

Module 11C. Piston, Aeroplane Aerodynamics, Structures and Systems

Note: The scope of this module shall reflect the technology of aeroplanes pertinent to the B3 category.

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11.1 Theory of Flight	
<p><i>Aeroplane Aerodynamics and Flight Controls</i></p> <p>Operation and effect of: — roll control: ailerons, — pitch control: elevators, stabilators, variable incidence stabilisers and canards, — yaw control, rudder limiters;</p> <p>Control using elevons, ruddervators;</p> <p>High lift devices, slots, slats, flaps, flaperons;</p> <p>Drag inducing devices, lift dumpers, speed brakes;</p> <p>Effects of wing fences, saw tooth leading edges;</p> <p>Boundary layer control using, vortex generators, stall wedges or leading edge devices;</p> <p>Operation and effect of trim tabs, balance and anti-balance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels.</p>	1
11.2 Airframe Structures — General Concepts	
<p>(a) Airworthiness requirements for structural strength;</p> <p>Structural classification, primary, secondary and tertiary;</p> <p>Fail safe, safe life, damage tolerance concepts;</p> <p>Zonal and station identification systems;</p> <p>Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue;</p> <p>Drains and ventilation provisions;</p> <p>System installation provisions;</p> <p>Lightning strike protection provision;</p> <p>Aircraft bonding;</p>	2
<p>(b) Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments;</p> <p>Structure assembly techniques: riveting, bolting, bonding;</p> <p>Methods of surface protection, such as chromating, anodising, painting;</p> <p>Surface cleaning;</p> <p>Airframe symmetry: methods of alignment and symmetry checks.</p>	2
11.3 Airframe Structures — Aeroplanes	
11.3.1 Fuselage (ATA 52/53/56)	
<p>Construction;</p> <p>Wing, tail-plane, pylon and undercarriage attachments;</p>	1

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<p>Seat installation;</p> <p>Doors and emergency exits: construction and operation;</p> <p>Window and windscreen attachment.</p>	
<p>11.3.2 <i>Wings (ATA 57)</i></p> <p>Construction;</p> <p>Fuel storage;</p> <p>Landing gear, pylon, control surface and high lift/drag attachments.</p>	1
<p>11.3.3 <i>Stabilisers (ATA 55)</i></p> <p>Construction;</p> <p>Control surface attachment.</p>	1
<p>11.3.4 <i>Flight Control Surfaces (ATA 55/57)</i></p> <p>Construction and attachment;</p> <p>Balancing — mass and aerodynamic.</p>	1
<p>11.3.5 <i>Nacelles/Pylons (ATA 54)</i></p> <p>Nacelles/Pylons:</p> <ul style="list-style-type: none"> — Construction, — Firewalls, — Engine mounts. 	1
<p>11.4 Air Conditioning (ATA 21)</p> <p>Heating and ventilation systems.</p>	1
<p>11.5 Instruments/Avionic Systems</p>	
<p>11.5.1 <i>Instrument Systems (ATA 31)</i></p> <p>Pitot static: altimeter, air speed indicator, vertical speed indicator;</p> <p>Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator;</p> <p>Compasses: direct reading, remote reading;</p> <p>Angle of attack indication, stall warning systems;</p> <p>Glass cockpit;</p> <p>Other aircraft system indication.</p>	1
<p>11.5.2 <i>Avionic Systems</i></p> <p>Fundamentals of system lay-outs and operation of:</p> <ul style="list-style-type: none"> — Auto Flight (ATA 22), — Communications (ATA 23), — Navigation Systems (ATA 34). 	1

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11.6 Electrical Power (ATA 24) Batteries Installation and Operation; DC power generation; Voltage regulation; Power distribution; Circuit protection; Inverters, transformers.	2
11.7 Equipment and Furnishings (ATA 25) Emergency equipment requirements; Seats, harnesses and belts.	2
11.8 Fire Protection (ATA 26) Portable fire extinguisher.	2
11.9 Flight Controls (ATA 27) Primary controls: aileron, elevator, rudder; Trim tabs; High lift devices; System operation: manual; Gust locks; Balancing and rigging; Stall warning system.	3
11.10 Fuel Systems (ATA 28) System lay-out; Fuel tanks; Supply systems; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling.	2
11.11 Hydraulic Power (ATA 29) System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical; Filters; Pressure Control;	2

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Power distribution; Indication and warning systems.	
11.12 Ice and Rain Protection (ATA 30) Ice formation, classification and detection; De-icing systems: electrical, hot air, pneumatic and chemical; Probe and drain heating; Wiper systems.	1
11.13 Landing Gear (ATA 32) Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering.	2
11.14 Lights (ATA 33) External: navigation, anti collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	2
11.15 Oxygen (ATA 35) System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	2
11.16 Pneumatic/Vacuum (ATA 36) System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure and vacuum pumps Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	2