

# Module 11a

## Turbine Aeroplane Aerodynamics, Structures and Systems

	Level		
	A1	B1.1	B2
<b>11.1 Theory of Flight</b>			
Aeroplane Aerodynamics and Flight Controls 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;	1	2	-
High Speed Flight 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.	1	2	-
<b>11.2 Airframe Structures - General Concepts</b>	A1	B1.1	B2
a) 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.	2	2	-
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; 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.	1	2	-
<b>11.3 Airframe Structures - Aeroplanes</b>			
Fuselage (ATA 52/53/56) 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;	1	2	-
Wings (ATA 57) Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments;	1	2	-
Stabilisers (ATA 55) Construction; Control surface attachment;	1	2	-

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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>	<b>A1</b>	<b>B1.1</b>	<b>B2</b>
Air supply Sources of air supply including engine bleed, APU and ground cart;	1	2	-
Air Conditioning Air conditioning systems; Air cycle and vapour cycle machines; Distribution systems; Flow, temperature and humidity control system;	1	3	-
Pressurisation Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers; Safety and warning devices; Protection and warning devices.	1	3	-
<b>11.5 Instruments / Avionic Systems</b>	<b>A1</b>	<b>B1.1</b>	<b>B2</b>
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>	<b>A1</b>	<b>B1.1</b>	<b>B2</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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	A1	B1.1	B2
<b>11.7 Equipment and Furnishings (ATA 25)</b>	A1	B1.1	B2
a) Emergency equipment requirements; Seats, harnesses and belts;	2	2	-
b) Cabin layout; Equipment layout; Cabin Furnishing Installation; Cabin entertainment equipment; Galley installation; Cargo handling and retention equipment; Airstairs	1	1	-
<b>11.8 Fire Protection (ATA 26)</b>	A1	B1.1	B2
a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.	1	3	-
b) Portable fire extinguisher.	1	1	-
<b>11.9 Flight Controls (ATA 27)</b>	A1	B1.1	B2
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 system; Balancing and rigging; Stall protection/warning system.	1	3	-
<b>11.10 Fuel Systems (ATA 28)</b>	A1	B1.1	B2
System layout; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling; Longitudinal balance fuel systems.	1	3	-
<b>11.11 Hydraulic Power (ATA 29)</b>	A1	B1.1	B2
System layout; 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.	1	3	-



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<b>11.12 Ice and Rain Protection (ATA 30)</b> 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.	1	3	-
<b>11.13 Landing Gear (ATA 32)</b> Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering.	2	3	-
<b>11.14 Lights (ATA 33)</b> External: navigation, anti-collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	2	3	-
<b>11.15 Oxygen (ATA 35)</b> System layout: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	1	3	-
<b>11.16 Pneumatic/Vacuum (ATA 36)</b> System layout; Sources: engine / APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	1	3	-
<b>11.17 Water/Waste (ATA 38)</b> Water system layout, supply, distribution, servicing and draining; Toilet system layout, flushing and servicing; Corrosion aspects.	2	3	-
<b>11.18 On Board Maintenance Systems (ATA 45)</b> Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	1	2	-

