



MCAST

Malta College of Arts, Science & Technology

MQF Level 3

**Diploma in Aircraft Maintenance
Course Specification**

ME3-01-20

Current Approved Programme Structure

Unit Title	ECVET/ECTS
Fundamentals of Electricity & Aircraft Electronic Instrument Systems	3
Aircraft Materials and Hardware Components	4
Maintenance Processes	5
Maintenance Practices 01	5
Maintenance Practices 02	5
Aircraft Aerodynamics & Structural Systems	6
Aircraft Electrical & Avionics Systems	6
Aircraft Mechanical and Control Systems	6
On the Job Experience	0
Mathematics	4
English	4
Malti	4
Information Technology	4
Human Factors	3
Science (Adapted for Assistant Aircraft Technicians)	4
Total ECVET/ECTS	60

Fundamentals of Electricity and Aircraft Electronic Instrument Systems

Unit level (MQF): 3

Credits: 3

Unit Description

In this unit learners will become familiar with the Fundamentals of Electricity and Aircraft Electronic Instrument Systems. The unit exposes students to the basic principles of electricity such as electron theory, static electricity and the relationship between voltage, current and resistance. Students are exposed to both DC and AC types of electrical power and are expected to understand the basic principles of generating and storing electrical energy typically employed in the aircraft industry.

The second part of the module covers electronic instrument systems employed on civil and commercial aircraft. Cockpit configurations and layouts are discussed as well as the principle of operation of the main types of instruments typically found on such aircraft with particular reference to the handling of such equipment and the precautions required to mitigate the effects of electrostatic discharge on these devices.

The unit requires a sound understanding of the underpinning knowledge and addresses the requirements of EASA Part-66 module 3 (Electrical Fundamentals) and module 5 (Digital Techniques/Electronic Instrument Systems) at Category A level.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Explain the basic principles of electricity and related terminology.*
2. *Describe different methods of generation and storage of electricity.*
3. *Describe typical system arrangements and cockpit layouts of electronic instrument systems.*
4. *Understand the basic components of a computer system and the proper handling of electrostatically sensitive devices.*

Aircraft Materials and Hardware Components

Unit level (MQF): 3

Credits: 4

Unit Description

In this unit learners will become familiar with the characteristics and properties of Ferrous and Non-Ferrous materials as well as Composite and Non-metallic materials used in the construction of aircraft. The unit exposes learners to the several types of corrosion and their causes and effects on materials typically used in the aircraft industry. Learners will become familiar with the typical defects that affect the performance of materials used in aircraft construction and are expected to understand the severity of such defects and material deterioration.

The second part of the module introduces learners to the hardware and components used on civil and commercial aircraft. These include the several types of fasteners used in the assembly of the aircraft structure and the installation of aircraft on board systems. Learners will be exposed to the different pipes and unions as well as control cable systems and components used in aircraft systems. The learner will be introduced to the different types of bearings and transmission systems in use.

The unit requires a sound understanding of the underpinning knowledge and addresses the requirements of EASA Part-66 module 6 (Materials and Hardware) excluding sub-module 6.11 at Category A level.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Explain the properties and effects of corrosion on ferrous and non-ferrous materials.*
2. *Describe the properties and possible defects of composite, wooden and fabric materials.*
3. *Select appropriate fasteners for given aircraft applications.*
4. *Illustrate the application of pipes, unions, control cables, bearings and transmissions.*

Maintenance Processes

Unit level (MQF): 3

Credits: 5

Unit Description

In this unit learners will be introduced to the potential hazards of working in workshops and on aircraft. They are also introduced to the precautions that need to be taken and how to deal with an emergency. This unit exposes the learners to workshop practices and to the several types of tools and tool handling. Learners are then taught the fundamentals of Engineering drawings and the different fits and clearances used in engineering.

The learners are also introduced to the different aircraft systems and how these are inspected and maintained. The aircraft systems covered are pipes and hoses, transmissions and control cables together with the associated bearings and springs.

Towards the end of the unit the learners will learn how to properly handle an aircraft especially during maintenance and the techniques used in the disassembly, inspection, repair and assembly of aircraft systems and structures and the associated maintenance procedures. Learners are also introduced to the potential abnormal events an aircraft can experience and what checks are carried out in such an eventuality.

The unit requires a sound understanding of the underpinning knowledge and addresses the requirements of EASA Part-66 module 7 (Maintenance Practices) excluding sub-module 7.7 at Category A level.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Take safety precautions and adopt correct practices when working on aircraft and in workshops.*
2. *Read and interpret engineering drawings, diagrams and standards of fits and clearances used on aircraft.*
3. *Install pipes and hoses, springs, bearings, transmissions and control cables in aircraft applications.*
4. *Carry out procedures for handling, maintenance and storage of aircraft that include inspection after abnormal events, disassembly, repair and assembly techniques.*

Maintenance Practices - Practical 1

Unit level (MQF): 3

Credits: 5

Unit Description

This unit has been designed to provide learners with the knowledge, skills and understanding needed to carry out a range of aircraft maintenance procedures in a safe, efficient and timely manner.

Safety is vital during aircraft maintenance, to protect both individuals and the integrity of the aircraft. Therefore this unit will cover the health and safety issues relating to all aspects of aircraft first line maintenance.

Many different machine tools, tools and equipment are used in an aviation workshop which have to be always well kept and properly stored. Learners will learn how to safely use these tools and equipment, and also they will understand the organisation and maintenance procedures as well as calibration standards.

Learners will also understand and practise basic concepts on how to communicate effectively and how to maintain good work relationships. This will give the learners the opportunity to work effectively as part of a team, as in an aviation workshop teamwork is highly important.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. Carry out marking out operation that involves sizing, squaring and punching of the work piece according to documentation provided.
2. Cut and shape given ferrous and non-ferrous work pieces to a given profile.
3. Manufacture a steel component to given specifications using both hand and power tools.
4. Manufacture and assemble a project involving several parts and sub components to meet required specifications.

Maintenance Practices 2

Unit level (MQF): 3

Credits: 5

Unit Description

In this unit learners will further familiarise with the requirements and fundamentals of working in the aviation maintenance sector. The learners will practice further health and safety requirements, personal protective equipment usage and the need to apply safe working practices. With the practical skills and knowledge acquired in this unit, learners will be able to work safely on basic tasks, whilst taking the necessary precautions in the working process.

In this unit learners will also become familiar with different tools used in an aviation workshop. Learners will also practice aircraft riveting and riveting techniques. They will also be introduced to an array of fasteners and fastening techniques commonly used in aircraft assemblies.

Learners will also understand basic concepts with relation to communication and maintaining work relationships. Therefore learners will be able to work effectively as part of a team since in an aviation workshop this is very important since some tasks need the collaboration of a team to be accomplished.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Prepare aircraft sheet metal parts for riveting and rivet prepared parts accurately according to documentation provided.*
2. *Install aircraft fasteners and apply safety features on such fasteners appropriately.*
3. *Prepare, install and test tubing systems.*
4. *Prepare, install and tension a control cable system.*

Aircraft Aerodynamics and Structural Systems

Unit level (MQF): 3

Credits: 6

Unit Description

Large modern passenger aircraft, by themselves can weigh tens of thousands of kilograms. In addition, they have to carry large loads in the form of fuel, passengers and cargo. This unit presents the theory how lift augmentation is achieved upon an aircraft to overcome such huge loads and be able to get into the flight. In addition to the weight, an aircraft has to overcome drag as well. During this unit the learner will get the basic principles how drag is overcome during the flight.

Upon delivering these basics of the theory of the flight, this unit then presents to the learner the effects of flying at different speeds on flight augmentation, as well as on the aircraft aerodynamics. The provisions taken to achieve subsonic and supersonic speeds are also examined.

The second part of the module presents the learner with the concepts of the Airframe structure of an aircraft, with particular emphasis on the aeroplane. Structural strength is very important. This unit presents an overview of the main airworthiness requirements to be met during the design and manufacturing of an aircraft, so that to achieve proper structural strength, to ensure a safe flight. Other elements related to safety presented in this unit are: Structural classification, strain and fatigue elements, as well as provisions taken to prevent corrosion and safe operation of the structure in case of a lightning strike.

The final part of the unit is related to the main sections related and attached to the fuselage of an aeroplane such as: Wings, flight control surfaces, engines, landing gears, doors and windows. Construction provisions to ensure structural integrity in case of abnormal flight conditions are also discussed need the collaboration of a team to be accomplished.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Explain the basic means by which lift and drag are generated during the flight of an aircraft.*
2. *Understand the effects of aerodynamics over aeroplanes flying at different air-speeds.*
3. *Describe the general concepts of the structure forming the airframe of an aircraft.*
4. *Understand the function of the main sections that constitute the airframe structure of an aeroplane.*

Aircraft Electrical and Avionics Systems

Unit level (MQF): 3

Credits: 6

Unit Description

To be able to fly an aircraft, both mechanical and electrical systems, as well as avionics (electronic) systems, are required so that the necessary control is achieved, as well as so that the different systems within the aircraft can operate correctly and safely. This unit focuses mainly on the electrical and avionics aspects of the different aircraft systems.

The first part of this unit covers the Electrical Wiring Interconnecting Systems (EWIS). In older times, general electrical wiring systems on aircraft were considered as 'fit and let go', with little legal binding of inspecting during normal operation, as well as less requirements to be followed during installation. However, nowadays, due to different reasons such as accidents and incidents attributed to electrical wiring failure, as well as due to the more involvement of electricity in controlling the aircraft, electrical wiring should be installed and maintained in accordance with strict legal requirements.

Closely related to EWIS is Aircraft Electrical Power (ATA 24). This unit helps the learner familiarise his/herself with the electrical power requirements for aircraft, starting from DC sources in the form of battery power, which is the main source of electrical power for small aircraft and the source for engine starting, as well as one source of electrical power for emergency. This part of unit then focuses on sources of power generation, essential for larger aircraft. Examples of Electrical power generating sources investigated are AC and DC power generation and distribution, as well as Essential and Emergency Power generation. Other topics like Voltage regulation, means of protection, as well as external/ground power requirements are also covered.

The unit then covers ATA chapter 33, Lighting. Lighting on aircraft has three main functions: External lighting, which is a mean that helps the pilot having an aid to better visualise external conditions during reduced visibility conditions and during the night. External lighting also serves to indicate the different ground operational sectors, with indications like engine condition (i.e. running), the position of the aircraft (e.g. Navigation lights), etc. This outcome also deals with internal lighting which has main scopes to provide passenger comfort, as well as proper lighting conditions to help both flight and maintenance or servicing ground crews perform their responsibilities. A final, but very important topic covered by this outcome is

Emergency Lighting which is essential for the safety of crew, passengers, as well as rescue people during emergency conditions.

Essential aspects for safely flying an aircraft are instrumentation and indicating systems. Instrumentation is divided into flight and system instrumentation. Nowadays, with the evolvement into glass cockpits and computerized aircraft systems, aircraft instrumentation has become more integrated and compact. However, the principles for sensing the conditions that enable flight conditions to be determined (or indicated) still apply. The unit presents the learner with the basics how air data is used to achieve flight conditions like altitude and airspeed, as well as how gyroscopic instrumentation is used to determine the attitude of the aircraft.

Modern aircraft make extensive use of complex avionic systems for communication and navigation. These systems rely primarily on radio and radar for their operation. This unit provides an introduction to the principles of aircraft communications and navigation systems. Learners will gain an understanding of the principles, characteristics and applications of the different systems used for voice communication, basic radio navigation systems (VOR/ADF), as well as other radio and radar systems used to determine distance, avoid collision, achieve precise and safe landings, as well as be aware of weather conditions.

Another important avionic system extensively used in modern aircraft is the automatic flight system. Auto-pilot have been in use on aircraft for many years. However, such system nowadays has evolved drastically achieving more precise and sophisticated automatic flying of an aircraft. This unit covers this topic by starting with the basic principle of the aircraft autopilot system, and then proceeds to the modern flight management system, where the autopilot and practically all other avionic and control systems are interfaced together and controlled by a central flight management computer, to achieve a full automatic control of the aircraft, all this in accordance with flight plans entered before the flight, and the use of special databases stored within the flight management computer. This also helping for more economic flights to be achieved.

The avionic systems installed on modern aircraft have grown significantly over the last few decades in terms of complexity and their level of integration with other aircraft systems. Avionics is nowadays also an essential part of the passenger cabin, mainly involved in providing extra comfort, as well as services such as flight entertainment, internet, communication means, etc. Hence, nowadays more than ever, a thorough understanding of avionic systems and their underpinning principles is needed by aircraft technicians involved in the installation and maintenance of these systems. This unit will familiarise learners with the basic principles for modern systems of Integrated Avionics, as well as avionics systems involved within the passenger cabin, and other avionic systems related to store, retrieve, record, or convey information between the aircraft and ground. Learners will also know how avionic systems are monitored and tested.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Apply the requirements for Aircraft Electrical Wiring Interconnecting Systems and be familiar with Aircraft Electrical Power Systems.*
2. *Know the purpose, function and operation of Aircraft Lighting Systems and be familiar with typical installations on aircraft.*
3. *Know the purpose, function and operation of Aircraft Indicating and Instrument Systems and be familiar with typical installations on aircraft.*
4. *Be familiar with the use of Avionics to achieve Communications, Navigation and Control of an Aircraft and respective installations.*

Aircraft Mechanical and Control Systems

Unit level (MQF): 3

Credits: 6

Unit Description

To be able to fly an aircraft, both mechanical and electrical systems are required so that the necessary control is achieved, as well as so that the different systems within the aircraft can operate correctly and safely. This unit focuses mainly on the mechanical aspects of the different aircraft systems.

A system that is very important and essential on large aircraft, so that to achieve the control of operations of systems like flight controls and landing gear, is the hydraulic system. The first part of this unit focuses on these systems, essential for the control of a large aircraft. The principles of hydraulic transmission and the associated aircraft systems and components are provided. Particularly, the principles associated with hydraulic power actuation and the application in modern hydraulic systems is covered. This includes typical provisions taken during emergency and abnormal conditions.

Two aircraft systems mainly related to hydraulics, are the landing gear and the flight control systems. The unit presents the purpose, construction and operation of typical aircraft landing gear systems, including typical systems for extension and retraction, nose wheel steering, as well as braking. This also includes typical system operation during abnormal events. The second main system usually related directly to the hydraulic system, is the flight control system of an aircraft. Large aircraft flight controls are subject to heavy loads that makes it impossible to move a flight control manually during flight. Hence, most large aircraft employ hydraulic power to achieve such control. The unit covers also typical flight control systems as found on different types of aircraft.

Apart from these three main systems for aircraft control, aircraft contain also other systems which are covered by this unit. Such systems are those related to air, fire emergency, cabin equipment, as well as pressurisation. The air systems covered include pneumatic supply, air-conditioning and pressurisation, with the latter two essential on passenger aircraft flying at high altitudes, where there is not enough oxygen present in the atmosphere, as well as where the ambient temperatures are extremely low.

Another essential aircraft system is the fuel system. The unit covers typical fuel systems found on aircraft. Typical system layouts and operation principles are explained, including methods of fuel supply, transferring, venting and draining.

To achieve a safe aircraft operation typical indication and warning systems are present within every aircraft system. These indicate to the pilot the system condition, both during normal and abnormal operation. The unit also discusses such system, as related to every aircraft system covered. In addition to these, two systems typically found on aircraft serve to protect against fire, ice and rain. The unit also covers ATA chapter 26 which deals with fire protection, including methods of detection and extinguishing. Related system tests are also covered. The other protection system is that related to ice and rain. Ice formation around critical parts of the structure may affect aircraft aerodynamics, while rain conditions may affect proper visibility to the pilot. Hence, systems to detect and/or prevent ice formation on aircraft, as well as systems to reduce the effect of rain are present on aircraft. The unit also explains typical ice and protection systems, as present on aircraft.

The final part of the unit deals with the passenger cabin and cargo compartments, and related systems like oxygen and water/waste. Typical system layouts, as well as safety requirements are presented. This includes typical cabin layouts and installations, typical cargo handling and retention equipment, typical oxygen supply systems (crew/passenger), typical water and waste systems. Oxygen and water/waste also presents typical servicing practices regularly performed during aircraft operation.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Describe the construction, purpose and operation of aircraft hydraulic systems, control systems and landing gear systems, including associated components.*
2. *Demonstrate the purpose, function and operation of components within aircraft fuel and protection systems.*
3. *Demonstrate the purpose, function and operation of components within aircraft air-conditioning and pressurisation systems.*
4. *Describe the construction, purpose and operation of aircraft cabin equipment, oxygen and water/waste systems, including associated components.*

Science (Adapted for Assistant Aviation Technicians)

Unit level (MQF): 3

Credits: 4

Unit Description

In this Level 3 key skill, learners will increase their awareness about the importance of science in our everyday life. The focus will be on natural sciences, mainly the three different areas; the living world, the physical world and the world of technology.

The focus of the living world will be on interactions between living organisms in a given environment, the dependence of animals on plants for their survival via food chains and food webs, and human life. Topics related with human life will include the position of the main body organs, anatomy and physiology of at least two organ systems, and physical health (importance of healthy food, clean water and unpolluted air; importance of balanced diet and regular exercise for physical and emotional well-being; adverse effects of drugs, alcohol and smoking; ways to avoid contamination of bacteria and viruses; role of white blood cells and misuse of antibiotics).

As part of the physical world, the learner will be more familiar with physical properties of materials, classifying objects and materials based on their physical properties, and linking the uses of objects and materials with their physical properties. Furthermore, they will enhance their knowledge on Kinetics, Dynamics, Fluid Dynamics and Thermodynamics. Students will also develop more awareness on the use of sources of energy in the immediate environment safely and economically, and on the energy-saving measures that can be applied at home and at work.

Related with the world of technology, the learners will discuss health and safety issues at home and in the workplace including recognising situations of risk and ways how one can avoid accidents. Also, the learners will familiarise themselves with issues related to costs and efficiency of everyday life processes by carrying out an analysis of a particular process or task in terms of energy and efficiency.

Learners will enhance their investigative skills via a project (which includes a site visit designed specifically for different institutes) in collaboration with BirdLife Malta. During a training session, lecturers will be given teaching resources and suggestions for sites to deliver the field teaching aspect and project themes. Via this learning outcome, the learner will be empowered to take action to develop a project that addresses an environmental issue. S/he will have to analyse the data, interpret and evaluate findings and then communicate them to their colleagues. The learner should realise that everyone can do something which will make a difference and that action can take place not only at the personal level but also at other levels such as

community, national and international levels. Learners should understand ecosystem services and recognise that they can be used in all careers to save time, money, resources etc. but that they need to be respected for this to be possible.

Learning Outcomes

On completion of this unit the student will be able to:

1. *Observe and classify objects in the immediate environment.*
2. *Link scientific knowledge with everyday life situations.*
3. *Research local environmental issues and use problem solving skills to investigate sustainable solutions.*
4. *Use scientific knowledge to improve everyday life.*