, knowledge and skills that contribute to the learning pathway of a person. Training and education courses from all over Member States² are available from the EUROPASS Platform

In the next few following pages, partners share the results of a very detailed analysis that saw them involved in the filtering process of all ESCO' Pillars and related sub-layers with the aim to intercept and identify the most relevant occupation and skills to the profiling of the ESCO-compliant AM TECH Curriculum.

The analysis has been carried out following a two-stage approach:

- (a) Stage 1, identification from the second pillar of ESCO of occupation – and related task – that more than others seemed to align with the envisioned scale and scope (i.e., training areas of interest and expected learning outcomes) of the AM TECH curriculum
- (b) Stage 2, further filtering of the occupation previously identified and selected based on field-specific occupations distinguished each other's per: Essential Skills and Competences; Essential Knowledge; Optional Skills and Competences; Optional Knowledge

The consolidation of Stage 2 allowed project's partners to narrow down as much as possible the desired outline of the AM TECH curriculum to occupational profiles already available.

² Austria, Belgium, Czechia, Estonia, France, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Serbia, Slovenia, Sweden, Turkey

STAGE 1 – Benchmarking the AM TECH curriculum with ESCO Occupations’ Pillar

As already mentioned, the Occupation’s Pillar collects a total of 3008 occupations. These occupations are distributed among 10 macro-categories: the following list provides for readers detailed indications for those occupations extrapolated from the second pillar that, more than others, seem suiting the range of the learning objectives (i.e., teaching areas of interest) addressed by the AM TECH curriculum. A list of tasks “traditionally” associated to that occupation is provided accordingly³.

- 2. Professionals
 - 21 Science and Engineering Professionals
 - 214 Engineering Professionals (excluding Electrotechnology)
 - **2144 Mechanical Engineers.** Mechanical engineers conduct research; advise on, design, and direct production of machines, aircraft, ships, machinery and industrial plant, equipment and systems; advise on and direct their functioning, maintenance and repair; or study and advise on mechanical aspects of particular materials, products or processes. Tasks include:
 - advising on and designing machinery and tools for manufacturing, mining, construction, agricultural, and other industrial purposes;
 - advising on and designing steam, internal combustion and other non-electric motors and engines used for propulsion of railway locomotives, road vehicles or aircraft, or for driving industrial or other machinery;
 - advising on and designing: hulls, superstructures and propulsion systems of ships; mechanical plant and equipment for the release, control and utilization of energy; heating, ventilation and refrigeration systems, steering gear, pumps, and other mechanical equipment;
 - advising on and designing airframes, undercarriages and other equipment for aircraft as well as suspension systems, brakes, vehicle bodies and other components of road vehicles;
 - advising on and designing non-electrical parts of apparatus or products such as word processors, computers, precision instruments, cameras and projectors;
 - establishing control standards and procedures to ensure efficient functioning and safety of machines, machinery, tools, motors, engines, industrial plant, equipment or systems;
 - ensuring that equipment, operation and maintenance comply with design specifications and safety standards
 - 25 Information and Communications Technology Professionals
 - 251 Software and Applications Developers and Analysts
 - **2512 Software Developers.** Software developers research, analyse and evaluate requirements for existing or new software applications and operating systems, and design, develop, test and maintain software solutions to meet these requirements. Tasks include:
 - researching, analysing and evaluating requirements for software applications and operating systems;
 - researching, designing and developing computer software systems;
 - consulting with engineering staff to evaluate interfaces between hardware and software;
 - developing and directing software testing and validation procedures;
 - modifying existing software to correct errors, to adapt it to new hardware or to upgrade interfaces and improve performance;
 - directing software programming and development of documentation;
 - assessing, developing, upgrading and documenting maintenance procedures for operating systems, communications environments and applications software;
 - consulting with customers concerning maintenance of software systems.
 - **2514 Applications Programmers.** Applications programmers write and maintain programmable code outlined in technical instructions and specifications for software applications and operating systems. Tasks include:
 - writing and maintaining program code outlined in instructions and specifications in accordance with quality accredited standards;

³ Worthy of mentioning is also the fact that many of the occupations linked to **7232 Aircraft engine mechanisms and repairers** might potentially fit into this framework of analysis. However, after in-depth inspection, partners realised that, for the very most, these professions are too closely related to traditional engine-propelled aircrafts.

- revising, repairing or expanding existing programs to increase operating efficiency or adapt to new requirements;
 - conducting trial runs of programs and software applications to confirm that they will produce the desired information;
 - compiling and writing documentation of program development;
 - identifying and communicating technical problems, processes and solutions.
- 3. Technician and Associated Professionals
 - 31 Science and Engineering Associate Professionals
 - 311 Physical and Engineering Science Technicians
 - **3113 Electrical Engineering Technicians.** Electrical engineering technicians perform technical tasks to aid in electrical engineering research and in the design, manufacture, assembly, construction, operation, maintenance and repair of electrical equipment, facilities and distribution systems. Tasks include:
 - providing technical assistance in research on and development of electrical equipment and facilities, or testing prototypes;
 - designing and preparing blueprints of electrical installations and circuitry according to the specifications given;
 - preparing detailed estimates of quantities and costs of materials and labour required for manufacture and installation, according to the specifications given;
 - monitoring technical aspects of the manufacture, installation, utilization, maintenance and repair of electrical systems and equipment to ensure satisfactory performance and compliance with specifications and regulations;
 - planning installation methods, checking completed installations for safety and controls or undertaking the initial running of the new electrical equipment or systems;
 - assembling, installing, testing, calibrating, modifying and repairing electrical equipment and installations to conform with regulations and safety requirements.
 - **3114 Electronics Engineering Technicians.** Electronics engineering technicians perform technical tasks to aid in electronic research and in the design, manufacture, assembly, construction, operation, maintenance and repair of electronic equipment. Tasks include:
 - providing technical assistance in research and development of electronic equipment, or testing prototypes;
 - designing and preparing blueprints of electronic circuitry according to the specifications given;
 - preparing detailed estimates of quantities and costs of materials and labour required for the manufacture and installation of electronic equipment, according to the specifications given;
 - monitoring technical aspects of the manufacture, utilization, maintenance and repair of electronic equipment to ensure satisfactory performance and ensure compliance with specifications and regulations;
 - assisting in the design, development, installation, operation and maintenance of electronic systems;
 - planning installation methods, checking completed installations for safety and controls or undertaking the initial running of the new electronic equipment or system;
 - conducting tests of electronic systems, collecting and analysing data, and assembling circuitry in support of electronics engineers.
 - **3115 Mechanical Engineering Technicians.** Mechanical engineering technicians perform technical tasks to aid in mechanical engineering research and in the design, manufacture, assembly, construction, operation, maintenance and repair of machines, components and mechanical equipment. Tasks include:
 - providing technical assistance in research on and development of machines and mechanical installations, facilities and components, or testing prototypes;
 - designing and preparing layouts of machines and mechanical installations, facilities and components, according to the specifications given;
 - preparing detailed estimates of quantities and costs of materials and labour required for manufacture and installation, according to the specifications given;
 - monitoring technical aspects of manufacture, utilization, maintenance and repair of machines and mechanical installations, facilities and components to ensure satisfactory performance and compliance with specifications and regulations;
 - developing and monitoring the implementation of safety standards and procedures for marine survey work in relation to ships' hulls, equipment and cargoes;
 - assembling and installing new and modified mechanical assemblies, components, machine tools and controls, and hydraulic power systems;
 - conducting tests of mechanical systems, collecting and analysing data, and assembling and installing mechanical assemblies in support of mechanical engineers;
 - ensuring that mechanical engineering designs and finished work are within specifications, regulations and contract provisions.
 - 315 Ship and Aircraft Controllers and Technicians
 - **3153 Aircraft Pilots and Related Associate Professionals.** Aircraft pilots and related associate professionals control the operation of mechanical, electrical and electronic equipment, in order to navigate aircraft for transporting passengers, mail and freight and perform related pre-flight and in-flight tasks. Tasks include:
 - flying and navigating aircraft in accordance with established control and operating procedures;
 - preparing and submitting flight plans or examining standard flight plans;
 - controlling the operation of mechanical, electrical and electronic equipment and ensuring that all instruments and controls work properly;
 - applying knowledge of principles and practices of flying in order to identify and solve problems arising in the course of their work;



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- examining maintenance records and conducting inspections to ensure that aircraft are mechanically sound, maintenance has been performed and that all equipment is operational;
 - signing necessary certificates and maintaining official records of flight;
 - obtaining briefings and clearances before flights and maintaining contact with air traffic or flight control during flight.
- **3154 Air Traffic Controllers.** Air traffic controllers direct aircraft movements in airspace and on the ground, using radio, radar and lighting systems, and provide information relevant to the operation of aircraft. Tasks include:
 - directing and controlling aircraft approaching and leaving airport and their movement on the ground;
 - directing and controlling aircraft operating in designated airspace sectors;
 - examining and approving flight plans;
 - informing flight crew and operations staff about weather conditions, operational facilities, flight plans and air traffic;
 - applying knowledge of principles and practices of air traffic control in order to identify and solve problems arising in the course of their work;
 - initiating and organizing emergency, search and rescue services and procedures;
 - directing activities of all aircraft and service vehicles on or near airport runways;
 - maintaining radio and telephone contact with adjacent control towers, terminal control units and other control centres, and coordinating the movement of aircraft into adjoining areas.
- **3155 Air Traffic Safety Electronics Technicians.** Air traffic safety electronics technicians perform technical tasks concerning the design, installation, management, operation, maintenance and repair of air traffic control and air navigation systems. Tasks include:
 - carrying out technical duties related to the development of electronic and computerized air navigation systems and equipment, and testing prototypes;
 - providing technical help in the design and layout of specific interface circuitry of air navigation and aircraft detection tracking systems;
 - preparing and contributing to the preparation of cost estimates and technical and training specifications for air traffic control and safety equipment;
 - providing or assisting with the technical supervision of construction, installation and operation of ground-based air navigation equipment and its maintenance and repair to ensure that standards and specifications are met;
 - applying the knowledge and skills of air traffic safety engineering principles and practices in order to identify and solve problems arising in the course of their work;
 - developing, modifying and debugging system software;
 - modifying existing ground-based air navigation systems and equipment to adapt them to new air traffic control procedures, in order to improve capability, reliability and integrity, or to facilitate air traffic control procedures and airspace designation;
 - controlling, monitoring and certifying communication navigation and surveillance air traffic management equipment, and calibrating the ground-based air navigation system to ensure maximum accuracy and safety of flight, take-off and landing operations;
 - providing technical training and supervising other workers.

STAGE 2 – Linkages with occupation-specific skills, knowledge and competences⁴

2114 Mechanical Engineer; 2144.1 Mechanical Engineer; 2144.1.1 Aerospace Engineer

Aerospace engineers develop, test and oversee the manufacture of flight vehicles such as aircrafts, missiles, and spacecrafts. The field of engineering they are active in, can be divided into two branches: aeronautical engineering and astronautical engineering.

| ESSENTIAL SKILL & COMPETENCES | ESSENTIAL KNOWLEDGE | OPTIONAL SKILLS & COMPETENCES | OPTIONAL KNOWLEDGE |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| adjust engineering designs approve engineering design assess financial viability ensure aircraft compliance with regulation execute feasibility study perform scientific research troubleshoot use technical drawing software | aerospace engineering aircraft mechanics engineering principles engineering processes industrial engineering manufacturing processes production processes quality standards technical drawings | analyse production processes for improvement apply advanced manufacturing build a product's physical model conduct performance tests control production create a product's virtual model design prototypes develop test procedures draft design specifications manage product testing oversee assembly operations plan test flights record test data use CAD software use CAM software | CAE software aerodynamics design principles fluid mechanics guidance, navigation and control material mechanics materials science mechanical engineering stealth technology synthetic natural environment unmanned air systems |

⁴ Each element of the table has an hyperlink activated landing readers to the official ESCO classification of the given Skills, Knowledge, and Competence



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2114 Mechanical Engineer; 2144.1 Mechanical Engineer; 2144.1.11 Mechatronics Engineer

Mechatronics engineers design and develop intelligent systems, such as robotic devices, smart home appliances, and aeroplanes, through combining technologies from mechanical, electronic, computer, and control engineering. They create blueprints or design documents for parts, assemblies or finished products using software programs, and also oversee and manage projects.

| ESSENTIAL SKILL & COMPETENCES | ESSENTIAL KNOWLEDGE | OPTIONAL SKILLS & COMPETENCES | OPTIONAL KNOWLEDGE |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> adjust engineering designs analyse test data approve engineering design conduct literature research conduct quality control analysis define technical requirements demonstrate disciplinary expertise design automation components design prototypes develop electronic test procedures develop mechatronic test procedures follow standards for machinery safety gather technical information interact professionally in research and professional environments manage professional development manage research data monitor manufacturing quality standards operate open source software perform data analysis perform project management prepare production prototypes report analysis results simulate mechatronic design concepts synthesise information test mechatronic units think abstractly use technical drawing software | <ul style="list-style-type: none"> automation technology computer engineering control engineering design drawings electrical engineering electronics engineering principles engineering processes mathematics mechanical engineering mechanics mechatronics physics robotics technical drawings | <ul style="list-style-type: none"> apply blended learning apply for research funding apply technical communication skills assemble mechatronic units calibrate mechatronic instruments communicate with a non-scientific public communicate with customers conduct research across disciplines coordinate engineering teams create technical plans define manufacturing quality criteria design firmware develop product design develop network with academia and business draft bill of materials evaluate research activities examine engineering principles install automation components install mechatronic equipment keep up with digital transformation of industry maintain control systems maintain safe engineering watches manage findable accessible interoperable and reusable data manage intellectual property rights manage open publications mentor individuals monitor automated machines perform resource planning perform scientific & academic research perform test run prepare assembly drawings | <ul style="list-style-type: none"> CAE software cybernetics electromechanics firmware hydraulics microelectromechanical systems micromechatronic engineering model based system engineering optoelectronics pneumatics quality standards safety engineering telecommunications engineering promote open innovation in research promote the participation of citizens in scientific and research activities promote the transfer of knowledge provide technical documentation publish academic research replace machines set up automotive robot speak different languages teach in academic or vocational contexts train employees use CAD software use CAM software write routine reports write scientific publications |



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| | | | |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| | | <ul style="list-style-type: none"><u>provide technical documentation</u><u>replace machines</u><u>set up automotive robot</u><u>speak different languages</u><u>teach in academic or vocational contexts</u><u>train employees</u><u>use CAD software</u><u>use CAM software</u> | |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|



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3144 Electronics Engineering Technicians, 3114.1 Electronics Engineering Technicians; 3114.1.1 Avionics Inspector

Avionics inspectors inspect instruments, electrical, mechanical and electronic systems of aircrafts to ensure their compliance with performance and safety standards. They also examine maintenance, repair and overhaul work and review any modification to check its conformity to standards and procedures. They provide detailed inspection, certification and repair records.

| ESSENTIAL SKILL & COMPETENCES | ESSENTIAL KNOWLEDGE | OPTIONAL SKILLS & COMPETENCES | OPTIONAL KNOWLEDGE |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| <u>conduct performance tests</u> <u>create solutions to problems</u> <u>inspect quality of products</u> <u>interpret electrical diagrams</u> <u>manage health and safety standards</u> <u>operate electronic measuring instruments</u> <u>read engineering drawings</u> <u>read standard blueprints</u> <u>test electronic units</u> <u>use technical documentation</u> <u>use testing equipment</u> <u>write inspection reports</u> | <u>aircraft flight control systems</u> <u>aircraft mechanics</u> <u>common aviation safety regulations</u> <u>electrical engineering</u> <u>electricity</u> <u>electromechanics</u> <u>electronics</u> <u>engineering processes</u> <u>mechanics</u> <u>quality assurance procedures</u> | <u>act as contact person during equipment incident</u> <u>calibrate electronic instruments</u> <u>inspect aircraft for airworthiness</u> <u>issue licences</u> <u>lead inspections</u> <u>liaise with engineers</u> <u>maintain test equipment</u> <u>manage maintenance operations</u> <u>perform test run</u> <u>prepare audit activities</u> <u>send faulty equipment back to assembly line</u> <u>supervise staff</u> <u>supervise work</u> | <u>engineering principles</u> |



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3153 Aircraft pilots and related associate professionals; 3153.1 Aircraft Maintenance Engineer

Aircraft maintenance engineers make preflight and postflight inspections, adjustments, and minor repairs to ensure safe and sound performance of aircrafts. They inspect aircraft prior to take-off to detect malfunctions such as oil leaks, electrical or hydraulic problems. They verify passenger and cargo distribution and amount of fuel to ensure that weight and balance specifications are met.

| ESSENTIAL SKILL & COMPETENCES | ESSENTIAL KNOWLEDGE | OPTIONAL SKILLS & COMPETENCES | OPTIONAL KNOWLEDGE |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <u>apply technical communication skills</u> <u>diagnose defective engines</u> <u>disassemble engines</u> <u>ensure compliance with airport security</u> <u>evaluate engine performance</u> <u>follow manufacturer guidelines in use of airport equipment</u> <u>inspect aircraft for airworthiness</u> <u>install electrical and electronic equipment</u> <u>manage airport development resources</u> <u>manage health and safety standards</u> <u>read engineering drawings</u> <u>read standard blueprints</u> <u>repair engines</u> <u>use power tools</u> <u>use technical documentation</u> <u>use testing equipment</u> <u>wear appropriate protective gear</u> | <ul style="list-style-type: none"> <u>aircraft flight control systems</u> <u>aircraft mechanics</u> <u>airport planning</u> <u>electrical engineering</u> <u>electrical wiring plans</u> <u>electricity</u> <u>electromechanics</u> <u>electronics</u> <u>engine components</u> <u>engineering principles</u> <u>engineering processes</u> <u>mechanical engineering</u> <u>mechanics</u> <u>technical drawings</u> | <ul style="list-style-type: none"> <u>assemble electrical components</u> <u>manage airport workshops</u> <u>operate precision measuring equipment</u> <u>operate soldering equipment</u> <u>test electronic units</u> <u>use computerised maintenance systems</u> | <ul style="list-style-type: none"> <u>electrical systems used in transportation</u> |



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The proposed final outline of the AM TECH benchmark with ESCO competences, skills and knowledge for aviation aerospace looks as follows:

| ESSENTIAL SKILL & COMPETENCES | ESSENTIAL KNOWLEDGE | OPTIONAL SKILLS & COMPETENCES | OPTIONAL KNOWLEDGE |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| adjust engineering designs approve engineering design manage health and safety standards read engineering drawings read standard blueprints test electronic units use technical documentation use testing equipment | aerospace engineering aircraft flight control systems aircraft mechanics electrical engineering electricity electromechanics electronics engineering principles engineering processes industrial engineering manufacturing processes mechanical engineering mechanics production processes quality standards technical drawings | build a product's physical model conduct performance tests control production create a product's virtual model design prototypes develop test procedures draft design specifications manage product testing oversee assembly operations plan test flights record test data use CAD software | CAE software aerodynamics design principles fluid mechanics guidance, navigation and control material mechanics materials science mechanical engineering stealth technology synthetic natural environment unmanned air systems promote the transfer of knowledge provide technical documentation replace machines train employees |

Operationalising ESCO for the profiling of the AM TECH curriculum: final remarks

The in-depth analysis of ESCO allowed partners to complement results from the needs assessment with comprehensive, holistic and EU-based evidences on specific training areas of interest and desired learning outcomes that should tackled and valorised by the AM TECH training and education offer⁵. General **domains of knowledge** are breakdown into four clusters:

1. Engineering:

- Electrical Engineering: understanding of electrical circuits, power systems, and electronic components used in mechatronic systems.
- Computer Engineering: proficiency in programming and software development, especially for control systems and automation.
- Mechanical Engineering: knowledge of mechanical principles, materials, and design to develop and maintain mechanical components in aircraft and aerospace systems.

2. Mechatronic:

- Robotics: familiarity with robotic systems used in aviation and aerospace applications, such as drones or autonomous vehicles.
- Systems Integration: ability to integrate mechanical, electrical, and computer components to create complex mechatronic systems.
- Control Systems: knowledge of control theory and implementation for precision control of aircraft and aerospace systems.

3. Aviation & Aerospace:

- Aircraft systems: Basic understanding of flight manoeuvres and equipment
- Avionics: Knowledge of navigation and communication systems
- Aerodynamics: Understanding principles of airflow and aerodynamics that are important for aircraft design and performance.

4. Technology

- Manufacturing: Knowledge of new additive manufacturing technologies such 3D printing and aerospace' applications.
- AI and Machine learning: Understanding of AI/ML systems and algorithms for data analysis and processing in aviation.

Formal **education programmes** that are most certainly instrumental in developing technical proficiency in the aforementioned domains of knowledge are represented by, but not limited to:

- Diploma – or other Certificate – in Mechatronics Engineering (or related)
- Other Certification from an industry institution
- Bachelor and /or master degree in:
 - Avionics technology
 - Mechanical engineering
 - Aerospace Engineering
 - Electrical (Electronics) Engineering
 - Robotics
 - Mechatronics

Last but not least, it is also relevant to remind the importance of other non-technical (soft) skills that might play a very crucial role in the profession and successful roll-out of tasks that come with it:

⁵ All of the above is instrumental and functional in some degree to proceed further with the consolidation of the other two deliverables of PR'4 passport.



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- Leadership
- Resilience
- Communication across Disciplines
- Creativity
- Interpersonal Skills
- Time Management
- Problem Solving
- Critical Thinking
- Ethics and Professionalism
- Attention to Detail
- Conflict Resolution
- Customer Focus
- Adaptability
- Teamwork

EURES narrative definition of the new profile and occupation

EURES is an EU cooperation network of employment services, designed to facilitate the free movement of workers, and ease for employers the search of suitable candidates matching their job offer parameters. EURES connects and bridges demand and supply side, facilitating the mobility of workers across the EU job market, and the very job-hunting experience of EU citizens⁶.

In the context of this project result specifically, partners provide for users (employers) a concise and ready-to-use job announcement that they can publish on the EURES portal to seek for AMTECH-aligned profiles.

Mock version of the EURES job announcement

JOB TITLE:

Aviation aerospace mechatronic technician for unmanned aerial vehicles (UAV) and unmanned aircraft systems (UAS).

JOB DESCRIPTION:

The ideal candidate is a highly skilled professional with in-depth knowledge in mechanical, electronic and aviation engineering – or related disciplines. The candidate will be in support of the design, development, and maintenance of sophisticated mechatronic systems used in unmanned aerial vehicles (UAV) and unmanned aircraft systems (UAS). Thanks to his/her contribution, the candidate will play a crucial role in supporting the innovation of new and cutting-edge technologies applied in the industry.

RESPONSIBILITIES:

- Design and planning of mechatronic systems for UAV and UAS
- Detailing specification of mechatronic systems in compliance with regulatory and law-bidding standards
- Optimizing of the performance and quality assurance parameters of mechatronic systems for systemic integration of mechanical and electrical components
- Programming of software and coding for human-machine interface and monitoring of functionalities
- Validation and testing of simulation tools for mechatronic systems' efficiency and effectiveness (i.e., compliance with safety standards)
- Troubleshooting of anomaly in standards and benchmark parameters
- Proactive engagement in R&D projects with multistakeholder cohorts (i.e., policy makers, academia, etc.)
- Availability to travel abroad

QUALIFICATION & SKILLS:

- Robust understanding of mechatronics principles and systems, and familiarity with general technical specification of UAV and UAS
- Advanced coding skills in the following programming languages: Python, MATLAB, JAVA, C/C++
- Experience in CAD and CAM tools is preferred
- Excellent analytical thinking and problem-solving attitude
- Strong ability to collaborate effectively in a diverse and multidisciplinary team
- Great attention to details and sophisticated communication skills, both oral and written (
- Knowledge of common Project Management essentials (familiarity with specific approaches as Lean, Waterfall, Kanban is preferred)
- Resilience and capacity to perform in high-pace environment and commit to deadlines
- Understanding and genuine interest on industry dynamics impacting and influencing the course of the UAV and UAS sector, with specific reference to: regulations, competition and market representation, technology development

EDUCATION:

- Bachelor and /or master degree in: Avionics technology, Mechanical engineering, Aerospace Engineering, Electrical (Electronics) Engineering, Robotics, Mechatronic engineering or equivalent

Or

- Diploma, or equivalent certificate, in Mechatronics technique (or related) applied to aviation technologies (UAV, UAS)

PROFESSIONAL BENEFITS FOR YOUR CAREER:

- Proactive involvement in prestigious and cutting-edge industry
- Global network of highly-skilled and experienced professionals from diverse field of knowledge
- Travel opportunities
- Highly competitive salary and performance bonuses
- Diverse and stimulating projects
- Impactful contributions and personal fulfilment
- Possibility to work from remote
- Guaranteed career growth potentials and continuous learning opportunities

The standard template presented above can be of course finetuned and customised based on the specific context of reference, nevertheless it represents a good starting point to launch the recruiting campaign of the next aviation aerospace mechatronics technician.

⁶ More about EURES here: https://eures.ec.europa.eu/index_it



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Its content is structured following the typical and traditional layout of any job announcement. Technical features in the sense of 'Responsibilities' and 'Qualification & Skills' are informed by the content of the curriculum and the cross-matching with ESCO's Pillars.



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EUROPASS standards description of the AM TECH' specialist

EUROPASS is the official EU tool in support of citizens and job-seekers to manage their learning and professional careers. EUROPASS provides for numerous opportunities and resources that citizens can exploit to find their next (or new) job, connect with employers and professional education providers. Most importantly, EUROPASS' users can create their own profile and valorise and all the information that they wish to embed in their CV. Here below, partners consolidated a mock version of EUROPASS profile that aspiring aviation aerospace mechatronic technicians can use for their online profile and CV. The content of this standard templates is informed of course by the learning outcomes of AM TECH' curriculum, the EURES mock job-announcement, and key features emerged from the interlinking between ESCO and the aforementioned curriculum.

Mock version of the EUROPASS profile

PERSONAL INFORMATION:

Full Name: [Your Full Name] Address: [Your Address]
Phone: [Your Phone Number] Email: [Your Email Address]
Nationality: [Your Nationality] Date of Birth: [Your Date of Birth]

PROFILE:

I am a highly motivated young Mechatronic with a strong passion for aviation technologies and the aerospace industry and throughout my education career I had the opportunity to equip myself with knowledge and skills required to maintain, repair and troubleshoot electrical and mechatronic systems in aircraft; identify, diagnose and resolve issues in avionics systems that use computer-based technologies; ensure the safety and efficiency of aircraft operations, minimize the risk of accidents, and comply with regulatory requirements.

WORK EXPERIENCE:

[If applicable, list your relevant work experience in reverse chronological order]

EDUCATION:

- Bachelor's Degree in Mechatronics Engineering, [University Name], [City/Country], [Year of Graduation]
- Master's Degree in Aerospace Engineering, [University Name], [City/Country], [Year of Graduation]

SKILLS & KNOWLEDGE

[tentative list, please remember to finetune based on the specific job announcement and the learning outcomes realistically acquired]

- Aviation & Aerospace
 - ✓ Ability to read and interpret technical manuals and schematics related to aircraft maintenance and repair.
 - ✓ Proficiency in the use of hand and power tools and equipment required for aircraft maintenance and repair.
 - ✓ Understanding of aviation regulations and safety protocols.
 - ✓ Ability to diagnose and troubleshoot mechanical and electrical systems in aircraft.
 - ✓ Familiarity with various aircraft systems, including hydraulic, pneumatic, electrical, and fuel systems.
 - ✓ Proficiency in conducting routine maintenance tasks such as engine inspections, oil changes, and tire replacements.
 - ✓ Ability to work efficiently and safely as part of a team of aircraft maintenance professionals.
 - ✓ Effective communication skills necessary for collaborating with other maintenance and flight crew personnel.
- Electrical & Mechatronics
 - ✓ Understand the principles of electricity, electronics, and mechatronics.
 - ✓ Read and interpret technical drawings and schematics.
 - ✓ Use various testing equipment and tools to diagnose and repair electrical and mechatronic systems.
 - ✓ Conduct routine maintenance and inspections on electrical and mechatronic systems.
 - ✓ Install and replace electrical and mechatronic components/Line Replaceable Units (LRU).
 - ✓ Work safely and efficiently with electrical and mechatronic systems in accordance with industry standards.
- Computer Science & Mechatronics
 - ✓ Ability to diagnose and troubleshoot avionics systems using computer-based technologies.
 - ✓ Proficiency in using diagnostic tools and software used in the avionics industry.
 - ✓ Ability to analyse and interpret technical data related to avionics systems.
 - ✓ Knowledge of safety regulations and procedures in the avionics industry.
 - ✓ Knowledge of computer systems and programming languages used in the avionics industry.
- Safety & Operations
 - ✓ Understand the principles of aircraft safety and operations
 - ✓ Identify potential hazards and risks associated with aircraft maintenance and operations
 - ✓ Apply best practices in aircraft maintenance, inspection, repair, and troubleshooting
 - ✓ Interpret technical manuals and schematics to diagnose and solve problems
 - ✓ Use specialized tools and equipment for aircraft maintenance and repair
 - ✓ Comply with regulatory requirements and industry standards related to aircraft safety and operations
 - ✓ Communicate effectively with other members of the aircraft maintenance team and with pilots and other aviation personnel

CERTIFICATIONS AND COURSES:

[If applicable, list any relevant certifications or courses related to the job description]

LANGUAGES:

[Language 1]: [Proficiency Level (e.g., Native, Fluent, Advanced, Intermediate, Basic)]
[Language 2]: [Proficiency Level (e.g., Native, Fluent, Advanced, Intermediate, Basic)]



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INTERESTS:

[Include any relevant hobbies or interests related to the aviation and aerospace field]

REFERENCES:

[Available upon request]

GDPR DISCLAIMER:

I hereby authorize the use of my personal data in accordance to the GDPR 679/16 – European regulation on the protection of personal data.

[Your signature with date]

Annex 1 – Guidelines for the articulation of Learning Outcomes

The completion of the curriculum and the final consolidation of the AM TECH passport followed a very sound and robust methodological approach.

At project launch, and under the lead of the applicant organisation CIT, all partners carried out with reference to the national ecosystem⁷ a thorough analysis aimed at assessing the existence and quality – in any was available – of formal training and education offers that they could rely on as a base reference for the AM TECH project.

Partners collected inputs and insights from both traditional literature sources, and primary target groups (VET centres specialised in mechatronics and related fields, SMEs and private sector representatives operating in the aviation / drone industry, etc.).

Data and findings were used by partners to gather up-to-date wealth of knowledge on needs assessment and competence gaps in the field, and to have better understanding on ‘hypothetical’ training areas of interest that could be tackled and addressed by the aviation aerospace mechatronics technician curriculum.

These training areas of interest relates to concrete domains of knowledge, each of which further structured in sub-didactic areas and contributing to the acquisition by targets of distinct learning outcomes.

The concept of learning outcome can be framed in different ways depending on how what the outcome actually is:

- Knowledge, in the case learners acquire new notions, theories, etc.
- Skills, in the case learners become more and more proficient in performing a new task, process, procedure, etc.
- Attitude, in the case learners adopt and embrace a renewed and empowered mindset in whatever they do.

The three shades of learning outcomes are not substitute and/or alternative, on the contrary they are very much complementary. In identifying the desired learning outcomes of training areas, trainers and educators should be considerate of all of the three, so that each piece of educational content has the potential to nurture and positively influence what learners know, what they can do, and the passion and motivation that they invest in it.

Final stage of the building framework is represented by the into-action piloting & testing of learning outcomes. The proactive involvement of target groups is of course instrumental in assuring for

⁷ With the Belgian partner IHF focused on the EU and international level of the analysis.



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ease of use and accessibility of the training material, and most importantly, the pedagogical reliability, legitimacy and accuracy as perceived final users.

If possible, it is recommended to engage and involve a diverse cohort of stakeholders, one that can reflect and represent the diversity of the partnership, and the wide interests of the many social parties that the project can potentially address.



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