



UNIVERSIDADE DA BEIRA INTERIOR
Covilhã | Portugal

03-Manutenção

Fabricação e Manutenção de Aeronaves (10384)

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Objetivos

- Support the students with the knowlage of Aeronautic Maintenance in the following areas:
 - Maintenance Process;
 - Maintenance Programs;

Acronyms and Abbreviations

- AD Airworthiness Directive
- AMO Aircraft Maintenance Organization
- AMP Aircraft Maintenance Programme
- AOC Air Operator Certificate
- ARC Airworthiness review certificate
- ARS Airworthiness review staff
- ATPL(A) Airline Transport Pilot Licence (Aeroplane)
- AWC Aerial Work Certificate
- CAME Continuing Airworthiness Management Exposition
- CAMO Continuous Airworthiness Management Organization
- CDL Control Deviation List
- CPL(A) Commercial Pilot Licence (Aeroplane)
- CTI Circular Técnica de Informação
- DDS Deferred Deffect Sheet (Section 4 of Tech Log)
- DOA Disign Organization Approval

Acronyms and Abbreviations

- EPA European Parts Approval
- FTO Flyght Training Organization
- HIL Hold Item List
- MEL Minimum Equipment List
- NAA National Aviation Authority
- OC On Condition
- OH Overhaul
- PPL(A) Private Pilot Licence (Aeroplane)
- RET Removal
- SB Service Bulletin
- STC Supplement Type Certificate
- TBO Time Between Overhaul
- TCDS Type Certificate Data Sheet
- TLB Technical Log Book

Certification

- What will be needed for an aircraft phase-in, in a Portuguese AOC Portugal?
 - Aircraft certification:
<http://www.inac.pt/vPT/Generico/Aeronaves/Paginas/Aeronaves.aspx>
 - AOC certification:
<http://www.inac.pt/vPT/OrganizacoeseEmpresas/Paginas/OrganizacoeseEmpresasHomePage.aspx>

MAINTENANCE



Maintenance Concepts

- Preventive Maintenance;
 - **Schedule Maintenance:** maintenance accomplish according the aircraft maintenance plan, at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning of an item.
Include: inspection checks, life limit replacement;
 - **Unscheduled Maintenance:** maintenance accomplish according some specified conditions as: hard landing, lightning strike, overweight landing, extreme turbulence or maneuver, flaps and landing gear overspeed, bleed air leak, overtemperature, high energy stop, tire burst, bird strike, volcanic ashes, ice/de-ice operation;
- Corrective Maintenance;
 - **Expected Maintenance:** wear and tear replacement and servicing.
Include brakes, tires, lamps, engine oil, hydraulic oil, oxygen, nitrogen;
 - **Unexpected Maintenance:** correction of unexpected malfunctions, system fails and faults, damages, FOD;

Maintenance Concepts

- Life-Limited Parts:
 - parts identified by the aircraft manufacturer or production certificate holder as being limited to a total life counted in hours, cycles, landings, or by calendar.
- Limited Shelf Life;
 - Parts that have a specific shelf life have a limit as to how long they are eligible to be used. Examples of shelf life-limited materials are, adhesives, solvents, sealants, O-rings, and other rubber products, and fire extinguisher squibs.
- Service Life:
 - ability of a system to maintain its capacity for work for a certain duration of time without hard failure. After the service life expire, with the necessary technical maintenance and repairs (overhaul, detailed inspection, NDT, etc.) the system can return to service. Applicable to primary safety systems as engines, propellers, landing gears.

Maintenance Concepts

- Condition Monitoring:
 - is the process of monitoring parameters of condition in a system, in order to identify a significant change which is indicative of a developing fault. It is a major component of predictive maintenance. The use of conditional monitoring allows maintenance to be scheduled, or other actions to be taken to prevent failure and avoid its consequences.
- Reliability:
 - the probability of an element make a specified function, according to given environmental and operational conditions, for a period of time.

Maintenance Concepts



- **Line Maintenance:** generally refers to minor, unscheduled or scheduled maintenance carried out on aircraft between flights that includes:
 - Any unscheduled maintenance resulting from unforeseen events. Most repairs conducted at this level are usually “on-wing” or simple parts replacement.
 - Scheduled checks that contain servicing and/or inspections that do not require specialized training, equipment, or facilities. In service; and that is preparing for its first flight in service
 - Maintenance performed on aircraft after a period of being out of service (such as aircraft in storage)
 - Preparing and readying an aircraft for flight during a period of service
 - Maintenance activities being performed to ensure that the aircraft is airworthy and fit for flight.



Maintenance Concepts

- Base Maintenance:
 - The highest level of Maintenance with capabilities of disassembling Inspecting, repairing, refurbishment, Overhaul and restoration. Often the capabilities of the facility will include a repair station certificated under part 145 where off wing repair and overhaul of individual components may also be performed.



Maintenance Concepts

- Base Shop Maintenance :
 - Engines
 - Propellers
 - Landing Gear
 - Avionics/ Instruments
 - Brakes and Wheels
 - Accessories: 1st Aid kit, Life Vest, Life Raft
 - Interior Refurbishment
 - Sheet Metal
 - Cleaning/ Paint shop
 - Parts & Logistics
 - NDT

Maintenance Plan

- MSG-3

- MSG-3 is the acronym for the Maintenance Steering Group - 3rd Task Force released by the Air Transport Association (ATA) of America in 1980.
- An analysis of the airplane's Maintenance Significant Items (MSI) and Structural Significant Items (SSI) was made by the MSG-3 Group.
- Each of these MSI are reviewed by Working Group(s) that had specialist representatives of operators, manufacture staff, and the regulatory authority.
- After each MSI was approved by the Working Group, it was then given to an Industry Steering Committee (ISC). The ISC made sure that the MSG-3 process identified all of the MSI and SSI and whether or not a task was made from the analysis.
- The initial scheduled maintenance tasks and intervals have been specified in a Maintenance Review Board (MRB) report completed by the manufacture MSG-3 Group.

Maintenance Plan

- Aircraft Maintenance Program;
 - The Maintenance Planning Document (MPD) was made so that operators can easily find details of maintenance/inspection tasks that are scheduled at specific intervals. The information is shown in the format of work packages as an aid to the operators.
 - MPD is a planning document only and is not a requirements document. Therefore, the MPD can be used by operators as a template to plan the accomplishment of the tasks at specific intervals.
 - The MPD includes all Airworthiness Limitation and Maintenance Review Board (MRB) tasks from the regulatory approved Time Limits/Maintenance Checks (TLMC), for the convenience of the operator. In addition, the MPD includes Optional Maintenance tasks that do not require regulatory authority approval.
 - Unscheduled maintenance (as a result of hard landing, lightning strike, etc.) can be found in Chapter 5 of the Aircraft Maintenance Manual.
 - (see files MPD1-2, MPD1-3)

Maintenance Plan

- Aircraft Maintenance Program (cont.);
 - AMM Chapter 4 & 5 include:
 - Structure of airworthiness limitations (chapter 4);
 - Schedule and unscheduled inspections (chapter 5).
 - (see files AMMch05)
- Inspection intervals are given in:
 - Aircraft Flight Time (hours);
 - Aircraft Landings;
 - Calendar Time (days, months or years);
 - Engine Time (hours);
 - Engine Cycles (flight consisting of an acceleration to takeoff power, takeoff and landing);
 - Component Hours/Cycles (e.g. APU H, wheels landings)

Maintenance Plan

- Aircraft Maintenance Program (cont.);
 - Flexible Maintenance Program: is a recommended scheduled maintenance program, which provides operators a window in which to perform tasks due at a specific interval. Use of the Flexible Maintenance Program may be subject to national/local regulatory approval.
 - (see files MPD4-1)
 - Equalized Maintenance Program (EMP): is a manufacturer's recommended program that allows the operator to distribute scheduled maintenance tasks in smaller allocations thereby improving aircraft availability. The EMP includes the hourly and monthly tasks from the MRB section of the TLMC manual. Use of Equalized Maintenance program may be subject to national and/or local regulatory approval.
 - (see files MPD5-1)

Maintenance Plan

- Aircraft Maintenance Program must comply with:
 - EASA Parte M, appendix I to AMC M.A. 302.;
 - CTI 01-01 Ed04 (Portuguese Regulation)
- Aircraft Maintenance Program must contain:
 - (i) instructions issued by the competent authority;
 - (ii) instructions for continuing airworthiness issued by the holders of the type certificate, restricted type-certificate, supplemental type-certificate, major repair design approval, ETSO authorisation or any other relevant approval issued under Regulation (EC) No 1702/2003 and its Annex (Part-21);
 - (iii) additional or alternative instructions proposed by the owner or the continuing airworthiness management organisation once approved in accordance with point M.A.302, except for intervals of safety related tasks referred in paragraph (e), which may be escalated, subject to sufficient reviews carried out in accordance with paragraph (g) and only when subject to direct approval in accordance with point M.A.302(b).

Maintenance Plan

- Aircraft Maintenance Program must comply with:
 - (e) The aircraft maintenance programme shall contain details, including frequency, of all maintenance to be carried out, including any specific tasks linked to the type and the specificity of operations.
 - (f) For large aircraft, when the maintenance programme is based on maintenance steering group logic or on condition monitoring, the aircraft maintenance programme shall include a reliability programme.
 - (g) The aircraft maintenance programme shall be subject to periodic reviews and amended accordingly when necessary. These reviews will ensure that the programme continues to be valid in light of the operating experience and instructions from the competent authority whilst taking into account new and/or modified maintenance instructions promulgated by the type certificate and supplementary type certificate holders and any other organisation that publishes such data in accordance with Annex (Part-21) to Regulation (EC) No 1702/2003.