Australian Government

Civil Aviation Safety Authority

I, JOHN FRANCIS McCORMICK, Director of Aviation Safety, on behalf of CASA, make this instrument under paragraph 66.055 (b) of the *Civil Aviation Safety Regulations 1998*.

[Signed John F. McCormick]
John F. McCormick
Director of Aviation Safety

16 February 2011

Manual of Standards Part 66 Instrument 2011

1 Name of instrument

This instrument is the *Manual of Standards Part 66 Instrument 2011*.

2 Commencement

This instrument commences on 27 June 2011.

3 Manual of Standards (*MOS*) Part 66

Schedule 1 makes MOS Part 66.

Schedule 1 Manual of Standards (*MOS*) Part 66

Continuing Airworthiness Aircraft Engineer Licences and Ratings

66.1 Scope

(a) This is the MOS for Part 66 of the *Civil Aviation Safety Regulations 1998* (***CASR 1998***).

(b) This MOS sets out the requirements for the issue of an aircraft engineer licence and other requirements or privileges associated with the licence.

66.5 Definitions

(a) Unless otherwise defined in this MOS, words and phrases have the same meaning as in Part 66 of CASR 1998.

(b) In this MOS:

avionics system means an aircraft system as specified in Table 1. An avionics system transfers, processes, displays or stores analogue or digital data using data lines, wireless or other data transmission medium, and includes the system's components and connectors. Examples of avionics systems include the following:

1. autoflight;
2. communication and navigation;
3. instruments;
4. in-flight entertainment systems;
5. integrated modular avionics (IMA);
6. cabin systems;
7. on-board maintenance systems;
8. information systems;
9. fly-by-wire systems (related to Air Transport Association (***ATA***) 27 "Flight Controls");
10. fibre optic control systems.

electrical system means the aircraft electrical power supply source, plus the distribution system to the different components contained in the aircraft and relevant connectors. Electrical systems are specified in Table 1. When working on cables (including coaxial cables) and connectors which are part of these electrical systems, the following typical practices are included in the privileges:

1. continuity, insulation and bonding techniques and testing;
2. crimping and testing of crimped joints;
3. connector pin removal and insertion;
4. wiring protection techniques.

lighting systems are part of the electrical system.

powerplant means an aircraft engine.

simple test means a test described in approved maintenance data that meets all of the following criteria:

1. the serviceability of the system can be verified using aircraft controls, switches, built-in test equipment (***BITE***), central maintenance computer (***CMC***) or external test equipment not involving special training;
2. the outcome of the test is a unique go – no go indication or parameter. No interpretation of the test result or interdependence of different values is allowed;
3. the test troubleshooting does not involve multiple LRU changes in pursuit of a system fault, unless the LRU changes are made in accordance with a published maintenance procedure (e.g. fault isolation procedure).

troubleshooting means the procedures and actions necessary, using approved maintenance data, in order to identify the root cause of a defect or malfunction. It may include the use of BITE or external test equipment.

66.A.1 Aircraft engineer licence

(a) This MOS specifies the requirements for the issue of an aircraft engineer licence in 1 or more of the following categories:

1. Category A;
2. Category B1;
3. Category B2;
4. Category C.

(b) Categories A and B1 may be endorsed with the following subcategories for maintenance on combinations of aeroplanes, helicopters, turbine and piston engines:

1. A1 and B1.1 aeroplanes turbine;
2. A2 and B1.2 aeroplanes piston;
3. A3 and B1.3 helicopters turbine;
4. A4 and B1.4 helicopters piston.

(c) Categories B1, B2 and C may be endorsed with aircraft type ratings, as specified by CASA in a CASA Part 66 Advisory Circular issued for that purpose.

66.A.10 Application — form

An application for an aircraft engineer licence, or an application for a variation of an aircraft engineer licence, must be made to CASA in the form approved by CASA.

66.A.20 Privileges

(a) The maintenance certification and certificate of release to service privileges of each category of licence are as follows:

1. A person who holds a Category A licence endorsed with a subcategory may perform maintenance certification for that subcategory maintenance if:
   (i) the person carried out the maintenance; and
   (ii) the maintenance is line maintenance of a kind mentioned in Appendix V of MOS Part 145;
2. A person who holds a Category A licence endorsed with a subcategory may issue a certificate of release to service for that subcategory maintenance if:
   (i) the maintenance was carried out by the person; or
   (ii) the maintenance and its maintenance certification were carried out by another person who holds a Category A licence with the appropriate subcategory; and
   (iii) the maintenance was line maintenance of a kind mentioned in Appendix V of MOS Part 145;
3. A reference to maintenance in subparagraphs (a) 1 or 2 does not include supervision of maintenance.
4. Subject to Table 1 and paragraph 66.A.45 (b), a person who holds a Category B1 licence endorsed with a subcategory may perform maintenance certification for that subcategory maintenance if:
   (i) the person carried out the subcategory maintenance; and
   (ii) the maintenance was any of the following:
      (A) work on an aircraft system designated in Table 1, as structural, powerplant, mechanical or electrical;
      (B) replacement of an avionic line replaceable unit that requires only simple tests to prove its serviceability;
      (C) line maintenance of a kind mentioned in Appendix II of MOS Part 145;
5. A person who holds a Category B1 licence endorsed with a subcategory may issue a certificate of release to service for maintenance covered by a subcategory endorsed on the licence if the maintenance was not base maintenance carried out on a large aircraft;
6. A person who holds a Category B2 licence may perform maintenance certification for Category B2 maintenance carried out on an aircraft if:

(i) the person carried out the maintenance; and

(ii) the maintenance was carried out:

(A) on an aircraft system designated in Table 1 as avionic or electrical; or

(B) on an instrument or electrical subsystem of an aircraft system designated in Table 1 as structural, powerplant or mechanical;

7. A person who holds a Category B2 licence may issue a certificate of release to service for aircraft maintenance covered by the licence if the maintenance was not base maintenance carried out on a large aircraft;

8. A person who holds a Category C licence may issue a certificate of release to service for base maintenance carried out on a large aircraft for the aircraft in its entirety, if:

(i) the maintenance was carried out on a particular type of large aircraft; and

(ii) the Category C holder's licence is endorsed with the type rating for the particular type of large aircraft.

(b) For the purposes of paragraph 66.120 (2) (c) of CASR 1998, the requalification requirements for an A, B1 or B2 aircraft engineer licence holder are:

1. carrying out maintenance of the kind that would be covered by the privileges of the licence held, for no less than a total of 100 days; or

2. the holder obtains a report from a Part 147 organisation (an ***MTO***) authorised for category training which states:

(i) that the holder has been assessed within 28 days of the date of the report; and

(ii) how the assessment was conducted; and

(iii) that the MTO has certified that the holder continues to have the knowledge and skills necessary for the holder of an aircraft engineer licence with the ratings on the licence; and

3. in relation to subparagraphs (b) 1 and 2, the holder retains either evidence of carrying out the maintenance, or the report from the MTO, as applicable; and

4. for the purposes of subparagraph (b) 2, the assessment by the MTO must include theory examination and practical assessment in the range of maintenance activities that the holder is authorised by their licence to carry out. The report must describe how the assessment by the MTO was performed.

(c) For the purposes of paragraph 66.120 (2) (c) of CASR 1998, the requalification requirement for a Category C licence holder is that the Part 145 organisation (an ***AMO***) provides the holder with suitable continuing airworthiness experience and records an AMO certification that the holder has re-established their knowledge and skill.

Table 1

Aircraft systems, designations and conditions for Category B1 and Category B2 licences

Aircraft system (and ATA chapter reference)	Designation of system	Conditions or limitations
Airframe general practices (ATA 20)	Structures	
Pressurisation, air-conditioning and equipment cooling systems (ATA21)	Mechanical	For a Category B2 licence, pressurisation control systems, if endorsed on the licence
Autopilot (ATA22)	Avionic	
Communications (ATA23) including ELT and underwater locating beacon (ATA25-60)	Avionic	
Electrical power supply systems generator constant speed drive/IDG (ATA24)	Electrical	
Equipment, furnishings and emergency equipment (ATA25)	Mechanical	
Fire, smoke, overheat detecting and extinguishing systems (ATA26)	Mechanical	
Flight control systems (ATA27)	Mechanical	
Flight control systems — system operation — fly-by-wire (ATA27)	Avionic	
Fuel systems (ATA28)	Mechanical	
Hydraulic power systems, including ram air turbine (ATA29)	Mechanical	

Aircraft system (and ATA chapter reference)	Designation of system	Conditions or limitations
Ice and rain protection systems (ATA30)	Mechanical	
Indicating and recording systems (ATA31)	Avionic	
Landing gear (ATA32)	Mechanical	
Wheels and brakes (ATA32-40)	Mechanical	
Lighting (operation) (ATA33)	Electrical	
Navigation systems: General Radio interface ACARS, SELCAL, INS/IRS Compass Flight management system Doppler systems (ATA34)	Avionic	For a Category B1 licence — compass swings, if endorsed on the licence
Oxygen system (ATA35)	Mechanical	For a Category B2 licence, if endorsed on the licence
Pneumatic system (ATA36)	Mechanical	
Vacuum (ATA37)	Mechanical	
Waste water (ATA38)	Mechanical	
Cabin intercom data and network systems (ATA42)	Avionic	
Cabin systems (ATA44)	Avionic	
Central maintenance system (ATA45)	Avionic	
Information system ATIMS Network server (ATA46)	Avionic	

Aircraft system (and ATA chapter reference)	Designation of system	Conditions or limitations
APU (ATA49)	Powerplant	
Cargo and accessory compartments (ATA50)	Mechanical	
Structures — General (ATA51)	Structure	Structures — general, but excluding wooden structures and fabric surfaces unless: (a) for wooden structures — the holder has obtained the relevant optional units of competency mentioned in section 66.A.25 of this MOS; or (b) for fabric surfaces — the holder has obtained the relevant optional units of competency mentioned in section 66.A.25 of this MOS. *Note* These optional units of competency are marked Z in Appendix IV.
Doors (ATA52)	Structure	
Fuselage (ATA53)	Structure	
Nacelles and pylons (ATA54)	Structure	
Stabilisers (ATA55)	Structure	
Windows (ATA56)	Structure	
Wings (ATA57)	Structure	
Propeller — rotor (ATA60)	Mechanical	
Propeller — propulsion (ATA61)	Powerplant	For Category B1 licence, only if the holder has obtained the relevant optional units of competency mentioned in section 66.A.25 of this MOS. *Note* These optional units of competency are marked P in Appendix IV.
Rotor (ATA62)	Mechanical	
Rotor drives (ATA63)	Mechanical	
Tail rotor (ATA64)	Mechanical	
Tail rotor drive (ATA65)	Mechanical	
Folding blades and pylon (ATA66)	Mechanical	

Aircraft system (and ATA chapter reference)	Designation of system	Conditions or limitations
Rotor flight control (ATA67)	Mechanical	
Powerplant (ATA71)	Powerplant	
Engine turbine/ turbo prop and fans (ATA72)	Powerplant	
Engine fuel and control — carburation/injection system (ATA73)	Powerplant	
FADEC (ATA73A)	Avionic	
Ignition system (ATA74)	Powerplant	
Air systems and control (ATA75)	Powerplant	
Engine control system (ATA76)	Powerplant	
Engine indicating system (ATA77)	Powerplant and Avionic	
Exhaust — thrust reverser (ATA78)	Powerplant	
Lubrication system (ATA79)	Powerplant	
Starting system (ATA80)	Powerplant	
Supercharging system (ATA81)	Powerplant	
Power augmentation (ATA82)	Powerplant	
Accessory drives (ATA83)	Powerplant	

66.A.25 Basic knowledge and competency requirements

(a) This paragraph sets out the requirements that must be met by a person who applies for:

1. an aircraft engineer licence in a category or subcategory; or
2. the addition of a category or subcategory to the person's licence.

(b) The applicant must demonstrate by examination, conducted by an MTO, knowledge:

1. of each subject module that is marked as applicable for the category or subcategory in accordance with Part 2 of Appendix I to this MOS; and
2. to the level of knowledge for the module and its items as indicated in Part 3 of Appendix I to this MOS for the category or subcategory; and
3. in accordance with Appendix II of this MOS or as otherwise approved by CASA.

(c) An applicant for a subcategory B1.1 licence is not required to demonstrate, by examination, knowledge of propellers in accordance with item 17 in Part 2 of Appendix I to this MOS unless the rating is to include propellers.

(d) An applicant for a subcategory B1.2 licence is not required to demonstrate, by examination, knowledge of high speed flight in accordance with subitem 11.1.2 of subject Module 11 in Part 3 of Appendix I to this MOS.

(e) An applicant must hold each unit of competency listed and coded in Appendix IV to this MOS that is marked X or indicated as its alternative for the category or subcategory and, before holding a unit of competency, hold the qualifications or units of competency that are prerequisites for the unit.

(f) In addition to the units of competency that are required under this section for a subcategory B1.1 or B1.2 licence, an applicant for such a rating that includes wooden structures or fabric surfaces must hold each relevant optional unit of competency listed and coded in Appendix IV to this MOS that is marked Z for the subcategory.

(g) A person may be taken to hold the necessary qualifications or units of competency as set out above if an MTO has conducted a recognition of prior learning assessment in accordance with that MTO's course plan and exposition.

66.A.30 Experience requirements

(a) An applicant for an aircraft engineer licence must have acquired the following practical experience:

1. for a Category A and subcategories B1.2 and B1.4 licences — practical maintenance experience in carrying out maintenance on operating aircraft and in training as mentioned in the following table.

Licence category	**Amount of practical experience**
A licence	2 years
B1.2 or B1.4 licence	3 years

2. for Category B2 and subcategories B1.1 and B1.3 licences — practical maintenance experience in carrying out maintenance on operating aircraft as mentioned in the following table.

Licence category	**Amount of practical experience**
B1.1 or B1.3 licence or B2 licence	4 years

3. for a Category C licence:

(i) 3 years experience exercising Category B1.1, B1.3 or B2 privileges on large aircraft; or

(ii) 5 years experience exercising Category B1.2 or B1.4 privileges on large aircraft; or

(iii) for an applicant holding an academic degree in a technical discipline from a university or other higher educational institution recognised by CASA, 3 years experience carrying out maintenance on operating aircraft, including at least 6 months of observation of base maintenance tasks.

(b) A person who holds a licence with a category or subcategory, who applies to CASA to add a category or subcategory to it, must provide evidence to CASA that he or she has been certified by an MTO as satisfying all of the following requirements for the category or subcategory to be added:

1. completion of the knowledge and examination requirements mentioned in Appendix I to this MOS; and
2. holding the units of competency required by Appendix IV to this MOS; and
3. having the practical maintenance experience on operating aircraft detailed in subparagraphs (a) 1 and 2.

(c) In this paragraph:

practical maintenance experience on operating aircraft may include 1 year of category training maintenance experience, such as:

1. simulated maintenance experience using maintenance simulation technology; and
2. practical maintenance experience on representative aeronautical products during maintenance training.

(d) At least 1 year of the practical maintenance experience required for an initial issue of an aircraft engineer licence must be:

1. maintenance experience on aircraft relevant to the category or subcategory for which the licence was sought; and
2. accumulated immediately before making the application for the licence.

(e) Practical aircraft maintenance experience gained outside a civil aircraft maintenance environment can be treated as practical maintenance experience if an MTO certifies to CASA that:

(a) the experience is equivalent to the practical experience required by this MOS; and

(b) the applicant has sufficient additional experience with civil aircraft maintenance to ensure he or she has an understanding of the civil aircraft maintenance environment.

66.A.45 Type/task training and ratings

(a) The holder of a Category A licence may only exercise certification privileges on a specific aircraft type following the satisfactory completion of the relevant Category A aircraft task training carried out by an appropriately approved AMO or MTO, which must include:

1. practical hands on training and theoretical training as appropriate for each task authorised; and
2. satisfactory completion of training demonstrated by an examination and/or by workplace assessment carried out by an AMO or MTO authorised to conduct such training.

(b) The holder of a subcategory B1.1, B1.2, B1.3, B1.4, or Category B2, licence may exercise his or her certification privileges on a non-type rated aircraft when the licence is endorsed with the appropriate category or subcategory for the maintenance required for that non-type rated aircraft.

Note The holder of a subcategory B1.1, B1.2, B1.3, B1.4, or Category B2, licence does not require a type rating to exercise his or her certification privileges on aircraft systems other than the powerplant systems of:

(i) a large aircraft with a particular type of aircraft engine; or

(ii) a small aircraft with a particular type of aircraft engine.

(ba) The holder of a subcategory B1.1, B1.2, B1.3, B1.4, or Category B2 or C, licence must only exercise his or her certification privileges on a particular type, or type and model, of a large aircraft with a particular type of aircraft engine when the licence is endorsed with the appropriate aircraft type rating by CASA.

Note These are aircraft referred to in paragraph (a) of the CASR 66.010 definition of ***aircraft type***.

(bb) The holder of a subcategory B1.1, B1.2, B1.3 or B1.4 licence must only exercise his or her certification privileges on the powerplant systems of:

(a) a large aircraft with a particular type of aircraft engine; or

(ii) a small aircraft with a particular type of aircraft engine;

when the licence is endorsed with the appropriate aircraft type rating by CASA.

Note These are aircraft referred to in paragraphs (b) and (c) of the CASR 66.010 definition of ***aircraft type***.

(c) Type ratings must only be issued by CASA following satisfactory completion of the relevant Category B1, B2 or C aircraft type training approved by CASA or conducted by an appropriately approved MTO.

(d) An applicant for a Category B1 or B2 aircraft type rating must complete the applicable type training in relation to paragraph 66.A.20 (a) privileges, which consists of:

1. theoretical training and examination; and
2. practical training and assessment as specified in section 66.A.50; and
3. in the case of first type rating within a subcategory — mandatory additional on the job training (***OJT***) and assessment as specified in section 66.A.55.

(e) Category C approved type training must comply with the requirements for such training in Appendix III to this MOS. In the case of a Category C licence holder qualified by holding an academic degree as specified in sub-subparagraph 66.A.30 (a) 3 (iii), the first aircraft type theoretical training can only be at the Category B1 or B2 licence level. Practical training is not required.

(f) Completion of approved aircraft type training, as required by paragraphs (b) to (c), must be demonstrated by an examination. The examination must comply with the requirements in Appendix III to this MOS.

(g) The training and assessment for a restricted rating for an aircraft type may be in:

1. a subset of the theoretical elements mentioned in Part 2 of Appendix III that are indicated for the category or subcategory by the numerical level of the type training; and
2. the corresponding practical elements mentioned in Part 3 of Appendix III that are appropriate for the category or subcategory and the rating, only if the MTO provides in the course plan for the training a description of:
   (i) the training and assessment in the subset of theoretical elements and its corresponding practical elements; and
   (ii) the persons eligible to undertake the training and assessment; and
   (iii) the restrictions for the rating to which the training and assessment relates; and
   (iv) ensures that all documents required under this MOS in connection with the training and assessment, describe the rating as a restricted rating.

(h) An AMO approved under section 145.A.37 may:

(i) deliver excluded system training and assessment for the excluded systems set out in Appendix VII; or

(ii) deliver aircraft type training if the subcategory, category and aircraft for the aircraft are set out in a CASR Part 66 advisory circular made for that purpose; or

(iii) arrange for the manufacturer of an aircraft or aircraft engine to provide training and assessment if the aircraft and engine are set out in a CASR Part 66 advisory circular made for that purpose.

66.A.50 Practical training

(a) Aircraft type practical training and assessment must include a representative cross-section of maintenance activities relevant to the category or subcategory.

(b) Practical training must be of fixed content/duration and can be conducted by either an MTO or appropriately approved AMO. Where practical training is conducted by an appropriately approved maintenance organisation, the practical training must be first approved by CASA. The practical training must be supported by a detailed syllabus or practical worksheets/logbook showing content and duration of training.

(c) Practical training can be performed by demonstrations using equipment, components, simulators, other training devices or aircraft. This training does not need to involve actual servicing or repair of aircraft.

(d) Records of demonstration of practical training must be retained by the organisation conducting the practical training for at least 5 years following completion of the practical training.

(e) Practical training must meet the requirements of Appendix III to this MOS.

66.A.55 On the job training

(a) In the case of a first type rating in any category or subcategory, practical training alone is not acceptable for type rating endorsement. In addition to practical training, an applicant must complete OJT.

(b) OJT is not required in the case of a second and subsequent type rating within the same category/subcategory.

(c) OJT must only be conducted by a maintenance organisation approved by CASA to undertake such training activities. The OJT must be supported by a detailed syllabus showing its content and recorded within detailed worksheets/logbook.

(d) OJT must be supervised and assessed by approved assessors.

(e) OJT must comply with the requirements of Appendix III to this MOS.

66.A.60 Recognised States

For the purposes of regulation 66.030 of CASR 1998, recognised States are set out in Appendix V.

66.A.65 Excluded States

For the purposes of regulation 66.060 of CASR 1998, excluded States are set out in Appendix VI.

66.A.70 Exclusions on type ratings

For the purposes of subregulation 66.095 (2) of CASR 1998, exclusions on type ratings are set out in Appendix VII.

Appendix I

CASA knowledge syllabus

Part 1 — Levels of knowledge

Levels of knowledge

The level of knowledge for a module, or part of a module, for a Category A, B1 or B2 licence is indicated in Part 3 of this Appendix by the allocation of a numerical indicator (1, 2 or 3) against the module or part. A level of knowledge has the meaning given to it below.

Level 1

A familiarisation with the principal elements of the subject such that the following objectives are met.

Objectives:

1 The applicant must be familiar with the basic elements of the subject.

2 The applicant must be able to give a simple description of the whole subject, using common words and examples.

3 The applicant must be able to use typical terms.

Level 2

A general knowledge of the theoretical and practical aspects of the subject and an ability to apply that knowledge, such that the following objectives are met.

Objectives:

1 The applicant must be able to understand the theoretical fundamentals of the subject.

2 The applicant must be able to give a general description of the subject using, as appropriate, typical examples.

3 The applicant must be able to use mathematical formulae in conjunction with physical laws describing the subject.

4 The applicant must be able to read and understand sketches, drawings and schematics describing the subject.

5 The applicant must be able to apply his or her knowledge in a practical manner using detailed procedures.

Level 3

A detailed knowledge of the theoretical and practical aspects of the subject, and a capacity to combine and apply the separate elements of knowledge in a logical and comprehensive manner, such that the following objectives are met.

Objectives:

1 The applicant must know the theory of the subject and interrelationships with other subjects.

2 The applicant must be able to give a detailed description of the subject using theoretical fundamentals and specific examples.

3 The applicant must understand and be able to use mathematical formulae related to the subject.

4 The applicant must be able to read, understand and prepare sketches, simple drawings and schematics describing the subject.

5 The applicant must be able to apply his or her knowledge in a practical manner using manufacturer's instructions.

6 The applicant must be able to interpret results from various sources and measurements and apply corrective action where appropriate.

Part 2 — Knowledge module requirements

Qualification on basic subjects for each category or subcategory of licence must be in accordance with the following table. Applicable subjects are indicated by an X.

Subject modules	**A or B1 aeroplane with:**		**A or B1 helicopter with:**		**B2**
	Turbine engine(s)	**Piston engine(s)**	**Turbine engine(s)**	**Piston engine(s)**	**Avionics**
1 Mathematics	X	X	X	X	X
2 Physics	X	X	X	X	X
3 Electrical fundamentals	X	X	X	X	X
4 Electronic fundamentals	X	X	X	X	X
5 Digital techniques electronic instrument systems	X	X	X	X	X
6 Materials and hardware	X	X	X	X	X
7 Maintenance practices	X	X	X	X	X
8 Basic aerodynamics	X	X	X	X	X
9 Human factors	X	X	X	X	X
10 Aviation legislation	X	X	X	X	X
11 Aeroplane aerodynamics, structures and systems	X	X			
12 Helicopter aerodynamics, structures and systems			X	X	
13 Aircraft structures and systems					X

Subject modules	A or B1 aeroplane with:		A or B1 helicopter with:		B2
	Turbine engine(s)	Piston engine(s)	Turbine engine(s)	Piston engine(s)	Avionics
14 Propulsion — avionic systems					X
15 Gas turbine engine	X		X		
16 Piston engine		X		X	
17 Propeller	X	X			

Part 3 — Details of modules and levels of knowledge

Module 1 Mathematics

	Level of knowledge for the category		
	A	B1	B2
1.1 Arithmetic	1	2	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			
(a) Evaluating simple algebraic expressions, addition, subtraction, multiplication and division, use of brackets, simple algebraic fractions;	1	2	2
(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
1.3 Geometry			
(a) Simple geometrical constructions;	—	1	1

	Level of knowledge for the category		
	A	**B1**	**B2**
(b) Graphical representation, nature and uses of graphs, graphs of equations and functions;	2	2	2
(c) Simple trigonometry, trigonometrical relationships, use of tables and rectangular and polar coordinates.	—	2	2

Module 2 Physics

	Level of knowledge for the category		
	A	**B1**	**B2**
2.1 Matter	1	1	1
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	1	2	1
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	2	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;			

	Level of knowledge for the category		
	A	**B1**	**B2**
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;	1	2	1
(b) Momentum, conservation of momentum; Impulse; Gyroscopic principles; Friction: nature and effects, coefficient of friction (rolling resistance).	1	2	2
2.2.4 Fluid dynamics			
(a) Specific gravity and density;	2	2	2
(b) Viscosity, fluid resistance, effects of streamlining; Effects of compressibility on fluids; Static, dynamic and total pressure: Bernoulli's Theorem, venturi.	1	2	1
2.3 Thermodynamics			
(a) Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin, heat definition;	2	2	2
(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	1	2	2

	Level of knowledge for the category		
	A	**B1**	**B2**
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)	—	2	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	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		
	A	**B1**	**B2**
3.1 Electron theory	1	1	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	1	2	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	1	2	2
The following terms, their units and factors affecting them: potential difference, electromotive force, voltage, current, resistance, conductance, charge, conventional current flow,			

	Level of knowledge for the category		
	A	**B1**	**B2**
electron flow.			
3.4 Generation of electricity	1	1	1
Production of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.			
3.5 DC sources of electricity	1	2	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	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			
(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;	—	2	2
(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;	—	1	1

	Level of knowledge for the category		
	A	**B1**	**B2**
Construction of Wheatstone Bridge.			
3.8 Power	—	2	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	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.			
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	2

	Level of knowledge for the category		
	A	**B1**	**B2**
(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.	—	2	2
3.11 Inductance and inductor	—	2	2
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	—	2	2
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	1	2	2
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			

	Level of knowledge for the category		
	A	**B1**	**B2**
voltage, current and power; Triangular and square waves; Single and 3 phase principles.			
3.14 Resistive (R), Capacitive (C) and Inductive (L) Circuits	—	2	2
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	—	2	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	1
Operation, application and uses of the following filters: low pass, high pass, band pass, band stop.			
3.17 AC generators	—	2	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.			

	Level of knowledge for the category		
	A	**B1**	**B2**
3.18 AC motors	—	2	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.			

Module 4 Electronic fundamentals

	Level of knowledge for the category		
	A	**B1**	**B2**
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	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	—	—	2

	Level of knowledge for the category		
	A	**B1**	**B2**
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.			

	Level of knowledge for the category		
	A	**B1**	**B2**
4.1.2 Transistors			
(a) Transistor symbols; Component description and orientation; Transistor characteristics and properties;	—	1	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;	—	1	—
(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;	—	—	2

	Level of knowledge for the category		
	A	**B1**	**B2**
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	—	1	2
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;	—	1	—
(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.	—	—	2

Module 5 Digital techniques electronic instrument systems

	Level of knowledge for the category		
	A	**B1**	**B2**
5.1 Electronic instrument systems	1	2	3
Typical systems arrangements and cockpit layout of electronic instrument systems.			

	Level of knowledge for the category		
	A	**B1**	**B2**
5.2 Numbering systems	—	1	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	—	1	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	2
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.	—	2	2
(b) Interpretation of logic diagrams.	—	—	2
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);	1	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;	—	—	2

	Level of knowledge for the category		
	A	**B1**	**B2**
Operation, advantages and disadvantages of the various data storage systems.			
5.7 Microprocessors	—	—	2
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			2
Operation and use of encoders and decoders; Function of encoder types; Uses of medium, large and very large scale integration.			
5.9 Multiplexing	—	—	2
Operation, application and identification in logic diagrams of multiplexers and demultiplexers.			
5.10 Fibre optics	—	1	2
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	—	2	2
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	1	2	2
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	—	2	2
Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programs.			

	Level of knowledge for the category		
	A	**B1**	**B2**
5.14 Electromagnetic environment	—	2	2
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	—	2	2
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

	Level of knowledge for the category		
	A	**B1**	**B2**
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	2	1

	Level of knowledge for the category		
	A	**B1**	**B2**
(b) Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.	—	1	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	2	1
(b) Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.	—	1	1
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;	1	2	2
(b) The detection of defects and deterioration in composite and non-metallic material; Repair of composite and non-metallic material.	1	2	—
6.3.2 Wooden structures	1	2	—
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.			

	Level of knowledge for the category		
	A	**B1**	**B2**
6.3.3 Fabric covering	1	2	—
Characteristics, properties and types of fabrics used in aeroplanes; Inspections 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;	1	1	1
(b) Types of corrosion and their identification; Causes of corrosion; Material types, susceptibility to corrosion.	2	3	2
6.5 Fasteners			
6.5.1 Screw threads	2	2	2
Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; Measuring screw threads;			
6.5.2 Bolts, studs and screws	2	2	2
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	2	2	2
Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick release fasteners, keys, circlips, cotter pins.			

	Level of knowledge for the category		
	A	**B1**	**B2**
6.5.4 Aircraft rivets	1	2	1
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;	2	2	2
(b) Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes.	2	2	1
6.7 Springs	1	2	1
Types of springs, materials, characteristics and applications.			
6.8 Bearings	1	2	2
Purpose of bearings, loads, material, construction; Types of bearings and their application.			
6.9 Transmissions	1	2	2
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	1	2	1
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	1	2	2
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

	Level of knowledge for the category		
	A	**B1**	**B2**
7.1 Safety precautions — aircraft and workshop	3	3	3
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	3	3	3
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	3	3	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	—	2	3
Operation, function and use of avionic general test equipment.			
7.5 Engineering drawings, diagrams and standards	1	2	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 of America; Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL; Wiring diagrams and schematic diagrams.			

	Level of knowledge for the category		
	A	**B1**	**B2**
7.6 Fits and clearances	1	2	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 cables and connectors	1	2	2
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	1	2	—
Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.			
7.9 Pipes and hoses	1	2	—
Bending and belling and flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes.			
7.10 Springs	1	2	—
Inspection and testing of springs.			
7.11 Bearings	1	2	—
Testing, cleaning and inspection of bearings; Lubrication requirements of bearings; Defects in bearings and their causes.			

	Level of knowledge for the category		
	A	**B1**	**B2**
7.12 Transmissions	1	2	—
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	1	2	—
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	—	2	—
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	—	2	—
Bonding practices; Environmental conditions; Inspection methods.			
7.15 Welding, brazing, soldering and bonding			
(a) Soldering methods, inspection of soldered joints;	—	2	2
(b) Welding and brazing methods; Inspection of welded and brazed joints; Bonding methods and inspection of bonded joints.	—	2	—
7.16 Aircraft weight and balance			
(a) Centre of gravity and balance limits calculation: use of relevant documents;	—	2	2

	Level of knowledge for the category		
	A	**B1**	**B2**
(b) Preparation of aircraft for weighing; Aircraft weighing.	—	2	—
7.17 Aircraft handling and storage	2	2	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			
(a) Types of defects and visual inspection techniques; Corrosion removal, assessment and reprotection;	2	3	2
(b) General repair methods, Structural Repair Manual; Ageing, fatigue and corrosion control programs;	—	2	—
(c) Non-destructive inspection techniques including: penetrant, radiographic, eddy current, ultrasonic and boroscope methods;	—	2	1
(d) Disassembly and re-assembly techniques;	2	2	2
(e) Trouble shooting techniques.	—	2	2
7.19 Abnormal events			
(a) Inspections following lightning strikes and HIRF penetration.	2	2	2

	Level of knowledge for the category		
	A	**B1**	**B2**
(b) Inspections following abnormal events such as heavy landings and flight through turbulence.	2	2	—
7.20 Maintenance procedures	1	2	2
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

	Level of knowledge for the category		
	A	**B1**	**B2**
8.1 Physics of the atmosphere	1	2	2
International Standard Atmosphere (ISA), application aerodynamics.			
8.2 Aerodynamics	1	2	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.			

	Level of knowledge for the category		
	A	**B1**	**B2**
8.3 Theory of flight	1	2	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	1	2	2
Longitudinal, lateral and directional stability (active and passive).			

Module 9 Human factors

	Level of knowledge for the category		
	A	**B1**	**B2**
9.1 General	2	2	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	2	2
Vision; Hearing; Information processing; Attention and perception; Memory; Claustrophobia and physical access.			
9.3 Social psychology	1	1	1
Responsibility: individual and group; Motivation and de-motivation; Peer pressure;			

	Level of knowledge for the category		
	A	**B1**	**B2**
Culture issues; Team working; Management, supervision and leadership.			
9.4 Factors affecting performance	2	2	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	1	1
Noise and fumes; Illumination; Climate and temperature; Motion and vibration; Working environment.			
9.6 Tasks	1	1	1
Physical work; Repetitive tasks; Visual inspection; Complex systems.			
9.7 Communication	2	2	2
Within and between teams; Work logging and recording; Keeping up-to-date, currency; Dissemination of information.			
9.8 Human error	2	2	2
Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e. accidents); Avoiding and managing errors.			

	Level of knowledge for the category		
	A	**B1**	**B2**
9.9 Hazards in the workplace	2	2	2
Recognising and avoiding hazards; Dealing with emergencies.			

Module 10 Aviation legislation

	Level of knowledge for the category		
	A	**B1**	**B2**
10.1 Regulatory Framework	1	1	1
Role of International Civil Aviation Organization; Role of CASA; Relationship between CASR Part 42, Part 66, Part 145 and Part 147; Relationship with other aviation authorities.			
10.2 Part 66 Certifying Staff	2	2	2
Detailed understanding of CASR Part 66.			
10.3 Part 145 – Approved maintenance organisations	2	2	2
Detailed understanding of CASR Part 145.			
10.4 Commercial air transportation	1	1	1
Air Operators Certificates; Operators responsibilities; Documents to be carried; Aircraft placarding (markings).			
10.5 Aircraft certification			
(a) General Certification rules; Type certification; Supplemental type certification; Part 21 – Design and production organisation approvals;	—	1	1

	Level of knowledge for the category		
	A	**B1**	**B2**
(b) Documents Certificate of Airworthiness; Certificate of Registration; Noise Certificate; Weight Schedule; Radio Station Licence and Approval.	—	2	2
10.6 Part 42	2	2	2
Detailed understanding of CASR Part 42.			
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.	1	2	2
(b) Continuing airworthiness; Test flights; ETOPS, maintenance and despatch requirements; All weather operation: category 2 and 3 operations and minimum equipment requirements.	—	1	1

Module 11 Aeroplane aerodynamics, structures and systems

	Level of knowledge for the category		
	A1 **A2**	**B1.1** **B1.2**	**B2**
11.1 Theory of flight	1	2	—
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	1	2	—
Speed of sound, subsonic flight, transonic flight, supersonic flight; Mach number, critical Mach number, compressibility buffet, shockwave, aerodynamic cheating, 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)	2	2	—
Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions;			

	Level of knowledge for the category		
	A1 **A2**	**B1.1** **B1.2**	**B2**
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.	1	2	—
11.3 Airframe structures — aeroplanes			
11.3.1 Fuselage (ATA52/53/56)	1	2	—
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)	1	2	—
Construction; Fuel storage; Landing gear, pylon, control surface and highlift and drag attachments.			
11.3.3 Stabilisers (ATA55)	1	2	—
Construction; Control surface attachment.			

	Level of knowledge for the category		
	A1 **A2**	**B1.1** **B1.2**	**B2**
11.3.4 Flight control surface (ATA55/57)	1	2	—
Construction and attachment; Balancing — mass and aerodynamic.			
11.3.5 Nacelles and pylons (ATA54)	1	2	—
Construction; Firewalls; Engine mounts.			
11.4 Air-conditioning and cabin pressurisation (ATA21)			
11.4.1 Air supply	1	2	—
Sources of air supply including engine bleed, APU and ground cart.			
11.4.2 Air-conditioning	1	3	—
Air-conditioning systems; Air cycle and vapour cycle machines; Distribution systems; Flow, temperature and humidity control system.			
11.4.3 Pressurisation	1	3	—
Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers.			
11.4.4 Safety and warning devices	1	3	—
Protection and warning devices.			
11.5 Instruments and avionic systems			
11.5.1 Instrument systems (ATA31)	1	2	—
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;			

	Level of knowledge for the category		
	A1 **A2**	**B1.1** **B1.2**	**B2**
Glass cockpit; Other aircraft system indication.			
11.5.2 Avionic systems	1	1	—
Fundamentals of system layouts and operation of: Auto flight (ATA22); Communications (ATA23); Navigation systems (ATA34).			
11.6 Electrical power (ATA24)	1	3	—
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;	2	2	—
(b) Cabin layout; Equipment layout; Cabin furnishing installation; Cabin entertainment equipment; Galley installation; Cargo handling and retention equipment; Airstairs.	1	1	—

	Level of knowledge for the category		
	A1 **A2**	**B1.1** **B1.2**	**B2**
11.8 Fire protection (ATA26)			
(a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests;	1	3	—
(b) Portable fire extinguisher.	1	3	—
11.9 Flight controls (ATA27)	1	3	—
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)	1	3	—
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)	1	3	—
System layout; Hydraulic fluids; Hydraulic reservoirs and accumulators;			

	Level of knowledge for the category		
	A1 **A2**	**B1.1** **B1.2**	**B2**
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)	1	3	—
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)	2	3	—
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)	2	3	—
External: navigation, anti-collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; emergency.			
11.15 Oxygen (ATA35)	1	3	—
System layout: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.			
11.16 Pneumatic and vacuum (ATA36)	1	3	—
System layout; Sources: engine and APU, compressors, reservoirs, ground supply;			

	Level of knowledge for the category		
	A1 **A2**	**B1.1** **B1.2**	**B2**
Pressure control; Distribution; Indications and warnings; Interfaces with other systems.			
11.17 Water and waste (ATA38)	2	3	—
Water system layout, supply, distribution, servicing and draining; Toilet system layout, flushing and servicing; Corrosion aspects.			
11.18 On-board maintenance systems (ATA45)	1	2	—
Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).			
11.19 Integrated modular avionics (ATA42)	1	2	—
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.			
11.20 Cabin systems (ATA44)	1	2	—
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.			

	Level of knowledge for the category		
	A1 **A2**	**B1.1** **B1.2**	**B2**
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)	1	2	—
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

		Level of knowledge for the category	
	A	**B1.3** **B1.4**	**B2**
12.1 Theory of flight — rotary wing aerodynamics	1	2	—
Terminology; Effects of gyroscopic precession; Torque reaction and directional control; Dissymmetry of lift, blade tip stall; Translating tendency and its correction; Coriolis effect and compensation; Vortex ring state, power settling, overpitching; Auto-rotation; Ground effect.			
12.2 Flight control systems	2	3	—
Cyclic control; Collective control; Swashplate; Yaw control: Anti-torque control, tail rotor, bleed air; Main rotor head: design and operation features; Blade dampers: function and construction; Rotor blades: main and tail rotor blade construction and attachment; Trim control, fixed and adjustable stabilisers; System operation: manual, hydraulic, electrical and fly-by-wire; Artificial feel; Balancing and rigging.			
12.3 Blade tracking and vibration analysis	1	3	—
Rotor alignment; Main and tail rotor tracking; Static and dynamic balancing; Vibration types, vibration reduction methods; Ground resonance.			

		Level of knowledge for the category	
	A	**B1.3** **B1.4**	**B2**
12.4 Transmissions	1	3	—
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;	2	2	—
(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.	1	2	—

		Level of knowledge for the category	
	A	**B1.3** **B1.4**	**B2**
12.6 Air-conditioning (ATA21)			
12.6.1 Air supply	1	2	—
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.	1	3	—
12.7 Instruments and avionic systems			
12.7.1 Instrument systems (ATA31)	1	2	—
Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Vibration indicating systems — HUMS; Glass cockpit; Other aircraft system indication.			
12.7.2 Avionic systems	1	1	—
Fundamentals of system layouts and operation of: Auto flight (ATA22); Communications (ATA23); Navigation Systems (ATA34).			
12.8 Electrical power (ATA24)	1	3	—
Batteries installation and operation; DC power generation, AC power generation; Emergency power generation; Voltage regulation, circuit protection; Power distribution; Inverters, transformers, rectifiers; External and ground power.			

		Level of knowledge for the category	
	A	**B1.3** **B1.4**	**B2**
12.9 Equipment and furnishings (ATA25)			
(a) Emergency equipment requirements; Seats, harnesses and belts; Lifting systems;	2	2	—
(b) Emergency flotation systems; Cabin layout, cargo retention; Equipment layout; Cabin furnishing installation.	1	1	—
12.10 Fire protection (ATA26)	1	3	—
Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.			
12.11 Fuel systems (ATA28)	1	3	—
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)	1	3	—
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.			

		Level of knowledge for the category	
	A	**B1.3** **B1.4**	**B2**
12.13 Ice and rain protection (ATA30)	1	3	—
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)	2	3	—
Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, tyres, brakes; Steering; Skids, floats.			
12.15 Lights (ATA33)	2	3	—
External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; emergency.			
12.16 Pneumatic and vacuum (ATA36)	1	3	—
System layout; Sources: engine, compressors, reservoirs, ground supply; Pressure control; Distribution; Indication sand warnings; Interfaces with other systems.			
12.17 Integrated modular avionics (ATA42)	1	2	—
Functions that may be typically integrated in the integrated modular avionic (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.			

		Level of knowledge for the category	
	A	**B1.3** **B1.4**	**B2**
12.18 On-board maintenance systems (ATA45)	1	2	—
Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).			
12.19 Information systems (ATA46)	1	2	—
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

	Level of knowledge for the category		
	A	**B1**	**B2**
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;	—	—	1

	Level of knowledge for the category		
	A	**B1**	**B2**
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;	—	—	1
(c) Rotary wing aerodynamics Terminology; Operation and effect of cyclic, collective and anti-torque controls.	—	—	1
13.2 Structures — general concepts			
(a) Fundamentals of structural systems;	—	—	1
(b) Zonal and station identification systems; electrical bonding; Lightning strike protection provision.	—	—	2
13.3 Autoflight (ATA22)	—	—	3
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.			

	Level of knowledge for the category		
	A	**B1**	**B2**
13.4 Communication and navigation (ATA23/34)	—	—	3
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)	—	—	3
Batteries installation and operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution;			

	Level of knowledge for the category		
	A	**B1**	**B2**
Inverters, transformers, rectifiers; Circuit protection; External and ground power.			
13.6 Equipment and furnishings (ATA25)	—	—	3
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;	—	—	1
(b) System operation: electrical, fly-by-wire.	—	—	3
13.8 Instrument systems (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;			

	Level of knowledge for the category		
	A	**B1**	**B2**
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)	—	—	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)			
13.11.1 Air supply	—	—	2
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.	— — — —	— — — —	2 3 1 3

	Level of knowledge for the category		
	A	**B1**	**B2**
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)			
(a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests;	—	—	3
(b) Portable fire extinguisher.	—	—	1
13.13 Fuel systems (ATA28)			
System layout;	—	—	1
Fuel tanks;	—	—	1
Supply systems;	—	—	1
Dumping, venting and draining;	—	—	1
Cross-feed and transfer;	—	—	2
Indications and warnings;	—	—	3
Refuelling and defuelling;	—	—	2
Longitudinal balance fuel systems.	—	—	3
13.14 Hydraulic power (ATA29)			
System layout;	—	—	1
Hydraulic fluids;	—	—	1
Hydraulic reservoirs and accumulators;	—	—	1
Pressure generation: electrical, mechanical, pneumatic;	—	—	3
Emergency pressure generation;	—	—	3
Pressure control;	—	—	3
Power distribution;	—	—	1
Indication and warning systems;	—	—	3
Interface with other systems.	—	—	3

	Level of knowledge for the category		
	A	**B1**	**B2**
13.15 Ice and rain protection (ATA30)	—	—	3
Ice formation, classification and detection;	—	—	2
Anti-icing systems: electrical, hot air and chemical;	—	—	2
De-icing systems: electrical, hot air, pneumatic and chemical;	—	—	3
Rain repellent;	—	—	1
Probe and drain heating;	—	—	3
Wiper systems.	—	—	1
13.16 Landing gear (ATA32)			
Construction, shock absorbing;	—	—	1
Extension and retraction systems: normal and emergency;	—	—	3
Indications and warnings;	—	—	3
Wheels, brakes, antiskid and autobraking;	—	—	3
Tyres;	—	—	1
Steering.	—	—	3
13.17 Oxygen (ATA35)			
System layout: cockpit, cabin;	—	—	1
Sources, storage, charging and distribution;	—	—	1
Supply regulation;	—	—	1
Indications and warnings.	—	—	3
13.18 Pneumatic/vacuum (ATA36)			
System layout;	—	—	2
Sources: engine/APU, compressors, reservoirs, ground supply;	—	—	2
Pressure control;	—	—	3
Distribution;	—	—	1
Indications and warnings;	—	—	3
Interfaces with other systems.	—	—	3
13.19 Water/waste (ATA38)	—	—	2
Water system layout, supply, distribution, servicing and draining; Toilet system layout, flushing and servicing.			
13.20 Integrated modular avionics (ATA42)	—	—	3
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,			

	Level of knowledge for the category		
	A	**B1**	**B2**
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)	—	—	3
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.			
13.22 Information systems (ATA46)	—	—	3
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			

	Level of knowledge for the category		
	A	**B1**	**B2**
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

	Level of knowledge for the category		
	A	**B1**	**B2**
14.1 Turbine engines			
(a) Constructional arrangement and operation of turbojet, turbofan, turbo shaft and turbopropeller engines;	—	—	1
(b) Electronic engine control and fuel metering systems (FADEC).	—	—	2
14.2 Engine indicating systems	—	—	2
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.			

	Level of knowledge for the category		
	A	**B1**	**B2**
14.3 Starting and ignition systems	—	—	2
Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements.			

Module 15 Gas turbine engine

	Level of knowledge for the category		
	A	**B1**	**B2**
15.1 Fundamentals	1	2	—
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	—	2	—
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	2	2	—
Compressor inlet ducts; Effects of various inlet configurations; Ice protection.			

	Level of knowledge for the category		
	A	**B1**	**B2**
15.4 Compressors	1	2	—
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	1	2	—
Constructional features and principles of operation.			
15.6 Turbine section	2	2	—
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	1	2	—
Constructional features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers.			
15.8 Bearings and seals	—	2	—
Constructional features and principles of operation.			
15.9 Lubricants and fuels	1	2	—
Properties and specifications; Fuel additives; Safety precautions.			
15.10 Lubrication systems	1	2	—
System operation and layout and components.			

	Level of knowledge for the category		
	A	**B1**	**B2**
15.11 Fuel systems	1	2	—
Operation of engine control and fuel metering systems including: electronic engine control (FADEC), systems layout and components.			
15.12 Air systems	1	2	—
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.	1	2	—
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.	1	2	—
15.15 Power augmentation systems	—	1	—
Operation and applications; Water injection, water methanol; Afterburner systems.			
15.16 Turbo-prop engines	1	2	—
Gas coupled and free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Over speed safety devices.			

	Level of knowledge for the category		
	A	**B1**	**B2**
15.17 Turbo-shaft engines	1	2	—
Arrangements drive systems, reduction gearing, couplings, control systems.			
15.18 Auxiliary power units (APUs)	1	2	—
Purpose, operation, protective systems.			
15.19 Powerplant installation	1	2	—
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	1	2	—
Operation of detection and extinguishing systems.			
15.21 Engine monitoring and ground operation	1	3	—
Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Trend (including oil analysis, vibration and baroscope) 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	—	2	—
Preservation and depreservation for the engine and accessories and systems.			

Module 16 Piston engine

	Level of knowledge for the category		
	A	**B1**	**B2**
16.1 Fundamentals	1	2	—
Mechanical, thermal and volumetric efficiencies; Operating principles: 2 stroke, 4 stroke, otto and diesel;			

	Level of knowledge for the category		
	A	**B1**	**B2**
Piston displacement and compression ratio; Engine configuration and firing order.			
16.2 Engine performance	1	2	—
Power calculation and measurement; Factors affecting engine power; Mixtures and leaning, pre-ignition.			
16.3 Engine construction	1	2	—
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	1	2	
Types, construction and principles of operation; Icing and heating.			
16.4.2 Fuel injection systems	1	2	—
Types, construction and principles of operation.			
16.4.3 Electronic engine control	1	2	—
Operation of engine control and fuel metering systems including: electronic engine control (FADEC), systems layout and components.			
16.5 Starting and ignition systems	1	2	—
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	1	2	—
Construction and operation of induction systems, including alternate air systems; Exhaust systems, engine cooling systems — air and liquid.			

	Level of knowledge for the category		
	A	**B1**	**B2**
16.7 Supercharging and turbo charging	1	2	—
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	1	2	—
Properties and specifications; Fuel additives; Safety precautions.			
16.9 Lubrication systems	1	2	—
System operation and layout and components.			
16.10 Engine indication systems	1	2	—
Engine speed; Cylinder head temperature; Coolant temperature; Oil pressure and temperature; Exhaust gas temperature; Fuel pressure and flow; Manifold pressure.			
16.11 Powerplant installation	1	2	—
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	1	3	—
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.			

	Level of knowledge for the category		
	A	**B1**	**B2**
16.13 Engine storage and preservation	—	2	—
Preservation and depreservation for the engine and accessories and systems.			

Module 17 Propeller

	Level of knowledge for the category		
	A	**B1**	**B2**
17.1 Fundamentals	1	2	—
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	1	2	—
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 speeding propeller; Propeller and spinner installation.			
17.3 Propeller pitch control	1	2	—
Speed control and pitch change methods, mechanical and electrical and electronic; Feathering and reverse pitch; Overspeed protection.			
17.4 Propeller synchronising	—	2	—
Synchronising and synchrophasing equipment.			

	Level of knowledge for the category		
	A	**B1**	**B2**
17.5 Propeller ice protection	1	2	—
Fluid and electrical de-icing equipment.			
17.6 Propeller maintenance	1	3	—
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	1	2	—
Propeller preservation and depreservation.			

Appendix II

Basic knowledge examination standard

1 Standardisation basis for examinations

1.1 Unless otherwise approved within the CASA approved exposition course syllabus, all basic examinations must be carried out using the multi-choice question format and essay questions as specified below. The incorrect alternatives must seem equally plausible to anyone ignorant of the subject. All of the alternatives should be clearly related to the question and of similar vocabulary, grammatical construction and length. In numerical questions, the incorrect answers should correspond to procedural errors such as corrections applied in the wrong sense or incorrect unit conversions: they must not be mere random numbers.

1.2 Each multi-choice question must have 3 alternative answers of which only 1 must be the correct answer and the candidate must be allowed a time per module which is based upon a nominal average of 75 seconds per question.

1.3 Each essay question requires the preparation of a written answer and the candidate must be allowed 20 minutes to answer each such question.

1.4 Suitable essay questions must be drafted and evaluated using the knowledge syllabus in Part 66, Appendix I, Modules 7, 9 and 10.

1.5 Each question will have a model answer drafted for it, which will also include any known alternative answers that may be relevant for other subdivisions.

1.6 The model answer will also be broken down into a list of important points known as Key Points.

1.7 The pass mark for each Part 66 module and sub-module multi-choice part of the examination is 75%.

1.8 The pass mark for each essay question is 75% in that the candidate's answer must contain 75% of the required key points addressed by the question and no significant error related to any required key point.

1.9 If either the multi-choice part or the essay part is failed, then it is only necessary to retake the multi-choice or essay part, as appropriate.

1.10 Penalty marking systems must not be used to determine whether a candidate has passed.

1.11 All Part 66 modules that make up a complete Part 66 aircraft maintenance licence category or subcategory must be passed within a 5 year time period of passing the first module except in the case specified in subclause 1.12. A failed module may not be retaken for at least 90 days following the date of the failed module examination, except in the case of an MTO which conducts a course of retraining tailored to the failed subjects in the particular module when the failed module may be retaken after 30 days.

1.12 The 5 year time period mentioned in subclause 1.11 does not apply to those modules which are common to more than one Part 66 aircraft maintenance licence category or subcategory and which were previously passed as part of another such category or subcategory examination.

1.13 Any variation to the examination standard must be approved by CASA.

2 Question numbers for the Part 66, Appendix I, Modules

2.1 Subject Module 1, Mathematics:

Category A – 16 multi-choice and 0 essay questions. Time allowed 20 minutes.
Category B1 – 32 multi-choice and 0 essay questions. Time allowed 40 minutes.
Category B2 – 32 multi-choice and 0 essay questions. Time allowed 40 minutes.

2.2 Subject Module 2, Physics:

Category A – 32 multi-choice and 0 essay questions. Time allowed 40 minutes.
Category B1 – 52 multi-choice and 0 essay questions. Time allowed 65 minutes.
Category B2 – 52 multi-choice and 0 essay questions. Time allowed 65 minutes.

2.3 Subject Module 3, Electrical fundamentals:

Category A – 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B1 – 52 multi-choice and 0 essay questions. Time allowed 65 minutes.
Category B2 – 52 multi-choice and 0 essay questions. Time allowed 65 minutes.

2.4 Subject Module 4, Electronic fundamentals:

Category A – None.
Category B1 – 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B2 – 40 multi-choice and 0 essay questions. Time allowed 50 minutes.

2.5 Subject Module 5, Digital techniques/electronic instrument systems:

Category A – 16 multi-choice and 0 essay questions. Time allowed 20 minutes.
Category B1.1 and B1.3 – 40 multi-choice and 0 essay questions. Time allowed 50 minutes.
Category B1.2 and B1.4 – 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B2 – 72 multi-choice and 0 essay questions. Time allowed 90 minutes.

2.6 Subject Module 6, Materials and hardware:

Category A – 52 multi-choice and 0 essay questions. Time allowed 65 minutes.
Category B1 – 72 multi-choice and 0 essay questions. Time allowed 90 minutes.
Category B2 – 60 multi-choice and 0 essay questions. Time allowed 75 minutes.

2.7 Subject Module 7, Maintenance practices:

Category A – 72 multi-choice and 2 essay questions. Time allowed 90 minutes plus 40 minutes.
Category B1 – 80 multi-choice and 2 essay questions. Time allowed 100 minutes plus 40 minutes.
Category B2 – 60 multi-choice and 2 essay questions. Time allowed 75 minutes plus 40 minutes.

2.8 Subject Module 8, Basic aerodynamics:

Category A – 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B1 – 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B2 – 20 multi-choice and 0 essay questions. Time allowed 25 minutes.

2.9 *Subject Module 9, Human factors:*

Category A – 20 multi-choice and 1 essay question. Time allowed 25 minutes plus 20 minutes.

Category B1 – 20 multi-choice and 1 essay question. Time allowed 25 minutes plus 20 minutes.

Category B2 – 20 multi-choice and 1 essay question. Time allowed 25 minutes plus 20 minutes.

2.10 *Subject Module 10, Aviation Legislation:*

Category A – 32 multi-choice and 1 essay question. Time allowed 40 minutes plus 20 minutes.

Category B1 – 40 multi-choice and 1 essay question. Time allowed 50 minutes plus 20 minutes.

Category B2 – 40 multi-choice and 1 essay question. Time allowed 50 minutes plus 20 minutes.

2.11 *Subject Module 11, Aeroplane aerodynamics, structures and systems:*

Category A – 108 multi-choice and 0 essay questions. Time allowed 135 minutes.

Category B1 – 140 multi-choice and 0 essay questions. Time allowed 175 minutes.

Category B2 – None.

2.12 *Not used*

2.13 *Subject Module 12, Helicopter aerodynamics, structures and systems:*

Category A – 100 multi-choice and 0 essay questions. Time allowed 125 minutes.

Category B1 – 128 multi-choice and 0 essay questions. Time allowed 160 minutes.

Category B2 – None.

2.14 *Subject Module 13, Aircraft aerodynamics, structures and systems:*

Category A – None.

Category B1 – None.

Category B2 – 180 multi-choice and 0 essay questions. Time allowed 225 minutes.

2.15 *Subject Module 14, Propulsion – avionic system:*

Category A – None.

Category B1 – None.

Category B2 – 24 multi-choice and 0 essay questions. Time allowed 30 minutes.

2.16 *Subject Module 15, Gas turbine engine:*

Category A – 60 multi-choice and 0 essay questions. Time allowed 75 minutes.

Category B1 – 92 multi-choice and 0 essay questions. Time allowed 115 minutes.

Category B2 – None.

2.17 *Subject Module 16, Piston engine:*

Category A – 52 multi-choice and 0 essay questions. Time allowed 65 minutes.

Category B1 – 72 multi-choice and 0 essay questions. Time allowed 90 minutes.

Category B2 – None.

2.18 Subject Module 17, Propeller:

Category A – 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B1 – 30 multi-choice and 0 essay questions. Time allowed 40 minutes.
Category B2 – None.

Appendix III

Type training and assessment standards

Part 1 — Type training levels

The 3 levels set out below describe the objectives, the depth of training, and the level of questions that the training is intended to achieve.

Level 1

A brief overview of the airframe, systems and powerplant, as outlined in the systems description section of the Aircraft Maintenance Manual/Instructions for Continued Airworthiness.

Course objectives:

On completion of the course, the student will be able to:

(a) provide a simple description of the whole subject, using common words, examples, and typical terms, and identify safety precautions related to the airframe, its systems and powerplant; and

(b) identify aircraft manuals, and maintenance practices important to the airframe, its systems and powerplant; and

(c) define the general layout of the aircraft's major systems; and

(d) define the general layout and characteristics of the powerplant; and

(e) identify special tooling and test equipment used with the aircraft.

Level 2

Basic system overview of controls, indicators, principal components – including their location and purpose – servicing and minor troubleshooting, general knowledge of the theoretical and practical aspects of the subject.

Course objectives:

In addition to the information contained in the Level 1 training, at the completion of Level 2 training, the student will be able to:

(a) understand the theoretical fundamentals, and apply knowledge in a practical manner using detailed procedures; and

(b) recall the safety precautions to be observed when working on or near the aircraft, powerplant and systems; and

(c) describe systems and aircraft handling procedures, particularly access, power availability and sources; and

(d) identify the locations of the principal components; and

(e) explain the normal functioning of each major system, including terminology and nomenclature; and

(f) perform the procedures for servicing associated with the aircraft for the following systems: fuel, powerplants, hydraulics, landing gear, water/waste and oxygen; and

(g) demonstrate proficiency in the use of crew reports and on-board reporting systems (minor troubleshooting), and determine aircraft airworthiness as per the MEL/CDL; and

(h) demonstrate the use, interpretation and application of appropriate documentation, including instructions for continued airworthiness, maintenance manual, and illustrated parts catalogue.

Level 3

Detailed description, operation, component location, removal and installation, and BITE and troubleshooting procedures to maintenance manual level.

Course objectives:

In addition to the information contained in Level 1 and Level 2 training, at the completion of Level 3, the student will be able to:

(a) demonstrate a theoretical knowledge of aircraft systems and structures and interrelationships with other systems, provide a detailed description of the subject using theoretical fundamentals and specific examples, and interpret results from various sources and measurements, and apply corrective action where appropriate; and

(b) perform system, powerplant, component, and functional checks as specified in the aircraft maintenance manual; and

(c) demonstrate the use of, interpret, and apply appropriate documentation, including structural repair manual, and troubleshooting manual; and

(d) correlate information for the purpose of making decisions in respect of fault diagnosis and rectification to maintenance manual level; and

(e) describe procedures for replacement of components unique to aircraft type.

Part 2 — Type training theoretical elements

Although aircraft type training includes both theoretical and practical elements, courses can be approved for the theoretical element, the practical element or for a combination of both.

Theoretical element

1 Objective:

On completion of a theoretical training course, the student must be able to demonstrate, to the levels identified in the Appendix III syllabus, the detailed theoretical knowledge of the aircraft's applicable systems, structure, operations, maintenance, repair, and troubleshooting according to approved maintenance data. The student must be able to demonstrate the use of manuals and approved procedures, including the knowledge of relevant inspections and limitations.

2 Level of training:

Training levels are those levels defined in Part 1 above. After the first type course for Category C certifying staff, all subsequent courses need only be to Level 1. During a Level 3 theoretical training, Level 1 and Level 2 training material may be used to teach the full scope of the chapter if required. However, during the training the majority of the course material and training time must be at the higher level.

3 Duration:

(a) times shown below are the minimum hours for the theoretical element; and

(b) times shown below are tuition hours only and exclude any breaks, examination, revision, preparation and aircraft visit; and

(c) 1 tuition hour means 60 minutes of teaching; and

(d) all course applications must be supported by a detailed training needs analysis; and

(e) for aeroplanes of a maximum take-off weight (***MTOW***) of 5 700 kg and below (non-complex) where type training is not required, the course length must be defined on an individual case basis if applied.

Minimum participation time is at least 90% of the tuition hours of the theoretical training course. Additional training may be given by the training organisation in order to meet the minimum participation time. The number of tuition hours per day for the theoretical training must not exceed 8 hours, which must be performed during regular office hours; in exceptional cases, deviation from this standard may be envisaged when justified. This maximum number of hours is also applicable for the combination of theoretical and practical training, when they are performed at the same time.

4 Justification of course duration:

When applying for approval of a Part 147 course, or a course to be approved directly by CASA, the proposed hour duration must be justified and shown to cover the full syllabus by a training needs analysis based on:

(a) the design of the aircraft type, its maintenance needs and the types of operation; and

(b) detailed analysis of applicable chapters – see contents table below; and

(c) detailed competency analysis showing that the objectives as stated in paragraph 2.1 (a) above are fully met; and

(d) information based on approved type design, if necessary.

Tuition hours of differences courses, and other training course combinations, such as combined B1/B2 courses, must be justified to CASA by the training needs analysis as described above.

5 Content:

As a minimum, the elements in the syllabus below, that are specific to the aircraft type, must be covered. Additional elements introduced due to type variations, technological changes etc. must also be included. The training syllabus should be focused on mechanical, powerplant, structural and electrical aspects for B1 personnel, and electrical and avionic aspects for B2.

Introductory elements of training — all aircraft										
ATA chapter	**Theory elements**	**Aeroplane turbine**		**Aeroplane piston**		**Helicopter turbine**		**Helicopter piston**		**Avionics**
		B1.1	**C**	**B1.2**	**C**	**B1.3**	**C**	**B1.4**	**C**	**B2**
05	Time limits and maintenance checks	1	1	1	1	1	1	1	1	1
06	Dimensions and areas, for example weights, maximum take-off weight (MTOW)	1	1	1	1	1	1	1	1	1
07	Lifting and shoring	1	1	1	1	1	1	1	1	1
08	Levelling and weighing	3	1	3	1	3	1	3	1	1
09	Towing and taxiing	1	1	1	1	1	1	1	1	1
10	Parking, mooring, storing and return to service	1	1	1	1	1	1	1	1	1
11	Placards and markings	1	1	1	1	1	1	1	1	1
12	Servicing	1	1	1	1	1	1	1	1	1
	Standard practices – only type particular	1	1	1	1	1	1	1	1	1

Introductory elements of training — all aircraft										
ATA chapter	**Theory elements**	**Aeroplane turbine**		**Aeroplane piston**		**Helicopter turbine**		**Helicopter piston**		**Avionics**
		B1.1	**C**	**B1.2**	**C**	**B1.3**	**C**	**B1.4**	**C**	**B2**
Helicopters										
18	Vibration and noise analysis (blade tracking)	—	—	—	—	3	1	3	1	—
25	Emergency flotation equipment	—	—	—	—	3	1	3	1	1
53	Airframe structure (helicopter)	—	—	—	—	3	1	3	1	—
60	Standard practices rotor	—	—	—	—	3	1	3	1	—
62	Rotor(s)	—	—	—	—	3	1	3	1	1
62A	Rotors – monitoring and indicating	—	—	—	—	3	1	3	1	3
63	Rotor drive(s)	—	—	—	—	3	1	3	1	1
63A	Rotor drive(s) – monitoring and indicating	—	—	—	—	3	1	3	1	3
64	Tail rotor	—	—	—	—	3	1	3	1	1
64A	Tail rotor – monitoring and indicating	—	—	—	—	3	1	3	1	3
65	Tail rotor drive	—	—	—	—	3	1	3	1	1
65A	Tail rotor drive	—	—	—	—	3	1	3	1	3

Introductory elements of training — all aircraft										
ATA chapter	**Theory elements**	**Aeroplane turbine**		**Aeroplane piston**		**Helicopter turbine**		**Helicopter piston**		**Avionics**
		B1.1	**C**	**B1.2**	**C**	**B1.3**	**C**	**B1.4**	**C**	**B2**
66	Folding blades and pylon	—	—	—	—	3	1	3	1	—
67	Rotors flight control	—	—	—	—	3	1	3	1	—
27A	Flight control surfaces (all)	3	1	3	1	—	—	—	—	1
Aircraft structures										
51	Standard practices and structures (damage classification, assessment and repair)	3	1	3	1	—	—	—	—	1
52	Doors	3	1	3	1	—	—	—	—	1
53	Fuselage	3	1	3	1	—	—	—	—	1
54	Nacelles and pylons	3	1	3	1	—	—	—	—	1
55	Stabilisers	3	1	3	1	—	—	—	—	1
56	Windows	3	1	3	1	—	—	—	—	1
57	Wings	3	1	3	1	—	—	—	—	1
	Zonal and station identification systems	1	1	1	1	1	1	1	1	1
Aircraft systems										
21	Air-conditioning	3	1	3	1	3	1	3	1	3
21-10/20	Air supply	3	1	3	1	3	1	3	1	2

Introductory elements of training — all aircraft										
ATA chapter	**Theory elements**	**Aeroplane turbine**		**Aeroplane piston**		**Helicopter turbine**		**Helicopter piston**		**Avionics**
		B1.1	**C**	**B1.2**	**C**	**B1.3**	**C**	**B1.4**	**C**	**B2**
21B	Pressurisation	3	1	3	1	3	1	3	1	3
21C	Safety and warning devices	3	1	3	1	3	1	3	1	3
22	Autoflight	2	1	2	1	2	1	2	1	3
23	Communications	2	1	2	1	2	1	2	1	3
24	Electrical power	3	1	3	1	3	1	3	1	3
25	Equipment and furnishings	3	1	3	1	3	1	3	1	1
25A	Electronic emergency equipment	1	1	1	1	1	1	1	1	3
26	Fire protection	3	1	3	1	3	1	3	1	3
27	Flight controls	3	1	3	1	3	1	3	1	2
27A	Systems operation: electrical and fly-by-wire	3	1	—	—	—	—	—	—	3
28	Fuel systems	3	1	3	1	3	1	3	1	2
28-40	Fuel systems – monitoring and indicating	3	1	3	1	3	1	3	1	3
29	Hydraulic power	3	1	3	1	3	1	3	1	2

Introductory elements of training — all aircraft										
ATA chapter	**Theory elements**	**Aeroplane turbine**		**Aeroplane piston**		**Helicopter turbine**		**Helicopter piston**		**Avionics**
		B1.1	**C**	**B1.2**	**C**	**B1.3**	**C**	**B1.4**	**C**	**B2**
29	Hydraulic power – monitoring and indicating	3	1	3	1	3	1	3	1	3
30	Ice and rain protection	3	1	3	1	3	1	3	1	3
31	Indicating and recording systems	3	1	3	1	3	1	3	1	3
31A	Instrument systems	3	1	3	1	3	1	3	1	3
32	Landing gear	3	1	3	1	3	1	3	1	2
32	Landing gear – monitoring and indicating	3	1	3	1	3	1	3	1	3
33	Lights	3	1	3	1	3	1	3	1	3
34	Navigation	2	1	2	1	2	1	2	1	3
35	Oxygen	3	1	3	1	—	—	—	—	2
36	Pneumatic	3	1	3	1	3	1	3	1	2
36	Pneumatic – monitoring and indicating	3	1	3	1	3	1	3	1	3
37	Vacuum	3	1	3	1	3	1	3	1	2
38	Water and waste	3	1	3	1	—	—	—	—	2
41	Water ballast	3	1	3	1	—	—	—	—	1
42	Integrated modular avionics	2	1	2	1	2	1	2	1	3

Introductory elements of training — all aircraft										
ATA chapter	**Theory elements**	**Aeroplane turbine**		**Aeroplane piston**		**Helicopter turbine**		**Helicopter piston**		**Avionics**
		B1.1	**C**	**B1.2**	**C**	**B1.3**	**C**	**B1.4**	**C**	**B2**
44	Cabin systems	2	1	2	1	2	1	2	1	3
45	On-board maintenance systems (except if the element is covered in the element for ATA chapter 31)	3	1	3	1	3	1	—	—	3
46	Information systems	2	1	2	1	2	1	2	1	3
50	Cargo and accessory compartments	3	1	3	1	3	1	3	1	1
Turbine engines										
49	Airborne auxiliary power (APUs)	3	1	—	—	—	—	—	—	2
70	Standard practices – engines	3	1	—	—	3	1	—	—	1
70A	Constructional arrangement and operation (namely, installation, inlet, compressors, combustion section, turbine section, bearings and seals, lubrications systems)	3	1	—	—	3	1	—	—	1

Introductory elements of training — all aircraft										
ATA chapter	**Theory elements**	**Aeroplane turbine**		**Aeroplane piston**		**Helicopter turbine**		**Helicopter piston**		**Avionics**
		B1.1	**C**	**B1.2**	**C**	**B1.3**	**C**	**B1.4**	**C**	**B2**
70B	Engine perform-ance	3	1	—	—	3	1	—	—	1
71	Powerplant	3	1	—	—	3	1	—	—	1
72	Engine turbine and turboprop and ducted fan and unducted fan	3	1	—	—	3	1	—	—	1
73	Engine fuel and controls	3	1	—	—	3	1	—	—	1
73-20	FADEC	3	1	—	—	3	1	—	—	3
74	Ignition	3	1	—	—	3	1	—	—	3
75	Air	3	1	—	—	3	1	—	—	1
76	Engine controls	3	1	—	—	3	1	—	—	1
77	Engine indicating systems	3	1	—	—	3	1	—	—	3
78	Exhaust	3	1	—	—	3	1	—	—	1
79	Oil	3	1	—	—	3	1	—	—	1
80	Starting	3	1	—	—	3	1	—	—	1
82	Water injections	3	1	—	—	3	1	—	—	1
83	Accessory gearboxes	3	1	—	—	3	1	—	—	1
84	Propulsion augmenta-tion	3	1	—	—	3	1	—	—	1
Piston engines										
70	Standard practices — engines	—	—	3	1	—	—	3	1	1

Introductory elements of training — all aircraft										
ATA chapter	**Theory elements**	**Aeroplane turbine**		**Aeroplane piston**		**Helicopter turbine**		**Helicopter piston**		**Avionics**
		B1.1	**C**	**B1.2**	**C**	**B1.3**	**C**	**B1.4**	**C**	**B2**
70A	Construc-tional arrangement and operation (installation, inlet, compressors, combustion section, turbine section, bearings and seals, lubrications systems)	—	—	3	1	—	—	3	1	1
70B	Engine per-formance	—	—	3	1	—	—	3	1	1
71	Powerplant	—	—	3	1	—	—	3	1	1
73	Engine fuel and control	—	—	3	1	—	—	3	1	1
73A	FADEC	—	—	3	1	—	—	3	1	3
74	Ignition	—	—	3	1	—	—	3	1	3
76	Engine controls	—	—	3	1	—	—	3	1	1
77	Engine indicating Systems	—	—	3	1	—	—	3	1	3
79	Oil	—	—	3	1	—	—	3	1	1
80	Starting	—	—	3	1	—	—	3	1	1
81	Turbines	—	—	3	1	—	—	3	1	1
82	Water injections	—	—	3	1	—	—	3	1	1
83	Accessory gearboxes	—	—	3	1	—	—	3	1	1
84	Propulsion augmenta-tion	—	—	3	1	—	—	3	1	1

Introductory elements of training — all aircraft										
ATA chapter	**Theory elements**	**Aeroplane turbine**		**Aeroplane piston**		**Helicopter turbine**		**Helicopter piston**		**Avionics**
		B1.1	**C**	**B1.2**	**C**	**B1.3**	**C**	**B1.4**	**C**	**B2**
Aeroplane propellers										
60	Standard practices – propeller	3	1	3	1	—	—	—	—	1
61	Propellers/ Propulsion	3	1	3	1	—	—	—	—	1
61A	Propeller construction	3	1	3	1	—	—	—	—	—
61B	Propeller pitch control	3	1	3	1	—	—	—	—	—
61C	Propeller synchronis-ing	3	1	3	1	—	—	—	—	1
61D	Propeller electronic control	2	1	2	1	—	—	—	—	3
61E	Propeller ice protection	3	1	3	1	—	—	—	—	—
60F	Propeller mainten-ance	3	1	3	1	—	—	—	—	1

Part 3 — Practical elements

1 The practical element of the type training may be conducted simultaneously with the conduct of the theoretical element or provided separately as a stand-alone element.

2 Options for the practical element include structured OJT performed according to a type-specific program. Such OJT may include training in maintenance of the aircraft, rigging, adjustments, replacement of line replaceable units, troubleshooting, rectification of minor defects and testing of systems covering each element of the course (e.g. practical consolidation training).

3 Other options for the practical element training include targeted experience to be recorded within a schedule of experience or competency-based assessment of a schedule of practical tasks.

4 Irrespective of how the practical training element is conducted, it must consist of the performance of representative maintenance tasks drawn from the type training and examination syllabus, at the indicated level, and their assessment in order to meet the following objectives:

(a) ensure safe performance of maintenance, inspections and routine work according to the maintenance manual and other relevant instructions and tasks as appropriate for the type of aircraft, for example, troubleshooting, repairs, adjustments, replacements and functional checks;

(b) correctly use all technical literature and documentation for the aircraft;

(c) correctly use specialist and special tooling and test equipment, perform removal and replacement of components and modules unique to type, including any on-wing maintenance activity.

Part 4

A Theory element — examination standard

Where aircraft type training is required, the examination must be written and comply with the following:

(a) Format of the examination is of the multiple-choice type. Each multi-choice question must have 3 alternative answers of which only 1 must be the correct answer. The time for answering is based upon a nominal average of 90 seconds per question.

(b) Alternative answers must seem equally possible to anyone with no knowledge of the subject. All of the alternatives should be clearly related to the question and of similar vocabulary, grammatical construction and length.

(c) In numerical questions, the incorrect answers must correspond to procedural errors such as the use of incorrect sense (+ versus -) or incorrect measurement units: they must not be mere random numbers.

(d) The level of each question should be the one defined in Part 2 “type training standard”.

(e) The examination must be of the closed book type. No reference material is permitted. An exception will be made for the case of examining a B1 or B2 candidate’s ability to interpret technical documents.

(f) The number of questions must be at least 1 question per hour of instruction, with a minimum of 1 question per chapter. CASA will assess number and level of questions on a sampling basis when approving the course. The number of questions for each level must be consistent with the effective training hours spent teaching at that level.

(g) The minimum examination pass mark is 75%. The pass mark for any exam is 75%, not just the final average score for all the examinations completed during the course.

(h) Penalty marking is not to be used to determine whether a candidate has passed.

(i) End of module phase examinations cannot be used as part of the final examination unless they contain the correct number and level of questions required.

(j) It is accepted that during a Level 3 examination, Level 1 and Level 2 questions may be used to examine the full scope of the course material. However, during

the examination it is not acceptable to use an excessive number of questions at any lower level such that the intention of the higher examination level is reduced.

Note ***Penalty marking*** means deducting marks for an incorrect answer.

B Practical element — assessment standard

1 For assessment of practical elements of type training, the assessment must be oral, written or practical assessment based, or a combination of all of these. Conduct of the assessment method must be in accordance with the MTO's exposition.

2 Practical assessment must determine a person's competence to perform a task based on a sample of subjects drawn from the type training and examination syllabus, at the indicated level.

3 A written report must be made by the assessor to explain why the candidate has passed or failed.

4 The assessment must ensure that the following objectives are met:

(a) accurately and confidently discuss the aircraft and its systems;

(b) ensure safe performance of maintenance, inspections and routine work according to the maintenance manual and other relevant instructions and tasks as appropriate for the type of aircraft, for example, troubleshooting, repairs, adjustments, replacements, rigging and functional checks such as engine run etc., if required;

(c) correctly use all technical literature and documentation for the aircraft;

(d) correctly use specialist and special tooling and test equipment, perform removal and replacement of components and modules unique to type, including any on-wing maintenance activity.

Appendix IV

Units of competency required for a category or subcategory of licence

Competency units required	Title	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2
MEA101B	Interpret occupational health and safety practices in aviation maintenance	X	X	X	X	X	X	X	X	X
MEA103B	Plan and organise aviation maintenance work activities	X	X	X	X	X	X	X	X	X
MEA105B	Apply quality standard applicable to aviation maintenance processes	X	X	X	X	X	X	X	X	X
MEA107B	Interpret and use aviation maintenance industry manuals and specifications	X	X	X	X	X	X	X	X	X
MEA108B	Complete aviation maintenance industry documentation	X	X	X	X	X	X	X	X	X
MEA109B	Perform basic hand skills, standard trade practices and fundamentals in aviation maintenance	X	X	X	X	X	X	X	X	X
MEA111B	Perform administrative processes to prepare for certification of civil aircraft maintenance					X	X	X	X	X
MEA112B	Plan and implement aircraft maintenance activities					X	X	X	X	X
MEA113B	Supervise civil maintenance activities and manage human resources in the workplace					X	X	X	X	X

Competency units required	Title	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2
MEA116A	Apply occupational health and safety procedures at supervisor level in aviation maintenance					X	X	X	X	X
MEA117A	Apply self in the aviation maintenance environment	X	X	X	X					
MEA118A	Conduct self in the aviation maintenance environment					X	X	X	X	X
MEA119A	Perform administrative processes to prepare for certification of civil aircraft A level line maintenance	X	X	X	X					
MEA142A	Manage self in the aviation maintenance environment					X	X	X	X	X
MEA201B	Remove and install miscellaneous aircraft electrical hardware/ components					X	X	X	X	X
MEA203B	Remove and install advanced aircraft electrical systems and components					X	X	X	X	X
MEA205B	Remove and install advanced aircraft instrument systems and components									X
MEA206B	Remove and install aircraft basic radio communication and navigation systems and components									X
MEA207C	Remove and install aircraft electronic systems and components									X

Competency units required	Title	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2
MEA208B	Remove and install pressurisation control systems and components					X	X			
MEA209B	Remove and install oxygen systems and components					X	X			
MEA211B	Inspect, test and troubleshoot advanced aircraft electrical systems and components					X	X	X	X	
MEA219B	Inspect, test and troubleshoot aircraft pressurisation control systems and components					X	X			
MEA222B	Inspect, test and troubleshoot aircraft oxygen systems and components					X	X			
MEA223C	Inspect aircraft electrical systems and components									X
MEA224B	Inspect aircraft instrument systems and components									X
MEA225B	Inspect fixed wing aircraft automatic flight control systems and components									X
MEA226C	Inspect aircraft electronic systems and components									X
MEA227C	Test and troubleshoot aircraft electrical systems and components									X
MEA228C	Test and trouble-shoot aircraft instrument systems and components									X

Competency units required	Title	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2
MEA229C	Test and trouble-shoot aircraft radio frequency navigation and communications systems and components									X
MEA230B	Test and troubleshoot fixed wing aircraft automatic flight control systems and components									X or MEA 231B
MEA231B	Test and troubleshoot rotary wing aircraft automatic flight control systems and components									X or MEA 230B
MEA232B	Test and troubleshoot aircraft pulse systems and components									X
MEA235B	Perform advanced troubleshooting in aircraft avionic maintenance									X
MEA240B	Use electrical test equipment to perform basic electrical tests	X	X	X	X					
MEA241B	Perform aircraft weight and balance calculations as a result of modifica-tions									X
MEA246B	Fabricate and/or repair aircraft electrical hardware or parts					X	X	X	X	X
MEA260B	Use electrical test equipment					X	X	X	X	X

Competency units required	Title	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2
MEA264B	Remove and install aircraft electrical/ avionic components during line maintenance	X	X	X	X					
MEA265A	Remove and install general aircraft electrical hardware	X	X	X	X					
MEA301B	Perform aircraft flight servicing					X	X	X	X	X
MEA302B	Remove and install aircraft hydro-mechanical and landing gear systems and components					X	X	X	X	
MEA303B	Remove and install aircraft pneumatic systems and components					X	X	X	X	
MEA304B	Remove and install non-pressurised aircraft structural and non-structural components							X or MEA 317B	X or MEA 317B	
MEA305B	Remove and install aircraft fixed wing flight control systems and components					X	X			
MEA306B	Remove and install engines and engine systems and components					X	X	X	X	
MEA307B	Remove and install propeller systems and components					P	X			
MEA308B	Remove and install rotary wing rotor and flight control system components							X	X	

Competency units required	Title	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2
MEA309B	Inspect, test and troubleshoot aircraft hydro-mechanical and landing gear systems and components						X	X	X	
MEA310B	Inspect, test and troubleshoot aircraft pneumatic systems and components						X	X	X	
MEA312B	Inspect, test and troubleshoot aircraft fixed wing flight control systems and components						X			
MEA313B	Inspect, test and troubleshoot piston engine systems and components						X		X	
MEA315B	Inspect, test and troubleshoot propeller systems and components					P	X			
MEA316B	Inspect, test and troubleshoot rotary wing rotor and control systems and components							X	X	
MEA317B	Remove and install pressurised aircraft structural and non-structural components					X	X			
MEA318B	Inspect aircraft hydro-mechanical, mechanical, gaseous and landing gear systems and components					X				
MEA319B	Inspect gas turbine engine systems and components					X		X		

Competency units required	Title	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2
MEA320B	Test and troubleshoot aircraft hydro-mechanical, mechanical, gaseous and landing gear systems and components					X				
MEA321B	Test and troubleshoot aircraft fixed wing flight control systems and components					X				
MEA322B	Test and troubleshoot gas turbine engine systems and components					X		X		
MEA323B	Perform advanced troubleshooting in aircraft mechanical maintenance					X	X	X	X	
MEA324B	Perform structural repair and modification assessment and evaluation					X	X	X	X	
MEA325B	Weigh aircraft and perform aircraft weight and balance calculations as a result of modifications					X	X	X	X	
MEA328B	Maintain and/or repair aircraft mechanical components or parts					X	X	X	X	
MEA339A	Inspect, repair and maintain aircraft structures					X	X	X	X	
MEA343B	Remove and install avionic systems and components					X	X	X	X	

Competency units required	Title	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2
MEA344A	Remove and install aircraft hydro-mechanical components during line maintenance	X	X	X	X					
MEA345A	Perform scheduled line maintenance activities on gas turbine engine fixed wing aircraft	X								
MEA346A	Perform scheduled line maintenance activities on gas turbine engine rotary wing aircraft			X						
MEA347A	Perform scheduled line maintenance activities on piston engine fixed wing aircraft		X							
MEA348A	Perform scheduled line maintenance activities on piston engine rotary wing aircraft				X					
MEA408B	Inspect and repair aircraft wooden structures					Z	Z			
MEA409B	Inspect, test, repair and re-cover aircraft fabric surfaces					Z	Z			
MEA418A	Basic repair of aircraft internal fittings during line maintenance	X	X	X	X					

Appendix V

Excluded States

Nil

Appendix VI

Recognised States

Nil

Note New Zealand has a status under the Trans-Tasman Mutual Recognition Arrangement that is equivalent to that of a Recognised State.

Appendix VII

Excluded systems – exclusions on type ratings – suitable for provision of training, assessment and authorisation within an AMO – if approved for the AMO exposition

Note Eligibility for removal of an exclusion from an aircraft type rating is only established by first having the affiliated exclusion removed from the category (e.g., a B1.1 with a propeller exclusion would first need to gain the appropriate category training from an MTO before an AMO could provide rating exclusion removal training for the propeller system).

Excluding: Audio CVR systems

Excluding: Propellers

Excluding: ATA29 (hydraulics)

Excluding: ATA21 (vapour cycle air-conditioning aspect)

Excluding: ATA21 (air-conditioning aspect)

Excluding: ATA21 (pressurisation aspect)

Excluding: ADF systems

Excluding: VOR systems

Excluding: ILS systems

Excluding: Weather radar systems

Excluding: ATC transponder systems

Excluding: Radio altimeter systems

Excluding: DME systems

Excluding: Doppler systems

Excluding: Sat nav systems

Excluding: Autopilots

Excluding: Autopilots – multi-axis

Excluding: Remote indicating compass systems

Excluding: Inertial navigation and reference systems

Excluding: Pressurisation systems

Excluding: Electrical systems – multi-generator power systems

Excluding: Avionic LRUs