

# Module 13

## Aircraft Aerodynamics, Structures and Systems

	Level		
	A	B1	B2
<b>13.1 Theory of Flight</b>	A	B1	B2
a) 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 and canards; Control using elevons, ruddervators; High lift devices: slots, slats, flaps; Drag inducing devices: spoilers, lift dumpers, speed brakes; Operation and effect of trim tabs, servo tabs, control surface bias;	-	-	1
b) High Speed Flight Speed of sound, subsonic flight, transonic flight, supersonic flight; Mach number, critical Mach number;	-	-	1
c) Rotary Wing Aerodynamics Terminology; Operation and effect of cyclic, collective and anti -torque controls;	-	-	1
<b>13.2 Structures - General Concepts</b>	A	B1	B2
a) Fundamentals of structural systems;	-	-	1
b) Zonal and station identification systems; Electrical bonding; Lightning strike protection provision.	-	-	2
<b>13.3 Autoflight (ATA 22)</b>	A	B1	B2
Fundamentals of automatic flight control including working principles and current terminology; Command signal processing; Modes of operation: roll, pitch and yaw channels; Yaw dampers; Stability Augmentation System in helicopters; Automatic trim control; Autopilot navigation aids interface; Autothrottle systems; Automatic Landing Systems: principles and categories, modes of operation, approach, glideslope, land, go-around, system monitors and failure conditions.	-	-	3



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<b>13.4 Communication / Navigation (ATA 23/34)</b>	A	B1	B2
Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter;	-	-	3
Working principles of the following systems:			
-Very High Frequency (VHF)communication;			
- High Frequency (HF)communication;			
- Audio;			
- Emergency Locator Transmitters;			
- Cockpit Voice Recorder;			
- Very High Frequency omnidirectional range (VOR);			
- Automatic Direction Finding (ADF);			
- Instrument Landing System (ILS);			
- Microwave Landing System (MLS);			
- Flight Directors stems, Distance Measuring Equipment (DME);			
- Very Low Frequency and hyperbolic navigation (VLF/Omega);			
- Doppler navigation;			
- Area navigation, RNAV systems;			
- Flight Management Systems;			
- Global Positioning System (GPS), Global Navigation Satellite Systems(GNSS);			
- Inertial Navigation System;			
- Air Traffic Control transponder, secondary surveillance radar;			
- Traffic Alert and Collision Avoidance System (TCAS);			
- Weather avoidance radar;			
- Radio altimeter;			
- ARINC communication and reporting.			
<b>13.5 Electrical Power (ATA 24)</b>	A	B1	B2
Batteries Installation and Operation;	-	-	3
DC power generation;			
AC power generation;			
Emergency power generation;			
Voltage regulation;			
Power distribution;			
Inverters, transformers, rectifiers;			
Circuit protection;			
External Ground power.			
<b>13.6 Equipment and Furnishings (ATA 25)</b>	A	B1	B2
Electronic emergency equipment requirements;	-	-	3
Cabin entertainment equipment			
<b>13.7 Flight Controls (ATA 27)</b>	A	B1	B2
a)	-	-	1
Primary controls: aileron, elevator, rudder, spoiler;			
Trim control;			
Active load control;			
High lift devices;			
Lift dump, speed brakes;			
System operation: manual, hydraulic, pneumatic;			
Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks;			
Stall protection systems.			
b)	-	-	2
System operation: electrical, fly by wire.			

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<b>13.8 Instrument Systems (ATA 31)</b>			
Classification; Atmosphere; Terminology; Pressure measuring devices and systems; Pilot static systems; Altimeters; Vertical speed indicators; Airspeed indicators; Machmeters; Altitude reporting / alerting systems; Air data computers; Instrument pneumatic systems; Direct reading pressure and temperature gauges; Temperature indicating systems; Fuel quantity indicating systems; Gyroscopic principles; Artificial horizons; Slip indicators; Ground Proximity Warning Systems; Directional gyros; Compass systems; Flight Data Recording systems; Electronic Flight Instrument Systems; Instrument warning systems including master warning systems and centralised; Stall warning systems and angle of attack indicating systems; Vibration measurement and indication.	-	-	2
<b>13.9 Lights (ATA 33)</b>	A	B1	B2
External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	-	-	3
<b>13.10 On Board Maintenance Systems (ATA 45)</b>	A	B1	B2
Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	-	-	2

