



Part 66 B2L AME Avionics Trade Training Syllabi and Learning Levels

Nominal Course hours: B2L 1500 hours plus systems ranging from 40 – 100 hours

Source: Appendix 1, EASR Part 147

Compiled from EASR Part 66 **Licensing:** Module 10 at end. **Post Trade**

Subject modules	B2L Avionics
1 Mathematics	X
2 Physics	X
3 Electrical fundamentals	X
4 Electronic fundamentals	X
5 Digital techniques electronic instrument systems	X
6 Materials and hardware	X
7A Maintenance practices	X
7B Maintenance practices	
8 Basic aerodynamics	X
9 Human factors	X
9B Human factors	
10 Aviation legislation	X
11A Turbine aeroplane aerodynamics, structures and systems	
11B Piston aeroplane aerodynamics, structures and systems	
11C Piston aeroplane aerodynamics, structures and systems	
12 Helicopter aerodynamics, structures and systems	X
13 Aircraft aerodynamics, structures and systems	
13.1 & 13.2	X
13.3(b)	X
13.5	X
13.9	X
13.19 to 13.22	X
13.3(a)	X <i>(for system rating 'Autoflight') (+80 hours)</i>
13.4(a)	X <i>(for system rating 'Com/Nav') (+90)</i>
13.4(b)	X <i>(for system rating 'Surveillance') (+40)</i>
13.7	X <i>(for system rating 'Autoflight') (+80)</i>
13.8	X <i>(for system rating 'Instruments') (+55)</i>
13.11 to 13.18	X <i>(for system rating 'Airframe systems') (+100)</i>
14 Propulsion Avionics	X <i>(for system rating 'instruments' and 'Airframe systems')</i>



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Module 1 Mathematics	Level of knowledge for the category	MEA Units
	B2L	
1.1 Arithmetic	2	
Arithmetical terms and signs, methods of multiplication and division, fractions and decimals, factors and multiples, weights, measures and conversion factors, ratio and proportion, averages and percentages, areas and volumes, squares, cubes, square and cube roots.		
1.2 Algebra	2	
(a) Evaluating simple algebraic expressions, addition, subtraction, multiplication and division, use of brackets, simple algebraic fractions;		
(b) Linear equations and their solutions; Indices and powers, negative and fractional indices; Binary and other applicable numbering systems; Simultaneous equations and second degree equations with one unknown; Logarithms.	1	
1.3 Geometry	1	
(a) Simple geometrical constructions;		
(b) Graphical representation, nature and uses of graphs, graphs of equations and functions;		
(c) Simple trigonometry, trigonometrical relationships, use of tables and rectangular and polar coordinates.	2	



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Module 2 Physics	Level of knowledge for the category	MEA Units
	B2L	
2.1 Matter	1	
Nature of matter: the chemical elements, structure of atoms, molecules; Chemical compounds; States: solid, liquid and gaseous; Changes between states.		
2.2 Mechanics	1	
2.2.1 Statics Forces, moments and couples, representation as vectors; Centre of gravity; Elements of theory of stress, strain and elasticity: tension, compression, shear and torsion; Nature and properties of solid, fluid and gas; Pressure and buoyancy in liquids (barometers).		
2.2.2 Kinetics	1	
Linear movement: uniform motion in a straight line, motion under constant acceleration (motion under gravity); Rotational movement: uniform circular motion (centrifugal and centripetal forces); Periodic motion: pendular movement; Simple theory of vibration, harmonics and resonance; Velocity ratio, mechanical advantage and efficiency.		
2.2.3 Dynamics	1	
(a) Mass; Force, inertia, work, power, energy (potential, kinetic and total energy), heat, efficiency;		
(b) Momentum, conservation of momentum; Impulse; Gyroscopic principles; Friction: nature and effects, coefficient of friction (rolling resistance).	1	
2.2.4 Fluid dynamics	2	
(a) Specific gravity and density;		
(b) Viscosity, fluid resistance, effects of streamlining; Effects of compressibility on fluids; Static, dynamic and total pressure: Bernoulli's Theorem, venturi.	1	
2.3 Thermodynamics	2	
(a) Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin, heat definition;		



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Module 2 Physics	Level of knowledge for the category	MEA Units
	B2L	
(b) Heat capacity, specific heat; Heat transfer: convection, radiation and conduction; Volumetric expansion; First and second law of thermodynamics; Gases: ideal gases laws, specific heat at constant volume and constant pressure, work done by expanding gas; Isothermal, adiabatic expansion and compression, engine cycles, constant volume and constant pressure, refrigerators and heat pumps; Latent heats of fusion and evaporation, thermal energy, heat of combustion.	2	
2.4 Optics (light)	2	
Nature of light, speed of light; Laws of reflection and refraction: reflection at plane surfaces, reflection by spherical mirrors, refraction, lenses; Fiberoptics.		
2.5 Wave motion and sound	2	
Wave motion: mechanical waves, sinusoidal wave motion, interference phenomena, standing waves; Sound: speed of sound, production of sound, intensity, pitch and quality, Doppler effect.		

Module 3 Electrical fundamentals	Level of knowledge for the category	MEA Units
	B2L	
3.1 Electron theory	1	
Structure and distribution of electrical charges within atoms, molecules, ions, compounds; Molecular structure of conductors, semiconductors and insulators.		
3.2 Static electricity and conduction	2	
Static electricity and distribution of electrostatic charges; Electrostatic laws of attraction and repulsion; Units of charge, Coulomb's Law; Conduction of electricity in solids, liquids, gases and vacuum.		
3.3 Electrical terminology	2	
The following terms, their units and factors affecting them: potential difference, electromotive force, voltage, current, resistance, conductance, charge, conventional current flow, electron flow.		
3.4 Generation of electricity	1	
Production of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.		



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Module 3 Electrical fundamentals	Level of knowledge for the category	MEA Units
	B2L	
3.5 DC Sources of electricity	2	
Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, other Alkaline cells; Cells connected in series and parallel; Internal resistance and its effect on a battery; Construction, materials and operation of thermocouples; Operation of photo-cells.		
3.6 DC circuits	2	
Ohms Law, Kirchoff's Voltage and Current Laws; Calculations using the above laws to find resistance, voltage and current; Significance of the internal resistance of a supply.		
3.7 Resistance and resistor	2	
(a) Resistance and affecting factors; Specific resistance; Resistor colour code, values and tolerances, preferred values, wattage ratings; Resistors in series and parallel; Calculation of total resistance using series parallel and series parallel combinations; Operation and use of potentiometers and rheostats; Operation of Wheatstone Bridge;		
(b) Positive and negative temperature coefficient conductance; Fixed resistors, stability, tolerance and limitations, methods of construction; Variable resistors, thermistors, voltage dependent resistors; Construction of potentiometers and rheostats; Construction of Wheatstone Bridge.		
3.8 Power	2	
Power, work and energy (kinetic and potential); Dissipation of power by a resistor; Power formula; Calculations involving power, work and energy.		
3.9 Capacitance and capacitor	2	
Operation and function of a capacitor; Factors affecting capacitance area of plates, distance between plates, number of plates, dielectric and dielectric constant, working voltage, voltage rating; Capacitor types, construction and function; Capacitor colour coding; Calculations of capacitance and voltage in series and parallel circuits; Exponential charge and discharge of a capacitor, time constants; Testing of capacitors.		



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Module 3 Electrical fundamentals	Level of knowledge for the category	MEA Units
	B2L	
3.10 Magnetism		
(a) Theory of magnetism; Properties of a magnet; Action of a magnet suspended in the Earth's magnetic field; Magnetisation and demagnetisation; Magnetic shielding; Various types of magnetic material; Electromagnets construction and principles of operation; Hand clasp rules to determine: magnetic field around current carrying conductor.	2	
(b) Magneto-motive force, field strength, magnetic flux density, permeability, hysteresis loop, retentivity, coercive force reluctance, saturation point, eddy currents; Precautions for care and storage of magnets.	2	
3.11 Inductance and inductor		
Faraday's Law; Action of inducing a voltage in a conductor moving in a magnetic field; Induction principles; Effects of the following on the magnitude of an induced voltage: magnetic field strength, rate of change of flux, number of conductor turns; Mutual induction; The effect the rate of change of primary current and mutual inductance has on induced voltage; Factors affecting mutual inductance: number of turns in coil, physical size of coil, permeability of coil, position of coils with respect to each other; Lenz's Law and polarity determining rules; Back emf, self-induction; Saturation point; Principal uses of inductors.	2	
3.12 DC motor and generator theory		
Basic motor and generator theory; Construction and purpose of components in DC generator; Operation of, and factors affecting output and direction of, current flow in DC generators; Operation of, and factors affecting output power, torque, speed and direction of rotation of DC motors; Series wound, shunt wound and compound motors; Starter generator construction.	2	
3.13 AC theory		
Sinusoidal waveform: phase, period, frequency, cycle; Instantaneous, average, root mean square, peak, peak to peak current values and calculations of these values, in relation to voltage, current and power; Triangular and square waves; Single and 3 phase principles.	2	
3.14 Resistive (R), Capacitive (C) and Inductive (L) Circuits		
Phase relationship of voltage and current in L, C and R circuits, parallel, series and series parallel; Power dissipation in L, C and R circuits; Impedance, phase angle, power factor and current calculations;	2	



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Module 3 Electrical fundamentals	Level of knowledge for the category	MEA Units
	B2L	
True power, apparent power and reactive power calculations.		
3.15 Transformers	2	
Transformer construction principles and operation; Transformer losses and methods for overcoming them; Transformer action under load and no-load conditions; Power transfer, efficiency, polarity markings; Calculation of line and phase voltages and currents; Calculation of power in a 3 phase system; Primary and secondary current, voltage, turns ratio, power, efficiency; Autotransformers.		
3.16 Filters	1	
Operation, application and uses of the following filters: low pass, high pass, band pass, band stop.		
3.17 AC generators	2	
Rotation of loop in a magnetic field and waveform produced; Operation and construction of revolving armature and revolving field type AC generators; Single phase, 2 phase and 3 phase alternators; Three phase star and delta connections advantages and uses; Permanent magnet generators.		
3.18 AC motors	2	
Construction, principles of operation and characteristics of: AC synchronous and induction motors both single and polyphase; Methods of speed control and direction of rotation; Methods of producing a rotating field: capacitor, inductor, shaded or split pole.		



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Module 4 Digital techniques electronic instrument systems	Level of knowledge for the category	MEA Units
	B2L	
4.1 Semiconductors		
4.1.1 Diodes		
(a) Diode symbols; Diode characteristics and properties; Diodes in series and parallel; Main characteristics and use of silicon controlled rectifiers (thyristors), light emitting diode, photo conductive diode, varistor, rectifier diodes; Functional testing of diodes;	2	
(b) Materials, electron configuration, electrical properties; P and N type materials: effects of impurities on conduction, majority and minority characters; PN junction in a semiconductor, development of a potential across a PN junction in unbiased, forward biased and reverse biased conditions; Diode parameters: peak inverse voltage, maximum forward current, temperature, frequency, leakage current, power dissipation; Operation and function of diodes in the following circuits: clippers, clampers, full and half wave rectifiers, bridge rectifiers, voltage doublers and triplers; Detailed operation and characteristics of the following devices: silicon controlled rectifier (thyristor), light emitting diode, Shottky diode, photoconductive diode, varactor diode, varistor, rectifier diodes, Zener diode.	2	
4.1.2 Transistors		
(a) Transistor symbols; Component description and orientation; Transistor characteristics and properties;	2	
(b) Construction and operation of PNP and NPN transistors; Base, collector and emitter configurations; Testing of transistors; Basic appreciation of other transistor types and their uses; Application of transistors: classes of amplifier (A, B, C); Simple circuits including: bias, decoupling, feedback and stabilisation; Multistage circuit principles: cascades, push-pull, oscillators, multivibrators, flip-flop circuits.	2	
4.1.3 Integrated circuits		
(a) Description and operation of logic circuits and linear circuits and operational amplifiers;		
(b) Description and operation of logic circuits and linear circuits; Introduction to operation and function of an operational amplifier used as: integrator, differentiator, voltage follower, comparator; Operation and amplifier stages connecting methods: resistive capacitive, inductive (transformer), inductive resistive (IR), direct; Advantages and disadvantages of positive and negative feedback.	2	
4.2 Printed circuit boards		
Description and use of printed circuit boards.	2	



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Module 4 Digital techniques electronic instrument systems	Level of knowledge for the category	MEA Units
	B2L	
4.3 Servomechanisms	2	
(b) Understanding of the following terms: open and closed loop, follow up, servomechanism, analogue, transducer, null, damping, feedback, dead band; Construction operation and use of the following synchro system components: resolvers, differential, control and torque, E and I transformers, inductance transmitters, capacitance transmitters, synchronous transmitters; Servo mechanism defects, reversal of synchro leads, hunting.		

Module 5 Digital techniques/electronic instrument systems	Level of knowledge for the category	MEA Units
	B2L	
5.1 Electronic instrument systems	3	
Typical systems arrangements and cockpit layout of electronic instrument systems.		
5.2 Numbering systems	2	
Numbering systems: binary, octal and hexadecimal; Demonstration of conversions between the decimal and binary, octal and hexadecimal systems, and vice versa.		
5.3 Data conversion	2	
Analogue data, digital data; Operation and application of analogue to digital, and digital to analogue converters, inputs and outputs, limitations of various types.		
5.4 Data buses	2	
Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications; Aircraft network/ethernet.		
5.5 Logic circuits	2	
(a) Identification of common logic gate symbols, tables and equivalent circuits; Applications used for aircraft systems, schematic diagrams;		
(b) Interpretation of logic diagrams.		
5.6 Basic computer structure	2	
(b) Computer-related terminology; Operation, layout and interface of the major components in a microcomputer, including their associated bus systems; Information contained in single and multi-address instruction words; Memory-associated terms; Operation of typical memory devices; Operation, advantages and disadvantages of the various data storage systems.		



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Module 5 Digital techniques/electronic instrument systems	Level of knowledge for the category	MEA Units
	B2L	
5.7 Microprocessors		
Functions performed and overall operation of a microprocessor; Basic operation of each of the following microprocessor elements: control and processing unit, clock, register, arithmetic logic unit.	2	
5.8 Integrated circuits		
Operation and use of encoders and decoders; Function of encoder types; Uses of medium, large and very large-scale integration.	2	
5.9 Multiplexing		
Operation, application and identification in logic diagrams of multiplexers and demultiplexers.	2	
5.10 Fibre optics		
Advantages and disadvantages of fibre-optic data transmission over electrical wire propagation; Fibre-optic data bus; Fibre-optic related terms; Terminations; Couplers, control terminals, remote terminals; Application of fibre optics in aircraft systems.	2	
5.11 Electronic displays		
Principles of operation of common types of displays used in modern aircraft, including cathode ray tubes, light emitting diodes and liquid crystal display.	2	
5.12 Electrostatic sensitive devices		
Special handling of components sensitive to electrostatic discharges; Awareness of risks and possible damage, component and personnel anti-static protection devices.	2	
5.13 Software management control		
Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programs.	2	
5.14 Electromagnetic environment		
Influence of the following phenomena on maintenance practices for electronic system: <ul style="list-style-type: none"> • EMC – electromagnetic compatibility • EMI – electromagnetic interference • HIRF – high-intensity radiated field • Lightning and lightning protection. 	2	
5.15 Typical electronic/digital aircraft systems		
General arrangement of typical electronic/digital aircraft systems and associated built-in test equipment (BITE), such as the following: <ul style="list-style-type: none"> • ACARS – ARINC communication and addressing and reporting system • ECAM – electronic centralised aircraft monitoring • EFIS – electronic flight instrument system • EICAS – engine indication and crew alerting system • FBW – fly-by-wire • FMS – flight management system • GPS – global positioning system • IRS – inertial reference system • TCAS – traffic alert collision avoidance system 	2	



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Module 6 Materials and hardware	Level of knowledge for the category	MEA Units
	B2L	
6.1 Aircraft materials ferrous		
(a) Characteristics, properties and identification of common alloy steels used in aircraft; Heat treatment and application of alloy steels;	1	
(b) Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.	1	
6.2 Aircraft materials — non-ferrous		
(a) Characteristics, properties and identification of common non-ferrous materials used in aircraft; Heat treatment and application of non-ferrous materials;	1	
(b) Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.	1	
6.3 Aircraft materials — composite and non-metallic		
<i>6.3.1 Composite and non-metallic other than wood and fabric</i>		
(a) Characteristics, properties and identification of common composite and non-metallic materials, other than wood, used in aircraft; Sealant and bonding agents;	2	
6.4 Corrosion		
(a) Chemical fundamentals; Formation by galvanic action process, microbiological, stress;	1	
(b) Types of corrosion and their identification; Causes of corrosion; Material types, susceptibility to corrosion.	2	
6.5 Fasteners		
<i>6.5.1 Screw threads</i>		
Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; Measuring screw threads;	2	
<i>6.5.2 Bolts, studs and screws</i>		
Bolt types: specification, identification and marking of aircraft bolts, international standards; Nuts: self-locking, anchor, standard types; Machine screws: aircraft specifications; Studs: types and uses, insertion and removal; Self tapping screws, dowels.	2	
<i>6.5.3 Locking devices</i>		
Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick release fasteners, keys, circlips, cotter pins.	2	
<i>6.5.4 Aircraft rivets</i>		
Types of solid and blind rivets: specifications and identification, heat treatment.	1	



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Module 6 Materials and hardware	Level of knowledge for the category	MEA Units
	B2L	
6.6 Pipes and unions		
(a) Identification of, and types of, rigid and flexible pipes and their connectors used in aircraft;	2	
(b) Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes.	1	
6.7 Springs		
Types of springs, materials, characteristics and applications.	1	
6.8 Bearings		
Purpose of bearings, loads, material, construction; Types of bearings and their application.	2	
6.9 Transmissions		
Gear types and their application; Gear ratios, reduction, and multiplication gear systems, driven and driving gears, idler gears, mesh patterns; Belts and pulleys, chains and sprockets.	2	
6.10 Control cables		
Types of cables; End fittings, turn buckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems.	1	
6.11 Electrical cables and connectors		
Cable types, construction and characteristics; High tension and co-axial cables; Crimping; Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes.	2	

Module 7A Maintenance Practices B2L	Level of knowledge for the category	MEA Units
	B2L	
7.1 Safety precautions — aircraft and workshop		
Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals; Instruction in the remedial action to be taken in the event of a fire or another accident with one or more of these hazards including knowledge on extinguishing agents.	3	
7.2 Workshop practices		
Care of tools, control of tools, use of workshop materials; Dimensions, allowances and tolerances, standards of workmanship; Calibration of tools and equipment, calibration standards.	3	



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Module 7A Maintenance Practices B2L	Level of knowledge for the category	MEA Units
	B2L	
7.3 Tools	3	
Common hand tool types; Common power tool types; Operation and use of precision measuring tools; Lubrication equipment and methods; Operation, function and use of electrical general test equipment.		
7.4 Avionic general test equipment	3	
Operation, function and use of avionic general test equipment.		
7.5 Engineering drawings, diagrams and standards	2	
Drawing types and diagrams, their symbols, dimensions, tolerances, and projections; Identifying title block information; Microfilm, microfiche and computerised presentations; Specification 100 of the ATA; Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL; Wiring diagrams and schematic diagrams.		
7.6 Fits and clearances	1	
Drill sizes for bolt holes, classes of fits; Common system of fits and clearances; Schedule of fits and clearances for aircraft and engines; Limits for bow, twist and wear; Standard methods for checking shafts, bearings and other parts.		
7.7 Electrical wiring interconnection system (EWIS)	3	
Continuity, insulation and bonding techniques and testing; Use of crimp tools: hand and hydraulic operated; Testing of crimp joints; Connector pin removal and insertion; Co-axial cables: testing and installation precautions; Identification of wire types, their inspection criteria and damage tolerance; Wiring-protection techniques: cable looming and loom support, cable clamps, protective sleeving techniques, including heat shrink wrapping, shielding; EWIS installations, inspection, repair, maintenance and cleanliness standards.		
7.15 Welding, brazing, soldering and bonding	2	
(a) Soldering methods, inspection of soldered joints;		
7.16 Aircraft weight and balance	2	
(a) Centre of gravity and balance limits calculation: use of relevant documents;		
7.17 Aircraft handling and storage	2	
Aircraft taxiing and towing and associated safety precautions; Aircraft jacking, chocking, securing and associated safety precautions; Aircraft storage methods; Refuelling and defuelling procedures; De-icing and anti-icing procedures; Electrical, hydraulic and pneumatic ground supplies; Effects of environmental conditions on aircraft handling and operation.		
7.18 Disassembly, inspection, repair and assembly techniques	3	
(a) Types of defects and visual inspection techniques; Corrosion removal, assessment and reprotection;		



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Module 7A Maintenance Practices B2L	Level of knowledge for the category	MEA Units
	B2L	
(c) Non-destructive inspection techniques including: penetrant, radiographic, eddy current, ultrasonic and borescope methods;	1	
(d) Disassembly and re-assembly techniques;	2	
(e) Trouble shooting techniques.	2	
7.19 Abnormal events		
(a) Inspections following lightning strikes and HIRF penetration.	2	
7.20 Maintenance procedures		
Maintenance planning; Modification procedures; Stores procedures; Certification and release procedures; Interface with aircraft operation; Maintenance inspection, quality control and quality assurance; Additional maintenance procedures; Control of life limited components.	2	



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Module 8 Basic aerodynamics	Level of knowledge for the category	MEA Units
	B2L	
8.1 Physics of the atmosphere	2	
International Standard Atmosphere (ISA), application aerodynamics.		
8.2 Aerodynamics	2	
Air flow around a body; Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, up wash and downwash, vortices, stagnation; The terms: camber, chord, mean aerodynamic chord, profile (parasite) drag, induced drag, centre of pressure, angle of attack, wash in and washout, fineness ratio, wing shape and aspect ratio; Thrust, weight, aerodynamic resultant; Generation of lift and drag: angle of attack, lift coefficient, drag coefficient, polar curve, stall; Aerofoil contamination including ice, snow, frost.		
8.3 Theory of flight	2	
Relationship between lift, weight, thrust and drag; Glide ratio; Steady state flights, performance; Theory of the turn; Influence of load factor: stall, flight envelope and structural limitations; Lift augmentation.		
8.4 Flight stability and dynamics	2	
Longitudinal, lateral and directional stability (active and passive).		

Module 9A Human factors	Level of knowledge for the category	MEA Units
	B2L	
9.1 General	2	
The need to take human factors into account; Incidents attributable to human factors and human error; “Murphy’s” law.		
9.2 Human performance and limitations	2	
Vision; Hearing; Information processing; Attention and perception; Memory; Claustrophobia and physical access.		
9.3 Social psychology	1	
Responsibility: individual and group; Motivation and de-motivation; Peer pressure; Culture issues; Team working; Management, supervision and leadership.		



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Module 9A Human factors	Level of knowledge for the category	MEA Units
	B2L	
9.4 Factors affecting performance	2	
Fitness and health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload and underload; Sleep and fatigue, shiftwork; Alcohol, medication, drug abuse.		
9.5 Physical environment	1	
Noise and fumes; Illumination; Climate and temperature; Motion and vibration; Working environment.		
9.6 Tasks	1	
Physical work; Repetitive tasks; Visual inspection; Complex systems.		
9.7 Communication	2	
Within and between teams; Work logging and recording; Keeping up-to-date, currency; Dissemination of information.		
9.8 Human error	2	
Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e. accidents); Avoiding and managing errors.		
9.9 Hazards in the workplace	2	
Recognising and avoiding hazards; Dealing with emergencies.		

Module 13 System Ratings	Level of knowledge for the category	MEA Units
	B2L	
Basic Requirements	2	
<i>(Submodules 13.1, 13.2, 13.5 and 13.9)</i>		
COM/NAV Rating	2	
<i>(Submodule 13.4(a))</i>		
INSTRUMENTS Rating	2	
<i>(Submodule 13.8)</i>		
AUTOFLIGHT Rating	1	
<i>(Submodules 13.3(a) and 13.7)</i>		
SURVEILLANCE Rating	2	
<i>(Submodule 13.4(b))</i>		
AIRFRAME SYSTEMS Rating	2	
<i>(Submodules 13.11 to 13.18)</i>		



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Module 13 Aircraft aerodynamics, structures and systems	Level of knowledge for the category	MEA Units
	B2L	
13.1 Theory of flight		
<p>(a) <i>Aeroplane aerodynamics and flight controls</i></p> <p>Operation and effect of:</p> <ul style="list-style-type: none"> • roll control: ailerons and spoilers; • pitch control: elevators, stabilators, variable incidence stabilisers and canards; • yaw control, rudder limiters; <p>Control using elevons, ruddervators; Highlift devices: slots, slats, flaps; Drag inducing devices: spoilers, lift dumpers, speed brakes; Operation and effect of trim tabs, servo tabs, control surface bias;</p>	1	
<p>(b) <i>High speed flight</i></p> <p>Speed of sound, subsonic flight, transonic flight, supersonic flight, Mach number, critical Mach number;</p>	1	
<p>(c) <i>Rotary wing aerodynamics</i></p> <p>Terminology; Operation and effect of cyclic, collective and anti-torque controls.</p>	1	
13.2 Structures — general concepts		
<p>(a)</p> <p>Fundamentals of structural systems;</p>	1	
<p>(b)</p> <p>Zonal and station identification systems; Electrical bonding; Lightning strike protection provision.</p>	2	
13.3 Autoflight (ATA22)		
<p>(a)</p> <p>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, glide slope, land, go-around, system monitors and failure conditions.</p>	3	
<p>(b)</p> <p>Autothrottle systems; Automatic landing systems: principles and categories, modes of operation, approach, glideslope, land, go-around, system monitors and failure conditions</p>	3	



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Module 13 Aircraft aerodynamics, structures and systems	Level of knowledge for the category	MEA Units
	B2L	
<p>13.4 Communication and navigation (ATA23/34)</p> <p>(a) Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter.</p> <p>Working principles of following systems:</p> <ul style="list-style-type: none"> — Very High Frequency (VHF) communication; — High Frequency (HF) communication; — Audio; — Emergency Locator Transmitters (ELTs); — Cockpit Voice Recorder (CVR); — Very High Frequency Omnidirectional Range (VOR); — Automatic Direction Finding (ADF); — Instrument Landing System (ILS); — Flight Director Systems (FDSs), Distance Measuring Equipment (DME); — Area navigation, RNAV systems; — Flight Management Systems (FMSs); — Global Positioning System (GPS), Global Navigation Satellite Systems (GNSSs); — Data Link <p>(b)</p> <ul style="list-style-type: none"> — Air Traffic Control transponder, secondary surveillance radar; — Traffic Alert and Collision Avoidance System (TCAS); — Weather avoidance radar; — Radio altimeter; — Automatic Dependent Surveillance — Broadcast (ADS-B). 3 <p>(c)</p> <ul style="list-style-type: none"> — Microwave Landing System (MLS); — Very Low Frequency and hyperbolic navigation (VLF/Omega); — Doppler navigation; — Inertial Navigation System (INS); — ARINC (Aircraft Radio Incorporated) communication and reporting 	3	
<p>13.5 Electrical Power (ATA 24)</p> <p>Batteries installation and operation;</p> <p>Direct Current (DC) power generation;</p> <p>Alternating Current (AC) power generation;</p> <p>Emergency power generation;</p> <p>Voltage regulation;</p> <p>Power distribution;</p> <p>Inverters, transformers, rectifiers;</p> <p>Circuit protection;</p> <p>External/Ground power.</p>	3	
<p>13.6 Equipment and furnishings (ATA25)</p> <p>Electronic emergency equipment requirements;</p> <p>Cabin entertainment equipment.</p>	3	
<p>13.7 Flight controls (ATA27)</p> <p>(a)</p> <p>Primary controls: aileron, elevator, rudder, spoiler;</p> <p>Trim control;</p> <p>Active load control;</p> <p>High lift devices;</p> <p>Lift dump, speed brakes;</p> <p>System operation: manual, hydraulic, pneumatic;</p> <p>Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks;</p> <p>Stall protection systems;</p>	2	
<p>(b)</p> <p>System operation: electrical, fly-by-wire.</p>	3	



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Module 13 Aircraft aerodynamics, structures and systems	Level of knowledge for the category	MEA Units
	B2L	
13.8 Instruments (ATA31)	3	
Classification; Atmosphere; Terminology; Pressure measuring devices and systems; Pitot static systems; Altimeters; Vertical speed indicators; Airspeed indicators; Machmeters; Altitude reporting and 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; Directional gyros; Ground proximity warning systems; Compass systems; Flight data recording systems; Electronic flight instrument systems; Instrument warning systems including master warning systems and centralised warning panels; Stall warning systems and angle of attack indicating systems; Vibration measurement and indication; Glass cockpit.		
13.9 Lights (ATA33)	3	
External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.		
13.10 On-board maintenance systems (ATA45)	3	
Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).		
13.11 Air-conditioning and cabin pressurisation (ATA21)	2	
13.11.1 Air supply		
Sources of air supply including engine bleed, APU and ground cart.		
13.11.3 Pressurisation	3	
Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers.		
13.11.4 Safety and warning devices	3	
Protection and warning devices.		
13.12 Fire protection (ATA26)	3	
(a)		



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Module 13 Aircraft aerodynamics, structures and systems	Level of knowledge for the category	MEA Units
	B2L	
Fire and smoke detection and warning systems; Fire extinguishing systems; System tests;		
(b) Portable fire extinguisher.	1	
13.15 Ice and rain protection (ATA30)		
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.	2 2 3 1 3 1	
13.16 Landing gear (ATA32)		
Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warnings; Wheels, brakes, antiskid and autobraking; Tyres; Steering; Air-ground sensing.	1 3 3 3 1 3 3	
13.17 Oxygen (ATA35)		
System layout: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	3	
13.18 Pneumatic/vacuum (ATA36)		
System layout; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	2 2 3 1 3 3	
13.19 Water/waste (ATA38)		
Water system layout, supply, distribution, servicing and draining; Toilet system layout, flushing and servicing.	2	
13.20 Integrated modular avionics (ATA42)		
Functions that may be typically integrated in the integrated modular avionics (IMA) modules are, among others: bleed management, air pressure control, air ventilation and control, avionics and cockpit ventilation control, temperature control, air traffic communication, avionics communication router, electrical load management, circuit breaker monitoring, electrical system BITE, fuel management, braking control, steering control, landing gear extension and retraction, tyre pressure indication, oleo pressure indication, brake temperature monitoring; Core system; Network components.	3	
13.21 Cabin systems (ATA44)		
The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (cabin intercommunication data system) and between the aircraft cabin and ground stations (cabin network service). These include voice, data, music and video transmissions.	3	



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Module 13 Aircraft aerodynamics, structures and systems	Level of knowledge for the category	MEA Units
	B2L	
<p>The cabin intercommunication data system provides an interface between cockpit/cabin crew and cabin systems. These systems support data exchange of the different related LRUs and they are typically operated via flight attendant panels.</p> <p>The cabin network service typically consists on a server, typically interfacing with, among others, the following systems: data/radio communication, in-flight entertainment system.</p> <p>The cabin network service may host functions such as:</p> <ul style="list-style-type: none"> ● access to pre-departure/departure reports ● e-mail/intranet/internet access ● passenger database ● cabin core system ● in-flight entertainment system ● external communication system ● cabin monitoring system ● cabin mass memory system ● miscellaneous cabin system. 		
<p>13.22 Information systems (ATA46)</p> <p>The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. These include units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. These do not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display.</p> <p>Typical examples include: air traffic and information management systems; network server systems; aircraft general information system; flight deck information system; maintenance information system; passenger cabin information system; miscellaneous information system.</p>	3	



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Module 14 Propulsion - Avionics	Level of knowledge for the category	MEA Units
	B2L	
14.1 Turbine Engines (a) Constructional arrangement and operation of turbojet, turbofan, turboshaft and turbopropeller engines; (b) Electronic Engine control and fuel metering systems (FADEC). 2	1 2	
14.2 Engine Indicating Systems Exhaust gas temperature/Interstage turbine temperature systems; Engine speed; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure, temperature and flow; Manifold pressure; Engine torque; Propeller speed.	2	
14.3 Starting and Ignition Systems Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements	2	



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Post Trade Licencing Module 10

Module 10 Aviation legislation	Level of knowledge for the category	MEA Units
	B2L	
10.6 Continuing airworthiness	2	
(a) Detailed understanding of Part 21 of CASR 1998 provisions relating to continuing airworthiness; (b) Detailed understanding of Part 42 of CASR 1998.		
10.7 Applicable national and international requirements	2	
(a) Management programs, maintenance checks and inspections; Master Minimum Equipment Lists, Minimum Equipment List, Dispatch Deviation Lists; Airworthiness Directives; Service bulletins, manufacturers' service information; Modification and repairs; Maintenance documentation: maintenance manuals, structural repair manuals, illustrated parts catalogue, etc.		
(b) Continuing airworthiness; Minimum equipment requirements — test flights; ETOPS, maintenance and dispatch requirements; All weather operations: categories 2 and 3 operations.	1	