

MODULE 11A. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

	Level		
	A1	B1.1	B2
<b>11.1 Theory of Flight</b>			
11.1.1 <i>Aeroplane Aerodynamics and Flight Controls</i>	1	2	—
Operation and effect of:			
— roll control: ailerons and spoilers;			
— pitch control: elevators, stabilators, variable incidence stabilisers and canards;			
— yaw control, rudder limiters;			
Control using elevons, ruddervators;			
High lift devices, slots, slats, flaps, flaperons;			

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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;			
11.1.2 <i>High Speed Flight</i>	1	2	—
Speed of sound, subsonic flight, transonic flight, supersonic flight,			
Mach number, critical Mach number, compressibility buffet, shock wave, aerodynamic heating, area rule;			
Factors affecting airflow in engine intakes of high speed aircraft;			
Effects of sweepback on critical Mach number.			
<b>11.2 Airframe Structures — General Concepts</b>			
(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;			

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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.			
<b>11.3 Airframe Structures — Aeroplanes</b>			
11.3.1 <i>Fuselage (ATA 52/53/56)</i>	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 construction and mechanisms.			
11.3.2 <i>Wings (ATA 57)</i>	1	2	—
Construction;			
Fuel storage;			
Landing gear, pylon, control surface and high lift/drag attachments.			
11.3.3 <i>Stabilisers (ATA 55)</i>	1	2	—
Construction;			
Control surface attachment.			
11.3.4 <i>Flight Control Surfaces (ATA 55/57)</i>	1	2	—
Construction and attachment;			
Balancing — mass and aerodynamic.			
11.3.5 <i>Nacelles/Pylons (ATA 54)</i>	1	2	—
Construction;			
Firewalls;			
Engine mounts.			
<b>11.4 Air Conditioning and Cabin Pressurisation (ATA 21)</b>			
11.4.1 <i>Air supply</i>	1	2	—
Sources of air supply including engine bleed, APU and ground cart;			

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11.4.2 <i>Air Conditioning</i> Air conditioning systems; Air cycle and vapour cycle machines; Distribution systems; Flow, temperature and humidity control system.	1	3	—
11.4.3 <i>Pressurisation</i> Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers.	1	3	—
11.4.4 <i>Safety and warning devices</i> Protection and warning devices.	1	3	—
<b>11.5 Instruments/Avionic Systems</b>			
11.5.1 <i>Instrument Systems (ATA 31)</i> Pitot 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	—
11.5.2 <i>Avionic Systems</i> Fundamentals of system lay-outs and operation of; Auto Flight (ATA 22); Communications (ATA 23); Navigation Systems (ATA 34).	1	1	—
11.6 <b>Electrical Power (ATA 24)</b> Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection. External/Ground power;	1	3	—

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<b>11.7 Equipment and Furnishings (ATA 25)</b>			
(a)	2	2	—
Emergency equipment requirements;			
Seats, harnesses and belts.			
(b)	1	1	—
Cabin lay-out;			
Equipment lay-out;			
Cabin Furnishing Installation;			
Cabin entertainment equipment;			
Galley installation;			
Cargo handling and retention equipment;			
Airstairs.			
<b>11.8 Fire Protection (ATA 26)</b>	1	3	—
(a)			
Fire and smoke detection and warning systems;			
Fire extinguishing systems;			
System tests.			
(b)			
Portable fire extinguisher	1	1	—
<b>11.9 Flight Controls (ATA 27)</b>	1	3	—
Primary controls: aileron, elevator, rudder, spoiler;			
Trim control;			
Active load control;			
High lift devices;			
Lift dump, speed brakes;			
System operation: manual, hydraulic, pneumatic, electrical, fly-by-wire;			
Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks systems;			
Balancing and rigging;			
Stall protection/warning system.			

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<b>11.10 Fuel Systems (ATA 28)</b>	1	3	—
System lay-out;			
Fuel tanks;			
Supply systems;			
Dumping, venting and draining;			
Cross-feed and transfer;			
Indications and warnings;			
Refuelling and defuelling;			
Longitudinal balance fuel systems.			
<b>11.11 Hydraulic Power (ATA 29)</b>	1	3	—
System lay-out;			
Hydraulic fluids;			
Hydraulic reservoirs and accumulators;			
Pressure generation: electric, mechanical, pneumatic;			
Emergency pressure generation;			
Pressure Control;			
Power distribution;			
Indication and warning systems;			
Interface with other systems.			
<b>11.12 Ice and Rain Protection (ATA 30)</b>	1	3	—
Ice formation, classification and detection;			
Anti-icing systems: electrical, hot air and chemical;			
De-icing systems: electrical, hot air, pneumatic and chemical;			
Rain repellent;			
Probe and drain heating.			
Wiper systems			
<b>11.13 Landing Gear (ATA 32)</b>	2	3	—
Construction, shock absorbing;			
Extension and retraction systems: normal and emergency;			
Indications and warning;			
Wheels, brakes, antiskid and autobraking;			
Tyres;			
Steering.			

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<p><b>11.14 Lights (ATA 33)</b></p> <p>External: navigation, anti-collision, landing, taxiing, ice;</p> <p>Internal: cabin, cockpit, cargo;</p> <p>Emergency.</p>	2	3	—
<p><b>11.15 Oxygen (ATA 35)</b></p> <p>System lay-out: cockpit, cabin;</p> <p>Sources, storage, charging and distribution;</p> <p>Supply regulation;</p> <p>Indications and warnings;</p>	1	3	—
<p><b>11.16 Pneumatic/Vacuum (ATA 36)</b></p> <p>System lay-out;</p> <p>Sources: engine/APU, compressors, reservoirs, ground supply;</p> <p>Pressure control;</p> <p>Distribution;</p> <p>Indications and warnings;</p> <p>Interfaces with other systems.</p>	1	3	—
<p><b>11.17 Water/Waste (ATA 38)</b></p> <p>Water system lay-out, supply, distribution, servicing and draining;</p> <p>Toilet system lay-out, flushing and servicing;</p> <p>Corrosion aspects.</p>	2	3	—
<p><b>11.18 On Board Maintenance Systems (ATA 45)</b></p> <p>Central maintenance computers;</p> <p>Data loading system;</p> <p>Electronic library system;</p> <p>Printing;</p> <p>Structure monitoring (damage tolerance monitoring).</p>	1	2	—