

# Module 11b

## Piston Aeroplane Aerodynamics, Structures and Systems

### Level

Note: The scope of this module should reflect the technology of aeroplanes pertinent to the A2 and B1.2 subcategory

### 11.1 Theory of Flight

A2 B1.2 B2

Aeroplane Aerodynamics and Flight Controls

1 2 -

Operation and effect of:

- roll control: ailerons and spoilers;
- pitch control: elevators, stabilators, variable incidence stabilisers and canards;
- yaw control, rudder limiters;

Controls using elevons, ruddervators;

High lift devices, slats, flaps, flaperons;

Drag inducing devices, spoilers, lift dumpers, speed brakes;

Effects of wing fences, saw tooth leading edges;

Boundary layer control using, vortex generators, stall wedges or leading edge devices;

Operation and effect of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels;

High Speed Flight - N/A

- - -

### 11.2 Airframe Structures - General Concepts

A2 B1.2 B2

a)

2 2 -

Airworthiness requirements for structural strength;

Structural classification, primary, secondary and tertiary;

Fail safe, safe life, damage tolerance concepts;

Zonal and station identification systems;

Stress, strain, bending, compression, shear, torsion, tension, hoop stress fatigue;

Drains and ventilation provisions;

System installation provisions;

Lightning strike protection provision;

Aircraft bonding.

b)

1 2 -

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;

Structure assembly techniques: riveting, bolting, bonding;

Methods of surface protection, such as chromating, anodising, painting;

Surface cleaning;

Airframe symmetry: methods of alignment and symmetry checks.

### 11.3 Airframe Structures - Aeroplanes

A2 B1.2 B2

Fuselage (ATA 52/53/56)

1 2 -

Construction and pressurisation sealing;

Wing, stabiliser, pylon and undercarriage attachments;

Seat installation and cargo loading system;

Doors and emergency exits: construction, mechanisms, operation and safety devices;

Windows and windscreen attachment;

Wings (ATA 57)

1 2 -

Construction;

Fuel storage;

Landing gear, pylon, control surface and high lift/drag attachments;

Stabilisers (ATA 55)

1 2 -

Construction;

Control surface attachment;

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Flight Control Surfaces (ATA 55/57) Construction and attachment; Balancing - mass and aerodynamic;	1	2	-
Nacelles/Pylons (ATA 54) Construction; Firewalls; Engine mounts.	1	2	-
<b>11.4 Air Conditioning and Cabin Pressurisation (ATA 21)</b>	A2	B1.2	B2
Pressurisation and Air Conditioning systems; Cabin pressure controllers, protection and warning devices.	1	3	-
<b>11.5 Instruments / Avionic Systems</b>	A2	B1.2	B2
Instrument Systems (ATA 31) Pilot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Angle of attack indication, stall warning systems; Other aircraft system indication.	1	2	-
Avionic Systems Fundamentals of system layouts and operation of: Auto Flight (ATA 22); Communications (ATA 23); Navigation Systems (ATA 34).	1	1	-
<b>11.6 Electrical Power (ATA 24)</b>	A2	B1.2	B2
Batteries Installation and Operation; DC power generation; Voltage regulation; Power distribution; Circuit protection; Inverters, transformers.	1	3	-
<b>11.7 Equipment and Furnishings (ATA 25)</b>	A2	B1.2	B2
a) Emergency equipment requirements; Seats, harnesses and belts;	2	2	-
b) Cabin layout; Equipment layout; Cabin Furnishing Installation(level 2); Cabin entertainment equipment; Galley installation; Cargo handling and retention equipment; Airstairs.	1	1	-



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	A2	B1.2	B2
<b>11.8 Fire Protection (ATA 26)</b>	A2	B1.2	B2
a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.	1	3	-
b) Portable fire extinguisher.	1	3	-
<b>11.9 Flight Controls (ATA 27)</b>	A2	B1.2	B2
Primary controls: aileron, elevator, rudder, spoiler; Trim control; High lift devices; System operation: manual; Gust locks; Balancing and rigging; Stall warning system.	1	3	-
<b>11.10 Fuel Systems (ATA 28)</b>	A2	B1.2	B2
System layout; Fuel tanks; Supply systems; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling;	1	3	-
<b>11.11 Hydraulic Power (ATA 29)</b>	A2	B1.2	B2
System layout; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Pressure Control; Power distribution; Indication and warning systems;	1	3	-
<b>11.12 Ice and Rain Protection (ATA 30)</b>	A2	B1.2	B2
Ice formation, classification and detection; De-icing systems: electrical, hot air, pneumatic and chemical; Probe and drain heating; Wiper systems.	1	3	-
<b>11.13 Landing Gear (ATA 32)</b>	A2	B1.2	B2
Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, anti-skid and autobraking; Tyres; Steering.	2	3	-



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	A2	B1.2	B2
11.14 Lights (ATA 33)	A2	B1.2	B2
External: navigation, anti-collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	2	2	-
11.15 Oxygen (ATA 35)	A2	B1.2	B2
System layout: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	1	3	-
11.16 Pneumatic/Vacuum (ATA 36)	A2	B1.2	B2
System layout; Sources: engine / APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	1	3	-
11.17 Water/Waste (ATA 38)	A2	B1.2	B2
Water system layout, supply, distribution, servicing and draining; Toilet system layout, flushing and servicing; Corrosion aspects.	2	3	-

