

MODULE 12. HELICOPTER AERODYNAMICS, STRUCTURES AND SYSTEMS

	Level		
	A3 A4	B1.3 B1.4	B2
12.1 Theory of Flight — Rotary Wing Aerodynamics	1	2	—
Terminology;			
Effects of gyroscopic precession;			
Torque reaction and directional control;			
Dissymmetry of lift, Blade tip stall;			
Translating tendency and its correction;			
Coriolis effect and compensation;			
Vortex ring state, power settling, overpitching;			
Auto-rotation;			
Ground effect.			
12.2 Flight Control Systems	2	3	—
Cyclic control;			
Collective control;			
Swashplate;			
Yaw control: Anti-Torque Control, Tail rotor, bleed air;			
Main Rotor Head: Design and Operation features;			
Blade Dampers: Function and construction;			
Rotor Blades: Main and tail rotor blade construction and attachment;			
Trim control, fixed and adjustable stabilisers;			
System operation: manual, hydraulic, electrical and fly-by-wire;			
Artificial feel;			
Balancing and Rigging.			

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12.3 Blade Tracking and Vibration Analysis	1	3	—
Rotor alignment;			
Main and tail rotor tracking;			
Static and dynamic balancing;			
Vibration types, vibration reduction methods;			
Ground resonance.			
12.4 Transmissions	1	3	—
Gear boxes, main and tail rotors;			
Clutches, free wheel units and rotor brake.			
12.5 Airframe Structures			
(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.			
(b)	1	2	—
Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning and anti-corrosive protection.			
Pylon, stabiliser and undercarriage attachments;			
Seat installation;			
Doors: construction, mechanisms, operation and safety devices;			
Windows and windscreen construction;			
Fuel storage;			
Firewalls;			
Engine mounts;			
Structure assembly techniques: riveting, bolting, bonding;			

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Methods of surface protection, such as chromating, anodising, painting;			
Surface cleaning.			
Airframe symmetry: methods of alignment and symmetry checks.			
12.6 Air Conditioning (ATA 21)			
12.6.1 <i>Air supply</i>	1	2	—
Sources of air supply including engine bleed and ground cart;			
12.6.2 <i>Air Conditioning</i>	1	3	—
Air conditioning systems;			
Distribution systems;			
Flow and temperature control systems;			
Protection and warning devices.			
12.7 Instruments/Avionic Systems			
12.7.1 <i>Instrument Systems (ATA 31)</i>	1	2	—
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;			
Vibration indicating systems — HUMS;			
Other aircraft system indication.			
12.7.2 <i>Avionic Systems</i>	1	1	—
Fundamentals of system layouts and operation of:			
Auto Flight (ATA 22);			
Communications (ATA 23);			
Navigation Systems (ATA 34).			
12.8 Electrical Power (ATA 24)	1	3	—
Batteries Installation and Operation;			
DC power generation, AC power generation;			
Emergency power generation;			
Voltage regulation, Circuit protection.			
Power distribution;			
Inverters, transformers, rectifiers;			
External/Ground power.			
12.9 Equipment and Furnishings (ATA 25)			
(a)	2	2	—
Emergency equipment requirements;			

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Seats, harnesses and belts;			
Lifting systems.			
(b)	1	1	—
Emergency flotation systems;			
Cabin lay-out, cargo retention;			
Equipment lay-out;			
Cabin Furnishing Installation.			
12.10 Fire Protection (ATA 26)	1	3	—
Fire and smoke detection and warning systems;			
Fire extinguishing systems;			
System tests.			
12.11 Fuel Systems (ATA 28)	1	3	—
System lay-out;			
Fuel tanks;			
Supply systems;			
Dumping, venting and draining;			
Cross-feed and transfer;			
Indications and warnings;			
Refuelling and defuelling.			
12.12 Hydraulic Power (ATA 29)	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.			

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<p>12.13 Ice and Rain Protection (ATA 30)</p> <p>Ice formation, classification and detection;</p> <p>Anti-icing and de-icing systems: electrical, hot air and chemical;</p> <p>Rain repellent and removal;</p> <p>Probe and drain heating.</p>	1	3	—
<p>12.14 Landing Gear (ATA 32)</p> <p>Construction, shock absorbing;</p> <p>Extension and retraction systems: normal and emergency;</p> <p>Indications and warning;</p> <p>Wheels, tyres, brakes;</p> <p>Steering;</p> <p>Skids, floats.</p>	2	3	—
<p>12.15 Lights (ATA 33)</p> <p>External: navigation, landing, taxiing, ice;</p> <p>Internal: cabin, cockpit, cargo;</p> <p>Emergency.</p>	2	3	—
<p>12.16 Pneumatic/Vacuum (ATA 36)</p> <p>System lay-out;</p> <p>Sources: engine, 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	—