



5

Synopsis:
EASA part 66 Moduls (CAT A1- 4)
& AEROVET-Learning Units



Lifelong Learning Programme

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

LU 5 Assembly and disassembly of equipment and systems in/at the aircraft airframe (incl. module 11, for helicopters with module 12)	5
LU 6 Functional checks and tuning at the aircraft (incl. module 11, for helicopters with module 12)	6
LU 6 Functional checks and tuning at the aircraft (incl. module 11, for helicopters with module 12)	6
LU 7 Maintenance and inspection of the aircraft.....	7
LU 9 Analysis and reconditioning of damage on structure components	8
LU 11 Independent quality inspections	9
LU 15 Assembly and disassembly of subsystems and devices at aircraft systems.....	10
LU 16 Modification of aircraft systems	11
LE 22 Maintenance and inspection of aircraft systems.....	12
LE + Analysis and reconditioning of malfunctions at the engine, (incl. module 15, for reciprocating engines with module 16).....	13

LU 5 Assembly and disassembly of equipment and systems in/at the aircraft airframe (incl. module 11, for helicopters with module 12)

With this unit the equipment and the accoutrement of the aircraft are installed in the context of the final equipment. This assembly work takes place either on the aircraft airframe or on complex assemblies of the aircraft. Here is the co-ordination and communication with the colleagues and supervisors of special concern, due to the complexity of the component parts. On the one hand, different instruments and systems (e.g. kitchen and toilet modules, engines, landing gear, brake of the landing flap) or sub-systems (e.g. hydraulic lines or electric conductions) are installed. On the other hand, already integrated components of systems or instruments (e.g. hydraulic, pneumatic, electro mechanic or electronic components) are connected with each other. For that purpose joining elements or plugs have to be installed. After the assembly, the systems and the instruments are examined (e.g. for tightness) and if necessary the marking of the equipment labels is carried out. In particular, during the assembly and the examination of electro mechanic or electronic components a close co-operation with specialists of electronics is necessary. The disassembly of instruments and systems of the aircraft airframe is mainly effected in maintenance operations. Due to adjustment and optimisation work this part of the work task is also very important for the prime production. As non-fixed components or tools, which have been forgotten in the aircraft, may influence the flight quality or the airworthiness, the inspection of completeness of the used tools after the termination of the assembly/disassembly work is an elementary part of the unit. The documentation of the orders, possible construction deviations and the serial numbers of the used components, as well as the life delimitation, is also part of this unit. After the termination of the assembly the surface of the components has to be protected. This work step is effected independently, according to work organisation, as the next unit or directly after the conclusion of the assembly work.

EASA Sub-Modules:

Pipes and Unions (M 6.6)	Equipment and Furnishings (ATA 25) (M 11.7)
Bearings (M 6.8)	Fire Protection (ATA 26) (M 11.8)
Transmissions (M 6.9)	Hydraulic Power (ATA 29) (M 11.11)
Control Cables (M 6.10)	Fahrwerk (M 11.13)
Disassembly, Inspection, Repair and Assembly Techniques (M 7.18)	Landing Gear (ATA 32) (M 11.14)
Airframe Structures — Aeroplanes (M 11.3)	Oxygen (ATA 35) (M 11.15)
Air Conditioning and Cabin Pressurisation ATA 21 (M 11.4)	Pneumatic/Vacuum (ATA 36) (M 11.16)

LU 6 Functional checks and tuning at the aircraft (incl. module 11, for helicopters with module 12)

At the end of the prime production or after the reconditioning of the single aircraft components or the entire aircraft, extensive functional checks and tunings have to be achieved. On the one hand, this guarantees the interchangeability of the single components and on the other hand, to control and optimise the airworthiness in the context of tests which are carried out on the ground. To assure the interchangeability of the single components measurements with varying measurement equipment are accomplished (e.g. micrometer screws, feeler gages, laser tracker, digital photogrammetry) and the components are if necessary adapted. In order to control the airworthiness, functional checks of all systems testable on the ground are effected (e.g.: examination of hydraulic pressures, landing gear test, flap test, examination of the emergency equipment). In case of setting deviations of the individual components are these, if possible, optimised by tuning. Possible malfunctions are documented (e.g. in non-conformance arc/non-conformance blade or a finding report) and are directly repaired or with the support of maintenance specialists. The documentation of the results of the functional check and of the performed settings is, as well as possible optimisation proposals, an integrative element of this unit. Additionally, the used measuring instruments are maintained in the context of this unit.

EASA Sub-Modules:

Flight Controls (ATA 27) (M 11.9)	Water/Waste (ATA 38) (M 11.17)
Fuel Systems (ATA 28) (M 11.10)	On Board Maintenance Systems (ATA 45) (M 11.18)
Ice and Rain Protection (ATA 30) (M 11. 12)	

LU 7 Maintenance and inspection of the aircraft

This unit contains the routinely servicing and inspection of aircrafts after a given number of flying hours. This is accomplished on airports/flight bases or in combination with the reconditioning of aircrafts in servicing or maintenance enterprises. Both during the inspection (e.g. visual inspection, crack inspection, corrosion inspection), the care and the servicing, the prescriptions of the maintenance manual (e.g. Aircraft maintenance Manuel (AMM) or German Air Force Technical Orders (GAFTO)) have to be observed. These documents exist predominantly in the English language. Simple malfunctions can also be eliminated in the context of the servicing and inspection of aircrafts. Depending on the effected maintenance work, function tests can be necessary. These are accomplished either by the concerned craftsman or by the customer (e.g. quality inspection by specialists of the Federal Armed Forces). The documentation of the accomplished work and of the possibly necessary function test is an integrative element of the unit.

EASA Sub-Modules:

Safety Precautions-Aircraft and Workshop (M 7.1)
Workshop Practices (M 7.2)
Engineering Drawings, Diagrams and Standards (M 7.5)
Electrical Cables and Connectors (M 7.7)
Pipes and Hoses (M 7.9)
Springs (M 7.10)
Bearings (M 7.11)
Transmissions (M 7.12)
Control Cables (M 7.13)
Abnormal Events (M 7.19)
Aircraft Handling and Storage (M 7.17)
Maintenance Procedures (M 7.20)

LU 9 Analysis and reconditioning of damage on structure components

During the operation of an aircraft, the different components (e.g. structure components) or assemblies can be damaged. In addition, the damage can already occur in the production process or in the further processing and/or - working. Typical damage is e.g. cracking, delaminations or too large tolerances. During the reconditioning the original resistance and therewith operational readiness of the component have to be achieved again. This is done on structure components e.g. with the setting up of repair units (Patches), using rivets. The reparations are effected either directly on the aircraft or in the reconditioning location. All repair procedures are carried out on the basis of the maintenance manuals (e.g. Aircraft Maintenance Manual (AMM), Structure Repair Manual (SRM) or German Air Force Technical Orders (GAFTO)). These documents exist predominantly in the English language. Furthermore, the repair is to be documented in the technical brochures as a construction deviation. In particular, special repair procedures and adhesive technologies have to be used for the reconditioning of carbon fiber reinforced plastics components (CFK) which are partly still in the development stage. Hence, a close co-operation with the specialists of the material inspection, the design department and the quality assurance is essential. If the reconditioning of the damaged component is no longer possible or too expensive, the damaged component is replaced by a new section.

EASA Sub-Modules:

Aircraft Materials — Ferrous (M 6.1)
Aircraft Materials — Non-Ferrous (M 6.2)
Aircraft Materials — Composite and Non-Metallic (M 6.3)
Corrosion (M 6.4)
Fasteners (M 6.5)
Safety Precautions-Aircraft and Workshop (M 7.1)
Workshop Practices (M 7.2)
Tools (M 7.3)
Engineering Drawings, Diagrams and Standards (M 7.5)
Fits and Clearances (M 7.6)
Riveting (M 7.8)
Physics of the Atmosphere (M 8.1)
Aerodynamics (M 8.2)
Theory of Flight (M 8.3)
Flight Stability and Dynamics (M 8.4)
Theory of Flight (M 11.1)
Airframe Structures — General Concepts (M 11.2)

LU 11 Independent quality inspections

As a result of the high requirement to the operation reliability of aircrafts, a foreign inspection of the product and the process quality is indispensable apart from the self-checking. While the self-checking is a component of each accomplished work task of an aircraft mechanic, the independent inspection is a self-contained task of the component and assembly acceptance by craftsmen who are not involved in the production and the reconditioning procedure. Here, varying non-destructive inspection methods are used like e.g. visual inspection and cracking inspections by means of eddy current or ultrasonic inspections. The documentation of the accomplished work is an integrative element of this unit.

EASA Sub-Modules:

Safety Precautions-Aircraft and Workshop (M 7.1)
--

Fits and Clearances (M 7.6)

LU 15 Assembly and disassembly of subsystems and devices at aircraft systems

Assembling and disassembling of subsystems or devices is necessary when producing or modifying aircrafts. The basics of this unit are engineering drawings, manufacturing instructions and a manufacturing order. The function of the affected subsystems or devices has to be considered when assembling or disassembling it. First the subsystem or device that will be disassembled has to be localised. Then the device(s) that will be assembled are chosen, inspected and installed according to the instructions. Before assembling a subsystem or device isolation, electrical resistance and bonding are checked. After assembling it another inspection, consisting of visual, isolation, function and continuity checks is performed. Usually mechanical activities (e. g. securing with a wire, mounting / demounting closure panels) are part of assembling electrical devices or subsystems. The documentation of the accomplished work is an integrated element of this unit. Depending on the respective manufacturing order final inspection and release are either done by the skilled worker or by the quality assurance.

EASA Sub-Modules:

Electron Theory (M 3.1)	Electronic Instrument Systems (M 5.1)
Static Electricity and Conduction (M 3.2)	Electrostatic Sensitive Devices (M 5.12)
Electrical Terminology (M 3.3)	Basic Computer Structure (M 5.6)
Generation of Electricity (M 3.4)	Electrical Cables and Connectors (M 6.11)
DC Sources of Electricity (M 3.5)	Instruments/Avionic Systems (M 11.5)
AC Theory (M 3.13)	Electrical Power (ATA 24) (M 11.6)

LU 16 Modification of aircraft systems

During maintenance and modification of aircraft systems outdated electric systems are renewed or new systems or components are added. Basics of this unit are engineering drawings, dimensional sketches, manufacturing instructions and an analysis of the initial state. Based on this initial state electric systems are upgraded according to actualised engineering drawings. Besides the addition or modification of electric components the installation of updated software is part of this unit. The documentation of the accomplished work is an integrated element of this unit. Depending on the respective manufacturing order final inspection is either done by the skilled worker or in close cooperation with the quality assurance.

EASA Sub-Modules:

Electronic Instrument Systems (M 5.1)
Electrostatic Sensitive Devices (M 5.12)
Electrical Power (ATA 24) (M 11.6)

LE 22 Maintenance and inspection of aircraft systems

This unit deals with the periodic maintenance and inspection (e. g. Pre-Flight-Checks and Post-Flight-Checks) of aircrafts. The maintenance manuals (e. g. Aircraft Maintenance Manuel (AMM) or German Air Force Technical Orders (GAFTO)) must be taken into account. When maintaining or inspecting an aircraft, simple malfunctions are repaired. Serious malfunctions are repaired in close cooperation with the respective skilled workers or the concerned aircraft, unit or subsystem got to be transferred for analysis and repair to the respective department. The worker has to add the maintenance or inspection to the documentation system. At the end of this unit functional tests are performed and the aircraft is enabled for the next flight.

EASA Sub-Modules:

Electronic Instrument Systems (M 5.1)

Electrostatic Sensitive Devices (M 5.12)
--

LE + Analysis and reconditioning of malfunctions at the engine, (incl. module 15, for reciprocating engines with module 16)

During the servicing and the reconditioning of engines the analysis of malfunctions as well as the repair of defective engine components ranks among the central tasks. The analysis of malfunctions on the engine is effected on the basis of an initial finding. During this initial finding a first damage evaluation is accomplished by visual inspections and checking of the accompanying documents of the engine (life-history file). With the results of these inspections the dismantling degree of the engine is determined. The dismantling of the engine takes place in the disassembly departments. Subsequently, the single components are cleaned and are particularly examined for cracking with different non-destructive material investigation procedures (e.g. penetrate-examination, magnetic powder examination, eddy current examination). If damage on the components is determined, they are transferred for reconditioning to the coworkers of the appropriate technical departments depending on the damage or they are replaced with new sections. The assembly of the engine is carried out on the assembly departments. The documentation of the accomplished work is an integrative element of this unit.

EASA Sub-Modules:

Safety Precautions-Aircraft and Workshop (M 7.1)	Turbo-shaft engines (M 15.17)
Fundamentals (M 15.1)	Auxiliary Power Units (APUs) (M 15.18)
Inlet (M 15.3)	Powerplant Installation (M 15.19)
Compressors (M 15.4)	Fire Protection Systems (M15.20)
Combustion Section (M 15.5)	Engine Monitoring and Ground Operation (M 15.21)
Turbine Section (M 15.6)	Turboprop Fundamentals (M 17.1)
Exhaust (M 15.7)	Propeller Construction (M17.2)
Lubricants and Fuels (M 15.9)	Propeller Pitch Control (M17.3)
Lubrication Systems (M 15.10)	Propeller Ice Protection (M17.5)
Fuel Systems (M 15. 11)	Propeller Maintenance (M17.6)
Air Systems (M 15.12)	Propeller Storage and Preservation (M17.7)
Starting and Ignition Systems (M 15.13)	
Engine Indication Systems (M 15.14)	
Turbo-prop Engines (M 15.16)	