

CASA Knowledge Syllabus (Part 66 Manual of Standards extract, March 2019)

Module 1 - Mathematics

1.1 Arithmetic

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

- (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.

1.3 Geometry

- (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.

Module 2 - Physics

2.1 Matter

Nature of matter: the chemical elements, structure of atoms, molecules;
Chemical compounds;
States: solid, liquid and gaseous;
Changes between states.

2.2 Mechanics

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

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

- (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).

2.2.4 Fluid dynamics

- (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.

2.3 Thermodynamics

- (a) Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin, heat definition;
- (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.

2.4 Optics (light)

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

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

3.1 Electron theory

Structure and distribution of electrical charges within atoms, molecules, ions, compounds;
Molecular structure of conductors, semiconductors and insulators.

3.2 Static electricity and conduction

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

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

Production of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.

3.5 DC sources of electricity

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

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

- (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

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

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.

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.

(b)

Magneto-motive force, field strength, magnetic flux density, permeability, hysteresis loop, retentivity, reluctance, saturation point, eddy currents, coercive force;
Precautions for care and storage of magnets.

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.

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.

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.

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;
True power, apparent power and reactive power calculations.

3.15 Transformers

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

Operation, application and uses of the following filters: low pass, high pass, band pass, band stop.

3.17 AC generators

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

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.

Module 4 - Electronic fundamentals

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;
- (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.

4.1.2 Transistors

- (a)
- Transistor symbols;
 - Component description and orientation;
 - Transistor characteristics and properties;
- (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.

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.

4.2 Printed circuit boards

Description and use of printed circuit boards.

4.3 Servomechanisms

(a)

Understanding of the following terms: open and closed loop systems, feedback, follow up, analogue transducers;
Principles of operation and use of the following synchro system components and features: resolvers, differential, control and torque, transformers, inductance and capacitance transmitters;

(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

5.1 Electronic instrument systems

Typical systems arrangements and cockpit layout of electronic instrument systems.

5.2 Numbering systems

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

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

Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications.

5.5 Logic circuits

(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

(a)

Computer terminology (including bit, byte, software, hard ware, CPU, IC and various memory devices such as RAM, ROM, PROM);
Computer technology (as applied in aircraft systems);

(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.

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.

5.8 Integrated circuits

Operation and use of encoders and decoders;

Function of encoder types;

Uses of medium, large and very large scale integration.

5.9 Multiplexing

Operation, application and identification in logic diagrams of multiplexers and demultiplexers.

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.

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.

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.

5.13 Software management control

Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programs.

5.14 Electromagnetic environment

Influence of the following phenomena on maintenance practices for electronic system:

EMC-electromagnetic compatibility;

EMI-electromagnetic interference;

HIRF-high intensity radiated field;

Lightning and lightning protection.

5.15 Typical electronic and digital aircraft systems

General arrangement of typical electronic and digital aircraft systems and associated BITE testing such as:

- 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.

Module 6 - Materials and hardware

6.1 Aircraft materials ferrous

(a)

Characteristics, properties and identification of common alloy steels used in aircraft;
Heat treatment and application of alloy steels;

(b)

Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.

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;

(b)

Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.

6.3 Aircraft materials — composite and non-metallic

6.3.1 Composite and non-metallic other than wood and fabric

(a)

Characteristics, properties and identification of common composite and non-metallic materials, other than wood, used in aircraft;
Sealant and bonding agents;

(b)

The detection of defects and deterioration in composite and non-metallic material;
Repair of composite and non-metallic material.

6.3.2 Wooden structures

Construction methods of wooden airframe structures;
Characteristics, properties and types of wood and glue used in aeroplanes;
Preservation and maintenance of wooden structure;
Types of defects in wood material and wooden structures;
The detection of defects in wooden structure;
Repair of wooden structure.

6.3.3 Fabric covering

Characteristics, properties and types of fabrics used in aeroplanes;
Inspection methods for fabric;
Types of defects in fabric;
Repair of fabric covering.

6.4 Corrosion

(a)

Chemical fundamentals;
Formation by galvanic action process, microbiological, stress;

(b)

Types of corrosion and their identification;
Causes of corrosion;
Material types, susceptibility to corrosion.

6.5 Fasteners

6.5.1 Screw threads

Screw nomenclature;
Thread forms, dimensions and tolerances for standard threads used in aircraft;
Measuring screw threads;

6.5.2 Bolts, studs and screws

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.

6.5.3 Locking devices

Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick release fasteners, keys, circlips, cotter pins.

6.5.4 Aircraft rivets

Types of solid and blind rivets: specifications and identification, heat treatment.

6.6 Pipes and unions

(a)

Identification of, and types of, rigid and flexible pipes and their connectors used in aircraft;

(b)

Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes.

6.7 Springs

Types of springs, materials, characteristics and applications.

6.8 Bearings

Purpose of bearings, loads, material, construction;

Types of bearings and their application.

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.

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.

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.

Module 7 - Maintenance practices

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.

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.

7.3 Tools

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

Operation, function and use of avionic general test equipment.

7.5 Engineering drawings, diagrams and standards

Drawing types and diagrams, their symbols, dimensions, tolerances and projections;

Identifying title block information;

Microfilm, microfiche and computerised presentations;

Specification 100 of the ATA of America;

Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL;

Wiring diagrams and schematic diagrams.

7.6 Fits and clearances

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 cables and connectors

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;

Wiring protection techniques: cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding.

7.8 Riveting

Riveted joints, rivet spacing and pitch;

Tools used for riveting and dimpling;

Inspection of riveted joints.

7.9 Pipes and hoses

Bending and belling and flaring aircraft pipes;

Inspection and testing of aircraft pipes and hoses;

Installation and clamping of pipes.

7.10 Springs

Inspection and testing of springs.

7.11 Bearings

Testing, cleaning and inspection of bearings;

Lubrication requirements of bearings;

Defects in bearings and their causes.

7.12 Transmissions

Inspection of gears, backlash;

Inspection of belts and pulleys, chains and sprockets;

Inspection of screw jacks, lever devices, push-pull rod systems.

7.13 Control cables

Swaging of end fittings;

Inspection and testing of control cables;

Bowden cables;

Aircraft flexible control systems.

7.14 Material handling

7.14.1 Sheet Metal

Marking out, and calculation of, bend allowance;

Sheet metal working including bending and forming;

Inspection of sheet metal work.

7.14.2 Composite and non-metallic

Bonding practices;

Environmental conditions;

Inspection methods.

7.15 Welding, brazing, soldering and bonding

(a)

Soldering methods, inspection of soldered joints;

(b)

Welding and brazing methods;

Inspection of welded and brazed joints;

Bonding methods and inspection of bonded joints.

7.16 Aircraft weight and balance

(a)

Centre of gravity and balance limits calculation: use of relevant documents;

(b)

Preparation of aircraft for weighing;

Aircraft weighing.

7.17 Aircraft handling and storage

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

- (a)
 - Types of defects and visual inspection techniques;
 - Corrosion removal, assessment and re-protection;
- (b)
 - General repair methods, Structural Repair Manual;
 - Ageing, fatigue and corrosion control programs;
- (c)
 - Non-destructive inspection techniques including: penetrant, radiographic, eddy current, ultrasonic and borescope methods;
- (d)
 - Disassembly and re-assembly techniques;
- (e)
 - Trouble shooting techniques.

7.19 Abnormal events

- (a)
 - Inspections following lightning strikes and HIRF penetration.
- (b)
 - Inspections following abnormal events such as heavy landings and flight through turbulence.

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.

Module 8 - Basic aerodynamics

8.1 Physics of the atmosphere

International Standard Atmosphere (ISA), application aerodynamics.

8.2 Aerodynamics

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

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

Longitudinal, lateral and directional stability (active and passive).

Module 9 - Human factors

9.1 General

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

Vision;
Hearing;
Information processing;
Attention and perception;
Memory;
Claustrophobia and physical access.

9.3 Social psychology

Responsibility: individual and group;
Motivation and de-motivation;
Peer pressure;
Culture issues;
Team working;
Management, supervision and leadership.

9.4 Factors affecting performance

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

Noise and fumes;
Illumination;
Climate and temperature;
Motion and vibration;
Working environment.

9.6 Tasks

Physical work;
Repetitive tasks;
Visual inspection;
Complex systems.

9.7 Communication

Within and between teams;
Work logging and recording;
Keeping up-to-date, currency;
Dissemination of information.

9.8 Human error

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

Recognising and avoiding hazards;
Dealing with emergencies.

Module 10 - Aviation legislation

10.1 Regulatory Framework

Role of International Civil Aviation Organization;
Role of CASA;
Relationship between Parts 21, 42, 66, 145 and 147 of CASR 1998;
Relationship with other aviation authorities.

10.2 Part 66 Certifying Staff

Detailed understanding of Part 66 of CASR 1998.

10.3 Part 145 – Approved maintenance organisations

Detailed understanding of Part 145 of CASR 1998.

10.4 Air operations

Air Operators' Certificates;
Operators' responsibilities, in particular regarding continuing airworthiness and maintenance;
Aircraft maintenance program;
MEL/CDL;
Documents to be carried on board;
Aircraft placarding (markings).

10.5 Certification of aircraft, parts and appliances

(a) *General*

General understanding of Parts 21, 23, 25, 27 and 29 of CASR 1998;

(b) *Documents*

Certificates of Airworthiness;
Restricted Certificates of Airworthiness;
Special Flight Permits;
Certificates of Registration;
Noise Certificates;
Weight Schedules;
Radio Station Licences and Approvals.

10.6 Parts 21 and 42

(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

(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;
Test flights;
ETOPS, maintenance and despatch requirements;
All weather operation: category 2 and 3 operations and minimum equipment requirements.

Module 11 - Aeroplane aerodynamics, structures and systems

11.1 Theory of flight

11.1.1 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;

Control using elevons, ruddervators;

High lift devices, slots, slats, flaps, flaperons;

Drag inducing devices, spoilers, lift dumpers, speed brakes;

Effects of wing fences, sawtooth leading edges;

Boundary layer control using, vortex generators, stall wedges or leading edge devices;

Operation and effect of trim tabs, balance and anti-balance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels.

11.1.2 High speed flight

Speed of sound, subsonic flight, transonic flight, supersonic flight;

Mach number, critical Mach number, compressibility buffet, shockwave, aerodynamic heating, area rule;

Factors affecting airflow in engine intakes of high speed aircraft;

Effects of sweepback on critical Mach number.

11.2 Airframe structures — general concepts

(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;

(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.

11.3 Airframe structures — aeroplanes

11.3.1 Fuselage (ATA52/53/56)

Construction and pressurisation sealing;
Wing, stabiliser, pylon and under carriage 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 Wings (ATA57)

Construction;
Fuel storage;
Landing gear, pylon, control surface and highlift and drag attachments.

11.3.3 Stabilisers (ATA55)

Construction;
Control surface attachment.

11.3.4 Flight control surface (ATA55/57)

Construction and attachment;
Balancing — mass and aerodynamic.

11.3.5 Nacelles and pylons (ATA54)

Construction;
Firewalls;
Engine mounts.

11.4 Air-conditioning and cabin pressurisation (ATA21)

11.4.1 Air supply

Sources of air supply including engine bleed, APU and ground cart.

11.4.2 Air-conditioning

Air-conditioning systems;
Air cycle and vapour cycle machines;
Distribution systems;
Flow, temperature and humidity control system.

11.4.3 Pressurisation

Pressurisation systems;
Control and indication including control and safety valves;
Cabin pressure controllers;
Heating systems.

11.4.4 Safety and warning devices

Protection and warning devices.

11.5 Instruments and avionic systems

11.5.1 Instrument systems (ATA31)

Pitot static: altimeter, airspeed 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;
Glass cockpit;
Other aircraft system indication.

11.5.2 Avionic systems

Fundamentals of system layouts and operation of:
Auto flight (ATA22);
Communications (ATA23);
Navigation systems (ATA34).

11.6 Electrical power (ATA24)

Batteries installation and operation;
DC power generation;
AC power generation;
Emergency power generation;
Voltage regulation;
Power distribution;
Inverters, transformers, rectifiers;
Circuit protection;
External and ground power.

11.7 Equipment and furnishings (ATA25)

- (a)
 - Emergency equipment requirements;
 - Seats, harnesses and belts;
- (b)
 - Cabin layout;
 - Equipment layout;
 - Cabin furnishing installation;
 - Cabin entertainment equipment;
 - Galley installation;
 - Cargo handling and retention equipment;
 - Airstairs.

11.8 Fire protection (ATA26)

- (a)
 - Fire and smoke detection and warning systems;
 - Fire extinguishing systems;
 - System tests;
- (b)
 - Portable fire extinguisher.

11.9 Flight controls (ATA27)

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 and warning system.

11.10 Fuel systems (ATA28)

System layout;
Fuel tanks;
Supply systems;
Dumping, venting and draining;
Cross-feed and transfer;
Indications and warnings;
Refuelling and defuelling;
Longitudinal balance fuel systems.

11.11 Hydraulic power (ATA29)

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.

11.12 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.

11.13 Landing gear (ATA32)

Construction, shock absorbing;
Extension and retraction systems: normal and emergency;
Indications and warning;
Wheels, brakes, antiskid and auto braking;
Tyres;
Steering.

11.14 Lights (ATA33)

External: navigation, anti-collision, landing, taxiing, ice;
Internal: cabin, cockpit, cargo; emergency.

11.15 Oxygen (ATA35)

System layout: cockpit, cabin;
Sources, storage, charging and distribution;
Supply regulation;
Indications and warnings.

11.16 Pneumatic and vacuum (ATA36)

System layout;
Sources: engine and APU, compressors, reservoirs, ground supply;
Pressure control;
Distribution;
Indications and warnings;
Interfaces with other systems.

11.17 Water and waste (ATA38)

Water system layout, supply, distribution, servicing and draining;
Toilet system layout, flushing and servicing;
Corrosion aspects.

11.18 On-board maintenance systems (ATA45)

Central maintenance computers;
Data loading system;
Electronic library system;
Printing;
Structure monitoring (damage tolerance monitoring).

11.19 Integrated modular avionics (ATA42)

Functions that may be typically integrated in the integrated modular avionics (IMA) modules include: 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.

11.20 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.

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.

The cabin network service typically consists on a server, typically interfacing with, among others, the following systems: data/radio communication, in-flight entertainment system.

The cabin network service may host functions such as:

- 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.

11.21 Information systems (ATA46)

The units and components which furnish a means of storing, updating and retrieving digital information, traditionally provided on paper, microfilm or microfiche. Includes 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.

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.

Module 12 - Helicopter aerodynamics, structures and systems

12.1 Theory of flight — rotary wing aerodynamics

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

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.

12.3 Blade tracking and vibration analysis

Rotor alignment;
Main and tail rotor tracking;
Static and dynamic balancing;
Vibration types, vibration reduction methods;
Ground resonance.

12.4 Transmissions

Gearboxes, main and tail rotors;
Clutches, freewheel units and rotor brake.

12.5 Airframe structures

(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;

(b)

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;
Methods of surface protection, such as chromating, anodising, painting;
Surface cleaning;
Airframe symmetry: methods of alignment and symmetry checks.

12.6 Air-conditioning (ATA21)

12.6.1 Air supply

Sources of air supply including engine bleed and ground cart.

12.6.2 Air-conditioning

Air-conditioning systems;
Distribution systems;
Flow and temperature control systems;
Protection and warning devices.

12.7 Instruments and avionics systems

12.7.1 Instrument systems (ATA31)

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;
Glass cockpit;
Other aircraft system indication.

12.7.2 Avionic systems

Fundamentals of system layouts and operation of:
Auto flight (ATA22);
Communications (ATA23);
Navigation Systems (ATA34).

12.8 Electrical power (ATA24)

Batteries installation and operation;
DC power generation, AC power generation;
Emergency power generation;
Voltage regulation, circuit protection;
Power distribution;
Inverters, transformers, rectifiers;
External and ground power.

12.9 Equipment and furnishings (ATA25)

(a)

Emergency equipment requirements;
Seats, harnesses and belts;
Lifting systems;

(b)

Emergency flotation systems;
Cabin layout, cargo retention;
Equipment layout;
Cabin furnishing installation.

12.10 Fire protection (ATA26)

Fire and smoke detection and warning systems;
Fire extinguishing systems;
System tests.

12.11 Fuel systems (ATA28)

System layout;
Fuel tanks;
Supply systems;
Dumping, venting and draining;
Cross-feed and transfer;
Indications and warnings;
Refuelling and defuelling.

12.12 Hydraulic power (ATA29)

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.

12.13 Ice and rain protection (ATA30)

Ice formation, classification and detection;
Anti-icing and de-icing systems: electrical, hot air and chemical;
Rain repellent and removal;
Probe and drain heating.

12.14 Landing gear (ATA32)

Construction, shock absorbing;
Extension and retraction systems: normal and emergency;
Indications and warning;
Wheels, tyres, brakes;
Steering;
Skids, floats.

12.15 Lights (ATA33)

External: navigation, landing, taxiing, ice;
Internal: cabin, cockpit, cargo; emergency.

12.16 Pneumatic and vacuum (ATA36)

System layout;
Sources: engine, compressors, reservoirs, ground supply;
Pressure control;
Distribution;
Indication and warnings;
Interfaces with other systems.

12.17 Integrated modular avionics (ATA42)

Functions that may be typically integrated in the integrated modular avionics (IMA) modules include: 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.

12.18 On-board maintenance systems (ATA45)

Central maintenance computers;
Data loading system;
Electronic library system;
Printing;
Structure monitoring (damage tolerance monitoring).

12.19 Information systems (ATA46)

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.
Typical examples include: air traffic and information management systems; network server system; aircraft general information system; flight deck information system; maintenance information system; passenger cabin information system; miscellaneous information system.

Module 13 - Aircraft structures and systems

13.1 Theory of flight

(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;
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;

(b) *High speed flight*

Speed of sound, subsonic flight, transonic flight, supersonic flight, Mach number, critical Mach number;

(c) *Rotary wing aerodynamics*

Terminology;
Operation and effect of cyclic, collective and anti-torque controls.

13.2 Structures — general concepts

(a)

Fundamentals of structural systems;

(b)

Zonal and station identification systems; electrical bonding;
Lightning strike protection provision.

13.3 Autoflight (ATA22)

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.

13.4 Communication and navigation (ATA23/34)

Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter.

Working principles of 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 director systems;
- Distance measuring equipment (DME);
- 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.

13.5 Electrical power (ATA24)

Batteries installation and operation;

DC power generation;

AC power generation;

Emergency power generation;

Voltage regulation;

Power distribution;

Inverters, transformers, rectifiers;

Circuit protection;

External and ground power.

13.6 Equipment and furnishings (ATA25)

Electronic emergency equipment requirements;

Cabin entertainment equipment.

13.7 Flight controls (ATA27)

(a)

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)

System operation: electrical, fly-by-wire.

13.8 Instrument systems (ATA31)

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.

13.9 Lights (ATA33)

External: navigation, landing, taxiing, ice;
Internal: cabin, cockpit, cargo;
Emergency.

13.10 On-board maintenance systems (ATA45)

Central maintenance computers;
Data loading system;
Electronic library system;
Printing;
Structure monitoring (damage tolerance monitoring).

13.11 Air-conditioning and cabin pressurisation (ATA21)

13.11.1 Air supply

Sources of air supply including engine bleed, APU and ground cart.

13.11.2 Air-conditioning

Air-conditioning systems;
Air cycle and vapour cycle machines;
Distribution systems;
Flow, temperature and humidity control system.

13.11.3 Pressurisation

Pressurisation systems;
Control and indication including control and safety valves;
Cabin pressure controllers.

13.11.4 Safety and warning devices

Protection and warning devices.

13.12 Fire protection (ATA26)

- (a)
 - Fire and smoke detection and warning systems;
 - Fire extinguishing systems;
 - System tests;
- (b)
 - Portable fire extinguisher.

13.13 Fuel systems (ATA28)

System layout;
Fuel tanks;
Supply systems;
Dumping, venting and draining;

Cross-feed and transfer;
Indications and warnings;
Refuelling and defuelling;
Longitudinal balance fuel systems.

13.14 Hydraulic power (ATA29)

System layout;
Hydraulic fluids;
Hydraulic reservoirs and accumulators;
Pressure generation: electrical, mechanical, pneumatic;
Emergency pressure generation;
Filters;
Pressure control;
Power distribution;
Indication and warning systems;
Interface with other systems.

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.

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.

13.17 Oxygen (ATA35)

System layout: cockpit, cabin;
Sources, storage, charging and distribution;
Supply regulation;
Indications and warnings.

13.18 Pneumatic/vacuum (ATA36)

System layout;
Sources: engine/APU, compressors, reservoirs, ground supply;
Pressure control;
Distribution;
Indications and warnings;
Interfaces with other systems.

13.19 Water/waste (ATA38)

Water system layout, supply, distribution, servicing and draining;
Toilet system layout, flushing and servicing.

13.20 Integrated modular avionics (ATA42)

Functions that may be typically integrated in the Integrated Modular Avionic (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.

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.

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- in-flight entertainment system
- external communication system
- cabin monitoring system
- cabin mass memory system
- miscellaneous cabin system.

13.22 Information systems (ATA46)

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.

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.

Module 14 - Propulsion (avionic systems)

14.1 Turbine engines

(a)

Constructional arrangement and operation of turbojet, turbofan, turbo shaft and turbopropeller engines;

(b)

Electronic engine control and fuel metering systems (FADEC).

14.2 Engine indicating systems

Exhaust gas temperature and 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.

14.3 Starting and ignition systems

Operation of engine start systems and components;

Ignition systems and components;

Maintenance safety requirements.

Module 15 - Gas turbine engine

15.1 Fundamentals

Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle;

The relationship between force, work, power, energy, velocity, acceleration;

Constructional arrangement and operation of turbojet, turbofan, turbo shaft, turboprop.

15.2 Engine performance

Gross thrust, net thrust, choked nozzle thrust, thrust distribution, resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption;

Engine efficiencies;

By-pass ratio and engine pressure ratio;
Pressure, temperature and velocity of the gas flow;
Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations.

15.3 Inlet

Compressor inlet ducts;
Effects of various inlet configurations;
Ice protection.

15.4 Compressors

Axial and centrifugal types;
Constructional features and operating principles and applications;
Fan balancing;
Operation;
Causes and effects of compressor stall and surge;
Methods of airflow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades;
Compressor ratio.

15.5 Combustion section

Constructional features and principles of operation.

15.6 Turbine section

Operation and characteristics of different turbine blade types;
Blade to disk attachment;
Nozzle guide vanes;
Causes and effects of turbine blade stress and creep.

15.7 Exhaust

Constructional features and principles of operation;
Convergent, divergent and variable area nozzles;
Engine noise reduction;
Thrust reversers.

15.8 Bearings and seals

Constructional features and principles of operation.

15.9 Lubricants and fuels

Properties and specifications;
Fuel additives;
Safety precautions.

15.10 Lubrication systems

System operation and layout and components.

15.11 Fuel systems

Operation of engine control and fuel metering systems including: electronic engine control (FADEC), systems layout and components.

15.12 Air systems

Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.

15.13 Starting and ignition systems

Operation of engine start systems and components;
Ignition systems and components;
Maintenance safety requirements.

15.14 Engine indication systems

Exhaust gas temperature and interstage turbine temperature;
Engine thrust indication: engine pressure ratio, engine turbine discharge pressure or jet pipe pressure systems;
Oil pressure and temperature;
Fuel pressure and flow;
Engine speed;
Vibration measurement and indication;
Torque;
Power.

15.15 Power augmentation systems

Operation and applications;
Water injection, water methanol;
Afterburner systems.

15.16 Turbo-prop engines

Gas coupled and free turbine and gear coupled turbines;
Reduction gears;
Integrated engine and propeller controls;
Over speed safety devices.

15.17 Turbo-shaft engines

Arrangements drive systems, reduction gearing, couplings, control systems.

15.18 Auxiliary power units (APUs)

Purpose, operation, protective systems.

15.19 Powerplant installation

Configuration of fire walls, cowlings, acoustic panels engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.

15.20 Fire protection systems

Operation of detection and extinguishing systems.

15.21 Engine monitoring and ground operation

Procedures for starting and ground run-up;
Interpretation of engine power output and parameters;
Trend (including oil analysis, vibration and borescope) monitoring;
Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer;
Compressor washing and cleaning;
Foreign object damage.

15.22 Engine storage and preservation

Preservation and depreservation for the engine and accessories and systems.

Module 16 - Piston engine

16.1 Fundamentals

Mechanical, thermal and volumetric efficiencies;
Operating principles: 2 stroke, 4 stroke, otto and diesel;
Piston displacement and compression ratio;
Engine configuration and firing order.

16.2 Engine performance

Power calculation and measurement;
Factors affecting engine power;
Mixtures and leaning, pre-ignition.

16.3 Engine construction

Crankcase, crankshaft, camshafts, sumps;
Accessory gearbox;
Cylinder and piston assemblies;
Connecting rods, inlet and exhaust manifolds;
Valve mechanisms;
Propeller reduction gearboxes.

16.4 Engine fuel systems

16.4.1 Carburettors

Types, construction and principles of operation;

Icing and heating.

16.4.2 Fuel injection systems

Types, construction and principles of operation.

16.4.3 Electronic engine control

Operation of engine control and fuel metering systems including: electronic engine control (FADEC), systems layout and components.

16.5 Starting and ignition systems

Starting systems, pre-heat systems;
Magneto types, construction and principles of operation;
Ignition harnesses, sparkplugs;
Low and high-tension systems.

16.6 Induction, exhaust and cooling systems

Construction and operation of induction systems, including alternate air systems;
Exhaust systems, engine cooling systems — air and liquid.

16.7 Supercharging and turbo charging

Principles and purpose of supercharging and its effects on engine parameters;
Construction and operation of supercharging and turbo charging systems;
System terminology;
Control systems;
System protection.

16.8 Lubricants and fuels

Properties and specifications;
Fuel additives;
Safety precautions.

16.9 Lubrication systems

System operation and layout and components.

16.10 Engine indication systems

Engine speed;
Cylinder head temperature;
Coolant temperature;
Oil pressure and temperature;
Exhaust gas temperature;
Fuel pressure and flow;
Manifold pressure.

16.11 Powerplant installation

Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.

16.12 Engine monitoring and ground operation

Procedures for starting and ground run-up;
Interpretation of engine power output and parameters;
Inspection of engine and components: criteria, tolerances and data specified by engine manufacturer.

16.13 Engine storage and preservation

Preservation and depreservation for the engine and accessories and systems.

Module 17 - Propeller

17.1 Fundamentals

Blade element theory;
High and low blade angle, reverse angle, angle of attack, rotational speed;
Propeller slip;
Aerodynamic, centrifugal, and thrust forces;
Torque;
Relative airflow on blade angle of attack;
Vibration and resonance.

17.2 Propeller construction

Construction methods and materials used in wooden, composite and metal propellers;
Blade station, blade face, blade shank, blade back and hub assembly;
Fixed pitch, controllable pitch, constant speed propeller;
Propeller and spinner installation.

17.3 Propeller pitch control

Speed control and pitch change methods, mechanical and electrical and electronic;
Feathering and reverse pitch;
Overspeed protection.

17.4 Propeller synchronising

Synchronising and synchrophasing equipment.

17.5 Propeller ice protection

Fluid and electrical de-icing equipment.

17.6 Propeller maintenance

Static and dynamic balancing;

Blade tracking;

Assessment of blade damage, erosion, corrosion, impact damage, delamination;

Propeller treatment and repair schemes;

Propeller engine running.

17.7 Propeller storage and preservation

Propeller preservation and depreservation.

Please Note: This document is provided for guidance purposes only and was correct at the time of download on 21 March 2019.

To view the current version of the Manual of Standards which contains this syllabus, please visit the CASA website here: www.casa.gov.au or the Australian Government Federal Register of Legislation here: www.legislation.gov.au.