Thailand Civil Aviation Regulation - Personnel Licensing Part Aircraft Maintenance Engineer Licence (TCAR PEL Part-66)

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Approved By

Suttipong Kongpool

Director General

The Civil Aviation Authority of Thaoland

THAILAND CIVIL AVIATION REGULATION (TCAR)

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INTRODUCTION AND APPLICABILITY

In this publication the word 'must' or 'shall' is used to indicate where the Director General requires the Organisation, owner, holder of a licence or operator to respond to and comply with, or adhere closely to, the defined requirement.

If the Organisation's/owner's/operator's/ holder of a licence, certificate or authorisation response is deemed to be inadequate by the Director General, a specific requirement or restriction may be applied as a condition of the appropriate instrument to be issued under Thailand Civil Aviation Regulations.

This TCAR PEL Part 66, is broadly based upon or derived from European Union Regulation (EU) 1321/2014.

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PART-66

GENERAL

66.1 Competent Authority

(a) For the purpose of Part 66 the competent authority shall be Dircetor Genaral of CAAT and a person appointed by the Director to execute the duties under this Requirement.

SECTION A — TECHNICAL REQUIREMENTS

SUBPART A — AIRCRAFT MAINTENANCE LICENCE

66.A.1 Scope

This section defines the aircraft maintenance licence and establishes the requirements for application, issue and continuation of its validity.

66.A.3 Licence Categories

(a) Aircraft maintenance licences include the following categories:

- Category A
- Category B1
- Category B2
- Category B2L
- Category B3
- Category L
- Category C

(b) Categories A and B1 are subdivided into subcategories relative to combinations of aeroplanes, helicopters, turbine and piston engines. These subcategories are:

- A1 and B1.1 Aeroplanes Turbine
- A2 and B1.2 Aeroplanes Piston
- A3 and B1.3 Helicopters Turbine
- A4 and B1.4 Helicopters Piston

(c) Category B2 The B2 licence is applicable to all aircraft.

(d) Category B2L The B2L licence is applicable to all aircraft other than those in Group 1 as set out in Point 66.**A.**5(1) and is divided into the following 'system ratings':

- communication/navigation (com/nav),
- instruments,
- autoflight,
- surveillance,
- airframe systems.

A B2L licence shall contain, as a minimum, one system rating.

(e) Category B3 is applicable to piston-engine non-pressurised aeroplanes of 2,000 kg MTOM and below.

(f) Category L, divided into the following subcategories:

- L1C: composite sailplanes,
- L1: sailplanes,
- L2C: composite powered sailplanes and composite LA1 aeroplanes,
- L2: powered sailplanes and LA1 aeroplanes,
- L3H: hot-air balloons,
- L3G: gas balloons,
- L4H: hot-air airships,
- L4G: LA2 gas airships,
- L5: gas airships other than LA2.

(g) Category C

The C licence is applicable to aeroplanes and helicopters.

66.A.5 Aircraft groups

For the purpose of ratings on aircraft maintenance licences, aircraft shall be classified in the following groups:

1. Group 1: complex motor-powered aircraft, helicopters with multiple engines, aeroplanes with maximum certified operating altitude exceeding FL290, aircraft equipped with fly-by-wire systems, gas airships other than LA2 and other aircraft requiring an aircraft type rating when defined as such by the CAAT.

CAAT may decide to classify into Group 2, Group 3 or Group 4, as appropriate, an aircraft which meets the conditions set out in the first subparagraph, if it considers that the lower complexity of the particular aircraft justifies so.

2. Group 2: aircraft other than those in Group 1 belonging to the following subgroups:

(i) subgroup 2a:

- single turboprop engine aeroplanes,
- those turbojet and multiple-turboprop aeroplanes classified by CAAT in this subgroup because of their lower complexity.

(ii) subgroup 2b:

- single turbine engine helicopters,
- those multiple turbine engine helicopters classified by CAAT in this subgroup because of their lower complexity.

(iii) subgroup 2c:

- single piston engine helicopters,
- those multiple piston engine helicopters classified by CAAT in this subgroup because of their lower complexity.

3. Group 3: piston engine aeroplanes other than those in Group 1.

4. Group 4: sailplanes, powered sailplanes, balloons and airships, other than those in Group 1.

66.A.10 Application

(a) An application for an aircraft maintenance licence or change to such licence shall be made in accordance with the Requirement of CAAT No. 45 on Procedure for personnel licensing and rating application on an CAAT Form.

(b) Each application shall be supported by documentation to demonstrate compliance with the applicable theoretical knowledge, practical training and experience requirements at the time of application.

66.A.15 Eligibility

An applicant for an aircraft maintenance licence shall be at least 18 years of age.

66.A.20 Privileges

(a) The following privileges shall apply:

(1) The following privileges shall apply: 1. A category A aircraft maintenance licence permits the holder to issue certificates of release to service following minor scheduled line maintenance and simple defect rectification within the limits of tasks specifically endorsed on the certification authorisation referred to in point 145.A.35 of Part-145. The certification privileges shall be restricted to work that the licence holder has personally performed in the maintenance organisation that issued the certification authorisation.

(2) A category B1 aircraft maintenance licence shall permit the holder to issue certificates of release to service and to act as B1 support staff following:

— maintenance performed on aircraft structure, powerplant and mechanical and electrical systems,

— work on avionic systems requiring only simple tests to prove their serviceability and not requiring troubleshooting.

Category B1 includes the corresponding A subcategory.

(3) A category B2 aircraft maintenance licence shall permit the holder:

(i) to issue certificates of release to service and to act as B2 support staff for following:

— maintenance performed on avionic and electrical systems, and

— electrical and avionics tasks within powerplant and mechanical systems, requiring only simple tests to prove their serviceability; and

(ii) to issue certificates of release to service following minor scheduled line maintenance and simple defect rectification within the limits of tasks specifically endorsed on the certification authorisation referred to in point 145.A.35 of Part-145. This certification privilege shall be restricted to work that the licence holder has personally performed in the maintenance organisation which issued the certification authorisation and limited to the ratings already endorsed in the B2 licence.

The category B2 licence does not include any A subcategory.

(4) A category B2L aircraft maintenance licence shall permit the holder to issue certificates of release to service and to act as B2L support staff for the following:

— maintenance performed on electrical systems;

— maintenance performed on avionics systems within the limits of the system ratings specifically endorsed on the licence, and

— when holding the 'airframe system' rating, performance of electrical and avionics tasks within power plant and mechanical systems, requiring only simple tests to prove their serviceability.

(5) A category B3 aircraft maintenance licence shall permit the holder to issue certificates of release to service and to act as B3 support staff for:

— maintenance performed on aeroplane structure, powerplant and mechanical and electrical systems,

— work on avionic systems requiring only simple tests to prove their serviceability and not requiring troubleshooting.

(6) A category L aircraft maintenance licence shall permit the holder to issue certificates of release to service and to act as L support staff for the following:

— maintenance performed on aircraft structure, power plant and mechanical and electrical systems;

— work on radio, Emergency Locator Transmitters (ELT) and transponder systems; and

— work on other avionics systems requiring simple tests to prove their serviceability. Subcategory L2 includes subcategory L1. Any limitation to subcategory L2 in accordance with point 66.A.45(h) becomes also applicable to subcategory L1.

Subcategory L2C includes subcategory L1C.

(7) A category C aircraft maintenance licence shall permit the holder to issue certificates of release to service following base maintenance on aircraft. The privileges apply to the aircraft in its entirety.

(b) The holder of an aircraft maintenance licence may not exercise its privileges unless:

(1) in compliance with the applicable requirements of Part-M and Part- 145; Part-ML and Part-CAO; and

(2) in the preceding 2-year period he/she has, either had 6 months of maintenance experience in accordance with the privileges granted by the aircraft maintenance licence or, met the provision for the issue of the appropriate privileges; and

(3) he/she has the adequate competence to certify maintenance on the corresponding aircraft; and

(4) he/she is able to read, write and communicate to an understandable level in the language(s) in which the technical documentation and procedures necessary to support the issue of the certificate of release to service are written.

66.A.25 Basic knowledge requirement

(a) An applicant for an aircraft maintenance licence, or the addition of a category or subcategory to such a licence, shall demonstrate by examination a level of knowledge in the appropriate subject modules in accordance with the Appendix I to Part-66.

(b) The training courses and examinations shall be passed within 10 years prior to the application for an aircraft maintenance licence or the addition of a category or subcategory to such aircraft maintenance licence.

(c) For licences other than category L, an applicant for an aircraft maintenance licence, or for the addition of a category or subcategory to such a licence, shall demonstrate by examination a level of knowledge of the appropriate subject modules in accordance with Appendix I to Part-66. The examination shall comply with the standard set out in Appendix II to Part-66 and shall be conducted either by a CAAT approved AMEL/Part 66 examination center, or by CAAT

(d) An applicant for an aircraft maintenance licence in category L within a given subcategory, or for the addition of a different subcategory, shall demonstrate by examination a level of knowledge of the appropriate subject modules in accordance with Appendix VII to Part-66. The examination shall comply with the standard set out in APPENDIX VI to Part-66 and shall be conducted by a CAAT approved AMEL/Part 66 examination center, by the CAAT or as agreed by CAAT.

The holder of an aircraft maintenance licence in subcategory B1.2 or category B3 is deemed to meet the basic knowledge requirements for a licence in subcategories L1C, L1, L2C and L2.

The basic knowledge requirements for subcategory L4H include the basic knowledge requirements for subcategory L3H.

The basic knowledge requirements for subcategory L4G include the basic knowledge requirements for subcategory L3G.

(e) An applicant for an aircraft maintenance licence in category B2L for a particular 'system rating', or for the addition of another 'system rating', shall demonstrate by examination a level of knowledge of the appropriate subject modules in accordance with Appendix I to Part-66. The examination shall comply with the standard set out in Appendix II to Part-66 and shall be conducted either by a CAAT approved AMEL/Part 66 examination center, or by CAAT.

(f) The holder of an aircraft maintenance licence applying for the addition of a different category or subcategory shall complement by examination the level of knowledge that is appropriate to the related subject modules in accordance with Appendix I (for category A, B1, B2, B2L, B3 and C licences) or APPENDIX V (for category L licences).

Appendix IV details the modules of Appendix I (for category B1, B2, B2L, B3 and C licences) or APPENDIX V (for category L licences) required for the addition of a new category or subcategory to an existing licence issued in accordance with this Part-66.';

66.A.30 Basic experience requirements

(a) An applicant for an aircraft maintenance licence shall have acquired:

(1) for category A, subcategories B1.2 and B1.4 and category B3.

(i) 1 year of practical maintenance experience on operating aircraft and completion of a basic training course approved in accordance with Part 147.

(2) for category B2 and subcategories B1.1 and B1.3:

(i) 2 years of practical maintenance experience on operating aircraft and completion of a basic training course approved in accordance with Part 147.

(3) for category B2L:

1 year of practical maintenance experience in operating aircraft, covering the corresponding system rating(s), and completion of a Part-147 approved basic training course. For the addition of (a) new system rating(s) to an existing B2L licence, 3 months of practical maintenance experience relevant to the new system rating(s) shall be required for each system rating added.

(4) for category L:

(i) 2 years of practical maintenance experience in operating aircraft covering a representative cross section of maintenance activities in the corresponding subcategory;

(ii) as a derogation from point (i), 1 year of practical maintenance experience in operating aircraft covering a representative cross section of maintenance activities in the corresponding subcategory, subject to the introduction of the limitation provided for in point 66.A.45(h)(ii)(3).

For the inclusion of an additional subcategory in an existing L licence, the experience required by points (i) and (ii) shall be 12 and 6 months respectively.

The holder of an aircraft maintenance licence in category/subcategory B1.2 or B3 is deemed to meet the basic experience requirements for a licence in subcategories L1C, L1, L2C and L2.

(5) for category C with respect to complex motor-powered aircraft:

(i) 3 years of experience exercising category B1.1, B1.3 or B2 privileges on complex motor-powered aircraft or as support staff according to point 145.A.35, or, a combination of both; or

(ii) 5 years of experience exercising category B1.2 or B1.4 privileges on complex motor- powered aircraft or as support staff according to point 145.A.35, or a combination of both;

(6) for category C with respect to other than complex motor-powered aircraft: 3 years of experience exercising category B1 or B2 privileges on other than complex motor-powered aircraft or as support staff according to point 145.A.35, or a combination of both;

(b) An applicant for an extension to an aircraft maintenance licence shall have a minimum civil aircraft maintenance experience requirement appropriate to the additional category or subcategory of licence applied for as defined in Appendix IV to this Annex (Part-66).

(c) The experience shall be practical and involve a representative cross section of maintenance tasks on aircraft.

(d) At least 1 year of the required experience shall be recent maintenance experience on aircraft of the category/subcategory for which the initial aircraft maintenance licence is sought. For subsequent category/subcategory additions to an existing aircraft maintenance licence, the additional recent maintenance experience required may be less than 1 year, but shall be at least 3 months. The required experience shall be dependent upon the difference between the licence category/subcategory held and applied for. Such additional experience shall be typical of the new licence category/subcategory sought.

66.A.40 Continued validity of the aircraft maintenance licence

In accordanece with the Ministerial regulations on personnel licensing B.E. 2550 and amendment.

(a) The aircraft maintenance licence becomes invalid 5 years after its last issue or change, unless the holder submits his/her aircraft maintenance licence to CAAT, in order to verify that the information contained in the licence is the same as that contained in the CAAT records.

(b) The holder of an aircraft maintenance licence shall complete the relevant parts of CAAT Form and submit it with the holder's copy of the licence, certificate of work experience issued by the original affiliation together with aircraft maintenance experience logbook that show the work experience of the ratings endorsed in the licence for not less than 6 months or 100 days within 24 months precedings the application date or a certificate of completion of CAAT approved Re-Qualification/Refresher or Type Rating training course within six months immediately preceding the application to CAAT.

(c) Any certification privilege based upon a aircraft maintenance licence becomes invalid as soon as the aircraft maintenance licence is invalid.

(d) The aircraft maintenance licence is only valid (i) when issued and/or changed by CAAT and (ii) when the holder has signed the document.

66.A.45 Endorsement with aircraft ratings

In accordanece with Requirement of CAAT No.45

(a) In order to be entitled to exercise certification privileges on a specific aircraft type, the holder of an aircraft maintenance licence need to have his/her licence endorsed with the relevant aircraft ratings.

– For category B1, B2 or C the relevant aircraft ratings are the following:

1. For group 1 aircraft, the appropriate aircraft type rating.
2. For group 2 aircraft, the appropriate aircraft type rating, manufacturer sub-group rating or full sub-group rating.
3. For group 3 aircraft, the appropriate aircraft type rating or full group rating.
4. For Group 4 aircraft, for the category B2 licence, the full group rating.

- For category B2L, the relevant aircraft ratings are the following:

1. For Group 2 aircraft, the appropriate manufacturer subgroup rating or full subgroup rating;
2. For Group 3 aircraft, the full group rating;
3. For Group 4 aircraft, the full group rating.

– For category B3, the relevant rating is 'piston-engine non-pressurised aeroplanes of 2000 kg MTOM and below'.

– For category L, the relevant aircraft ratings are the following:

1. For subcategory L1C, the rating 'composite sailplanes';
2. For subcategory L1, the rating 'sailplanes';
3. For subcategory L2C, the rating 'composite powered sailplanes and composite LA1 aeroplanes';
4. For subcategory L2, the rating 'powered sailplanes and LA1 aeroplanes';
5. For subcategory L3H, the rating 'hot-air balloons';
6. For subcategory L3G, the rating 'gas balloons'
7. For subcategory L4H, the rating 'hot-air airships';
8. For subcategory L4G, the rating 'LA2 gas airships';
9. For subcategory L5, the appropriate airship type rating.

– For category A, no rating is required, subject to compliance with the requirements of point 145.A.35 of Part-145.

(b) The endorsement of aircraft type ratings requires the satisfactory completion of one of the following:

- the relevant category B1, B2 or C aircraft type training in accordance with Appendix III to Part-66;
- in the case of gas airship type ratings on a B2 or L5 licence, a type training approved by CAAT.

(c) For other than category C licences, in addition to the requirements of point (b), the endorsement of the first aircraft type rating within a given category/subcategory requires satisfactory completion of the corresponding on-the-job training. This on-the-job training shall comply with Appendix III to Part-66, except in the case of gas airships, where it shall be directly approved by CAAT.

(d) By derogation from points (b) and (c), for Group 2 and 3 aircraft, aircraft type ratings may also be endorsed on a licence after completing the following steps:

- satisfactory completion of the relevant category B1, B2 or C aircraft type examination in accordance with Appendix III to this Part-66;
- in the case of B1 and B2 category, demonstration of practical experience in the aircraft type. In that case, the practical experience shall include a representative cross section of maintenance activities relevant to the licence category.

(e) For group 2 aircraft:

1. the endorsement of manufacturer sub-group ratings for category B1 and C licence holders requires complying with the aircraft type rating requirements of at least two aircraft types from the same manufacturer which combined are representative of the applicable manufacturer sub-group;
2. the endorsement of full sub-group ratings for category B1 and C licence holders requires complying with the aircraft type rating requirements of at least three aircraft types from different manufacturers which combined are representative of the applicable sub-group;
3. the endorsement of manufacturer sub-groups and full sub-group ratings for category B2 licence holders requires demonstration of practical experience which shall include a representative cross section of maintenance activities relevant to the licence category and to the applicable aircraft sub-group and, in the case of the B2L licence, relevant to the applicable system rating(s);
4. by derogation from point (e)(iii), the holder of a B2 or B2L licence, endorsed with a full subgroup 2b, is entitled to be endorsed with a full subgroup 2c

(f) For Group 3 and 4 aircraft:

1. the endorsement of the full Group 3 rating for category B1, B2, B2L and C licence holders and the endorsement of the full Group 4 rating for B2 and B2L licence holders require demonstration of practical experience, which shall include a representative cross section of maintenance activities relevant to the licence category and to Group 3 or 4, as applicable;
2. for category B1, unless the applicant provides evidence of appropriate experience, the group 3 rating shall be subject to the following limitations, which shall be endorsed on the licence:
   - pressurised aeroplanes
   - metal structure aeroplanes
   - composite structure aeroplanes
   - wooden structure aeroplanes
   - aeroplanes with metal tubing structure covered with fabric.

3. by derogation from point (f)1, the holder of a B2L licence, endorsed with a full subgroup 2a or 2b, is entitled to be endorsed with Groups 3 and 4.

(g) For the B3 licence:

1. the endorsement of the rating 'piston-engine non-pressurised aeroplanes of 2,000 kg MTOM and below' requires demonstration of practical experience which shall include a representative cross-section of maintenance activities relevant to the licence category.

2. unless the applicant provides evidence of appropriate experience, the rating referred to in point 1 shall be subject to the following limitations, which shall be endorsed on the licence:

— wooden structure aeroplanes

— aeroplanes with metal tubing structure covered with fabric

— metal structure aeroplanes

— composite structure aeroplanes.

(h) For all L licence subcategories, other than L5:

1. the endorsement of ratings requires demonstration of practical experience which shall include a representative cross section of maintenance activities relevant to the licence subcategory;

2. unless the applicant provides evidence of appropriate experience, the ratings shall be subject to the following limitations, which shall be endorsed on the licence:

(1) for ratings 'sailplanes' and 'powered sailplanes and LA1 aeroplanes':

— wooden-structure aircraft covered with fabric,

— aircraft with metal-tubing structure covered with fabric,

— metal-structure aircraft,

— composite-structure aircraft,

(2) for the rating 'gas balloons':

— other than LA1 gas balloons; and

(3) if the applicant has only provided evidence of one-year experience in accordance with the derogation contained in point 66.A.30(a)(2b)(ii), the following limitation shall be endorsed on the licence:

'complex maintenance tasks provided for in APPENDIX V to Part-M, standard changes provided for in Part-21 and standard repairs provided for in Part-21.'

The holder of an aircraft maintenance licence in subcategory B1.2 endorsed with the Group 3 rating, or in category B3 endorsed with the rating 'piston engine nonpressurised aeroplanes of 2,000 kg MTOM and below', is deemed to meet the requirements for the issuance of a licence in subcategories L1 and L2 with the corresponding full ratings and with the same limitations as the B1.2/B3 licence held.

66.A.50 Limitations

(a) Limitations introduced on an aircraft maintenance licence are exclusions from the certification privileges and affect the aircraft in its entirety.

(b) For limitations referred to in point 66.A.45, limitations shall be removed upon:

(1) demonstration of appropriate experience; or

(2) after a satisfactory practical assessment performed by CAAT.

(c) For limitations referred to in point 66.A.70, limitations shall be removed upon satisfactory completion of examination on those modules/subjects defined in the applicable conversion report.

(d) CAAT will determine limitation Endorsement, The numerical limitations list are applicable to this license. especially the number (1) – (10) as follows:

(1) Excluding Aeroplanes with metal tubing structure covered with fabric

(2) Excluding Composite structure aeroplanes.

(3) Excluding Metal structure aeroplanes.

(4) Excluding Pressurized aeroplanes.

(5) Excluding Wooden structure aeroplanes.

(6) Excluding autopilot systems.

(7) Excluding electrical power generation & distribution systems.

(8) Excluding radio communication/navigation and radar systems.

(9) Excluding instrument systems, INS/IRS and flight drectors systems.

(10) Excluding Powerplant

66 A.55.Evidence of qualification

Personnel exercising certification privileges as well as support staff shall produce their licence, as evidence of qualification, within 24 hours upon request by an authorised person.

66.A.70 Conversion provisions

(a) Existing holder of Thai Aircraft Maintenance Licence issued by the CAAT before the entry into force of this TCAR PEL Part 66 regulation shall be converted into TCAR PEL Part 66 licences by CAAT within 3 years starting from the date the TCAR PEL Part 66 becomes effective otherwise the licence will become invalid. The holder of Aircraft Maintenance Licence shall submit the documentary evidences as follows:

(1) an Aircraft Maintenance Licence

(2) a certified true copy of Thai citizen identification card

(3) Certificate of work experience issued by the original affiliation together with Aircraft Maintenance Experience Logbook or other documents that show the work experience of ratings endorsed in the licence

(4) Evidence sunstaining that the holder of the licence has passed the Conversion Modules Examination

(b) Existing holder of Thai Aircraft Maintenance Licence issued by the CAAT shall be converted to TCAR PEL Part 66 provided that the holder of licence must be able to demonstrate that he/she has, at level appropriate to the privilege being granted, the operational knowledge as well as the specific knowledge by passing the Conversion Modules Examination

(c) Applicants with 4 years of aircraft maintenance experience will only be issued a B3 license. They must demonstrate their knowledge and skill through examinations and practical assessments, as prescribed in the regulations for converting the license.

(d) Applicants who have completed a basic training course approved by the CAAT before 3 December 2023 must demonstrate that the training received is equivalent to the standards outlined in Part - 66. They must demonstrate their knowledge and skills through exams and practical assessments and need to have relevant aircraft maintenance experience specific to the license category, in line with Part - 66 guidelines.

(e) Where necessary, the aircraft maintenance licence shall contain limitations in accordance with point 66.A.50 to reflect the differences between (i) the scope of the certifying staff qualification valid in Thailand before the entry into force of this Regulation and (ii) the basic knowledge requirements and the basic examination standards laid down in Appendix I and II to this Part-66.

(f) By derogation from point (d), for aircraft not used by licenced air carriers in accordance with CAAT regulation, other than complex motor-powered aircraft, and for balloons, sailplanes, motor-powered sailplanes and airships, the aircraft maintenance licence shall contain limitations in accordance with point 66.A.50 to ensure that the certifying staff privileges valid in the Member State before the entry into force of the applicable Part-66 licence category/subcategory and those of the converted Part-66 aircraft maintenance licence remain the same.

APPENDICES TO PART-66

Appendix I –Basic Knowledge Requirements (except for category licence)

1. Knowledge levels for Category A, B1, B2, B2L, B3 and C aircraft maintenance licences

Basic knowledge for categories A, B1, B2, B2L and B3 is indicated by knowledge levels (1, 2 or 3) of each applicable subject. Category C applicants shall meet either the category B1 or the category B2 basic knowledge levels.The knowledge level indicators are defined on 3 levels as follows:

– LEVEL 1: A familiarisation with the principal elements of the subject.

Objectives:

(a) The applicant should be familiar with the basic elements of the subject.

(b) The applicant should be able to give a simple description of the whole subject, using common words and examples.

(c) The applicant should 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.

Objectives:

(a) The applicant should be able to understand the theoretical fundamentals of the subject.

(b) The applicant should be able to give a general description of the subject using, as appropriate, typical examples.

(c) The applicant should be able to use mathematical formulae in conjunction with physical laws describing the subject.

(d) The applicant should be able to read and understand sketches, drawings and schematics describing the subject.

(e) The applicant should be able to apply his 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.

Objectives:

(a) The applicant should know the theory of the subject and interrelationships with other subjects.

(b) The applicant should be able to give a detailed description of the subject using theoretical fundamentals and specific examples.

(c) The applicant should understand and be able to use mathematical formulae related to the subject.

(d) The applicant should be able to read, understand and prepare sketches, simple drawings and schematics describing the subject.

(e) The applicant should be able to apply his knowledge in a practical manner using manufacturer's instructions.

(f) The applicant should be able to interpret results from various sources and measurements and apply corrective action where appropriate.

2. Modularisation

Qualification on basic subjects for each aircraft maintenance licence category or subcategory should be in accordance with the following matrix, where applicable subjects are indicated by an 'X':

Subject module	A or B1 aeroplane with:		A or B1 helicopter with:		B3
	Turbine engine(s)	Piston engine(s)	Turbine engine(s)	Piston engine(s)	Piston-engine non-pressurised aeroplanes 2000 kg MTOM and below
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X
4	X	X	X	X	X
5	X	X	X	X	X
6	X	X	X	X	X
7A	X	X	X	X	
7B					X
8	X	X	X	X	X
9A	X	X	X	X	
9B					X
10	X	X	X	X	X
11A	X				
11B		X			
11C					X
12			X	X	
13					
14					
15	X		X		
16		X		X	X
17A	X	X			
17B					X

For categories B2 and B2L:

Subject module/submodules	B2	B2L
1	X	X
2	X	X
3	X	X
4	X	X
5	X	X
6	X	X
7A	X	X
7B		

Subject module/submodules	B2	B2L
8	X	X
9A	X	X
9B		
10	X	X
11A		
11B		
11C		
12		
13.1 and 13.2	x	x
13.3(a)	x	X (for system rating 'Autoflight')
13.3(b)	x	
13.4(a)	x	X (for system rating 'Com/Nav')
13.4(b)	x	X (for system rating 'Surveillance')
13.4(c)	x	
13.5	x	x
13.6	x	
13.7	x	X (for system rating 'Autoflight')
13.8	x	X (for system rating 'Instruments')
13.9	x	x
13.10	x	
13.11 to 13.18	x	X (for system rating 'Airframe systems')
13.19 to 13.22	x	
14	x	X (for system rating 'instruments' and 'Airframe systems')
15		
16		
17A		
17B		

MODULE 1. MATHEMATICS

MODULE 1. MATHEMATICS	LEVEL			
	A	**B1**	**B2 B2L**	**B3**
1.1. Arithmetic Arithmetical terms and signs, methods of multiplication and division, fractions and decimals, factors and multiples, weights, measures and conversion factors, ratio and proportion, averages and percentages, areas and volumes, squares, cubes, square and cube roots.	1	2	2	2
1.2. Algebra a) Evaluating simple algebraic expressions, addition, subtraction, multiplication and division, use of brackets, simple algebraic fractions;	1	2	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
1.3. Geometry a) Simple geometrical constructions;	—	1	1	1
b) Graphical representation; nature and uses of graphs, graphs of equations/functions;	2	2	2	2
c) Simple trigonometry; trigonometrical relationships, use of tables and rectangular and polar coordinates.	—	2	2	2

MODULE 2. PHYSICS

MODULE 2. PHYSICS	LEVEL			
	A	**B1**	**B2 B2L**	**B3**
2.1. Matter	1	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	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	1
Linear movement: uniform motion in a straight line, motion under constant acceleration (motion under gravity); Rotational movement: uniform circular motion (centrifugal/centripetal forces); Periodic motion: pendular movement; Simple theory of vibration, harmonics and resonance; Velocity ratio, mechanical advantage and efficiency.				
2.2.3. Dynamics				
a) Mass; Force, inertia, work, power, energy (potential, kinetic and total energy), heat, efficiency;	1	2	1	1
b) Momentum, conservation of momentum; Impulse; Gyroscopic principles; Friction: nature and effects, coefficient of friction (rolling resistance).	1	2	2	1
2.2.4. Fluid dynamics				
a) Specific gravity and density;	2	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	1
2.3. Thermodynamics				
a) Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin; Heat definition;	2	2	2	2
b) Heat capacity, specific heat;	—	2	2	1

MODULE 2. PHYSICS	LEVEL			
	A	**B1**	**B2 B2L**	**B3**
Heat transfer: convection, radiation and conduction; Volumetric expansion; First and second law of thermodynamics; Gases: ideal gases laws; specific heat at constant volume and constant pressure, work done by expanding gas; Isothermal, adiabatic expansion and compression, engine cycles, constant volume and constant pressure, refrigerators and heat pumps; Latent heats of fusion and evaporation, thermal energy, heat of combustion.				
2.4. Optics (Light) Nature of light; speed of light; Laws of reflection and refraction: reflection at plane surfaces, reflection by spherical mirrors, refraction, lenses; Fibre optics.	—	2	2	—
2.5. Wave Motion and Sound Wave motion: mechanical waves, sinusoidal wave motion, interference phenomena, standing waves; Sound: speed of sound, production of sound, intensity, pitch and quality, Doppler effect.	—	2	2	—

MODULE 3. ELECTRICAL FUNDAMENTALS

MODULE 3. ELECTRICAL FUNDAMENTALS	LEVEL			
	A	**B1**	**B2 B2L**	**B3**
3.1. Electron Theory Structure and distribution of electrical charges within: atoms, molecules, ions, compounds; Molecular structure of conductors, semiconductors and insulators.	1	1	1	1
3.2. Static Electricity and Conduction Static electricity and distribution of electrostatic charges; Electrostatic laws of attraction and repulsion; Units of charge, Coulomb's Law; Conduction of electricity in solids, liquids, gases and a vacuum.	1	2	2	1
3.3. Electrical Terminology The following terms, their units and factors affecting them: potential difference, electromotive force, voltage, current, resistance, conductance, charge, conventional current flow, electron flow.	1	2	2	1
3.4. Generation of Electricity Production of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.	1	1	1	1
3.5. DC Sources of Electricity Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, other alkaline cells; Cells connected in series and parallel; Internal resistance and its effect on a battery; Construction, materials and operation of thermocouples; Operation of photo-cells.	1	2	2	2
3.6. DC Circuits Ohms Law, Kirchoff's Voltage and Current Laws; Calculations using the above laws to find resistance, voltage and current; Significance of the internal resistance of a supply.	—	2	2	1
3.7. Resistance/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	1

b) Positive and negative temperature coefficient conductance; Fixed resistors, stability, tolerance and limitations, methods of construction; Variable resistors, thermistors, voltage dependent resistors; Construction of potentiometers and rheostats; Construction of Wheatstone Bridge.	—	1	1	—

MODULE 3. ELECTRICAL FUNDAMENTALS	LEVEL			
	A	**B1**	**B2** **B2L**	**B3**
3.8. Power Power, work and energy (kinetic and potential); Dissipation of power by a resistor; Power formula; Calculations involving power, work and energy.	—	2	2	1
3.9. Capacitance/Capacitor Operation and function of a capacitor; Factors affecting capacitance area of plates, distance between plates, number of plates, dielectric and dielectric constant, working voltage, voltage rating; Capacitor types, construction and function; Capacitor colour coding; Calculations of capacitance and voltage in series and parallel circuits; Exponential charge and discharge of a capacitor, time constants; Testing of capacitors.	—	2	2	1
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	1
b) Magnetomotive force, field strength, magnetic flux density, permeability, hysteresis loop, retentivity, coercive force reluctance, saturation point, eddy currents; Precautions for care and storage of magnets.	—	2	2	1

MODULE 3. ELECTRICAL FUNDAMENTALS	LEVEL			
	A	**B1**	**B2 B2L**	**B3**
3.11. Inductance/Inductor Faraday's Law; Action of inducing a voltage in a conductor moving in a magnetic field; Induction principles; Effects of the following on the magnitude of an induced voltage: magnetic field strength, rate of change of flux, number of conductor turns; Mutual induction; The effect the rate of change of primary current and mutual inductance has on induced voltage; Factors affecting mutual inductance: number of turns in coil, physical size of coil, permeability of coil, position of coils with respect to each other; Lenz's Law and polarity determining rules; Back emf, self induction; Saturation point; Principle uses of inductors.	—	2	2	1
3.12. DC Motor/Generator Theory Basic motor and generator theory; Construction and purpose of components in DC generator; Operation of, and factors affecting output and direction of current flow in DC generators; Operation of, and factors affecting output power, torque, speed and direction of rotation of DC motors; Series wound, shunt wound and compound motors; Starter Generator construction.	—	2	2	1
3.13. AC Theory Sinusoidal waveform: phase, period, frequency, cycle; Instantaneous, average, root mean square, peak, peak to peak current values and calculations of these values, in relation to voltage, current and power; Triangular/Square waves; Single/3 phase principles.	1	2	2	1
3.14. Resistive (R), Capacitive (C) and Inductive (L) Circuits Phase relationship of voltage and current in L, C and R circuits, parallel, series and series parallel; Power dissipation in L, C and R circuits; Impedance, phase angle, power factor and current calculations; True power, apparent power and reactive power calculations.	—	2	2	1

MODULE 3. ELECTRICAL FUNDAMENTALS	LEVEL			
	A	**B1**	**B2 B2L**	**B3**
3.15. Transformers Transformer construction principles and operation; Transformer losses and methods for overcoming them; Transformer action under load and no-load conditions; Power transfer, efficiency, polarity markings; Calculation of line and phase voltages and currents; Calculation of power in a three phase system; Primary and Secondary current, voltage, turns ratio, power, efficiency; Auto transformers.	—	2	2	1
3.16. Filters Operation, application and uses of the following filters: low pass, high pass, band pass, band stop.	—	1	1	—
3.17. AC Generators Rotation of loop in a magnetic field and waveform produced; Operation and construction of revolving armature and revolving field type AC generators; Single phase, two phase and three phase alternators; Three phase star and delta connections advantages and uses; Permanent Magnet Generators.	—	2	2	1
3.18. AC Motors Construction, principles of operation and characteristics of: AC synchronous and induction motors both single and polyphase; Methods of speed control and direction of rotation; Methods of producing a rotating field: capacitor, inductor, shaded or split pole.	—	2	2	1

MODULE 4. ELECTRONIC FUNDAMENTALS

MODULE 4. ELECTRONIC FUNDAMENTALS	LEVEL			
	A	**B1**	**B2 B2L**	**B3**
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	1
b) Materials, electron configuration, electrical properties; P and N type materials: effects of impurities on conduction, majority and minority characters; PN junction in a semiconductor, development of a potential across a PN junction in unbiased, forward biased and reverse biased conditions; Diode parameters: peak inverse voltage, maximum forward current, temperature, frequency, leakage current, power dissipation; Operation and function of diodes in the following circuits: clippers, clampers, full and half wave rectifiers, bridge rectifiers, voltage doublers and triplers; Detailed operation and characteristics of the following devices: silicon controlled rectifier (thyristor), light emitting diode, Schottky diode, photo conductive diode, varactor diode, varistor, rectifier diodes, Zener diode.	—	—	2	—
4.1.2. Transistors				
a) Transistor symbols; Component description and orientation; Transistor characteristics and properties.	—	1	2	1
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	—

MODULE 4. ELECTRONIC FUNDAMENTALS	LEVEL			
	A	B1	B2 B2L	B3
4.1.3. Integrated Circuits				
a) Description and operation of logic circuits and linear circuits/operational amplifiers;	—	1	—	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; Operation and amplifier stages connecting methods: resistive capacitive, inductive (transformer), inductive resistive (IR), direct; **Advantages and disadvantages of positive and negative feedback**.	—	—	2	—
4.2. Printed Circuit Boards Description and use of printed circuit boards.	—	1	2	—
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/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, deadband; 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; Servomechanism defects, reversal of synchro leads, hunting	—	—	2	—

MODULE 5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS

MODULE 5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS	LEVEL				
	A	**B1-1 B1-3**	**B1-2 B1-4**	**B2 B2L**	**B3**
5.1. Electronic Instrument Systems Typical systems arrangements and cockpit layout of electronic instrument systems.	1	2	2	3	1
5.2. Numbering Systems Numbering systems: binary, octal and hexadecimal; Demonstration of conversions between the decimal and binary, octal and hexadecimal systems and vice versa.	—	1	—	2	—
5.3. Data Conversion Analogue Data, Digital Data; Operation and application of analogue to digital, and digital to analogue converters, inputs and outputs, limitations of various types.	—	1	—	2	—
5.4. Data Buses Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications. Aircraft Network/Ethernet.	—	2	—	2	—
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, hardware, 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 micro computer including their associated bus systems; Information contained in single and multi address instruction words; Memory associated terms; Operation of typical memory devices; Operation, advantages and disadvantages of the various data storage systems.	—	—	—	2	—

MODULE 5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS	LEVEL				
	A	**B1-1 B1-3**	**B1-2 B1-4**	**B2 B2L**	**B3**
5.7. Microprocessors Functions performed and overall operation of a microprocessor; Basic operation of each of the following microprocessor elements: control and processing unit, clock, register, arithmetic logic unit.	—	—	—	2	—
5.8. Integrated Circuits Operation and use of encoders and decoders; Function of encoder types; Uses of medium, large and very large scale integration.	—	—	—	2	—
5.9. Multiplexing Operation, application and identification in logic diagrams of multiplexers and demultiplexers.	—	—	—	2	—
5.10. Fibre Optics Advantages and disadvantages of fibre optic data transmission over electrical wire propagation; Fibre optic data bus; Fibre optic related terms; Terminations; Couplers, control terminals, remote terminals; Application of fibre optics in aircraft systems.	—	1	1	2	—
5.11. Electronic Displays Principles of operation of common types of displays used in modern aircraft, including Cathode Ray Tubes, Light Emitting Diodes and Liquid Crystal Display.	—	2	1	2	1
5.12. Electrostatic Sensitive Devices Special handling of components sensitive to electrostatic discharges; Awareness of risks and possible damage, component and personnel anti-static protection devices.	1	2	2	2	1
5.13. Software Management Control Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programmes.	—	2	1	2	1
5.14. Electromagnetic Environment Influence of the following phenomena on maintenance practices for electronic system: EMC-Electromagnetic Compatibility EMI-Electromagnetic Interference HIRF-High Intensity Radiated Field Lightning/lightning protection.	—	2	2	2	1

MODULE 5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS	LEVEL				
	A	**B1-1 B1-3**	**B1-2 B1-4**	**B2 B2L**	**B3**
5.15. Typical Electronic/Digital Aircraft Systems General arrangement of typical electronic/digital aircraft systems and associated BITE (Built In Test Equipment) such as:	—	2	2	2	1
a) For B1 and B2 only: ACARS-ARINC Communication and Addressing and Reporting System EICAS-Engine Indication and Crew Alerting System FBW-Fly-by-Wire FMS-Flight Management System IRS-Inertial Reference System;					
b) For B1, B2 and B3: ECAM-Electronic Centralised Aircraft Monitoring EFIS-Electronic Flight Instrument System GPS-Global Positioning System TCAS-Traffic Alert Collision Avoidance System Integrated Modular Avionics Cabin Systems Information Systems.					

MODULE 6. MATERIALS AND HARDWARE

MODULE 6. MATERIALS AND HARDWARE	LEVEL			
	A	**B1**	**B2 B2L**	B3
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	2
b) Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.	—	1	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	2
b) Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance	—	1	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; b) The detection of defects/deterioration in composite and non-metallic material: Repair of composite and non-metallic material.	1 1	2 2	2 —	2 2
6.3.2. Wooden structures Construction methods of wooden airframe structures; Characteristics, properties and types of wood and glue used in aeroplanes; Preservation and maintenance of wooden structure; Types of defects in wood material and wooden structures; The detection of defects in wooden structure; Repair of wooden structure.	1	2	—	2
6.3.3. Fabric covering Characteristics, properties and types of fabrics used in aeroplanes; Inspections methods for fabric; Types of defects in fabric; Repair of fabric covering.	1	2	—	2
6.4. Corrosion a) Chemical fundamentals; Formation by, galvanic action process, microbiological, stress;	1	1	1	1

MODULE 6. MATERIALS AND HARDWARE	LEVEL			
	A	**B1**	**B2 B2L**	B3
b) Types of corrosion and their identification; Causes of corrosion; Material types, susceptibility to corrosion	2	3	2	2
6.5. Fasteners *6.5.1. Screw threads* Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; Measuring screw threads	2	2	2	2
6.5.2. Bolts, studs and screws Bolt types: specification, identification and marking of aircraft bolts, international standards; Nuts: self locking, anchor, standard types; Machine screws: aircraft specifications; Studs: types and uses, insertion and removal; Self tapping screws, dowels.	2	2	2	2
6.5.3. Locking devices Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick release fasteners, keys, circlips, cotter pins.	2	2	2	2
6.5.4. Aircraft rivets Types of solid and blind rivets: specifications and identification, heat treatment.	1	2	1	2
6.6. Pipes and Unions a) Identification of, and types of rigid and flexible pipes and their connectors used in aircraft;	2	2	2	2
b) Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes.	2	2	1	2
6.7. Springs Types of springs, materials, characteristics and applications.	—	2	1	1
6.8. Bearings Purpose of bearings, loads, material, construction; Types of bearings and their application.	1	2	2	1
6.9. Transmissions Gear types and their application; Gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns; Belts and pulleys, chains and sprockets	1	2	2	1

MODULE 6. MATERIALS AND HARDWARE	LEVEL			
	A	**B1**	**B2 B2L**	B3
6.10. Control Cables Types of cables; End fittings, turnbuckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems.	1	2	1	2
6.11. Electrical Cables and Connectors Cable types, construction and characteristics; High tension and co-axial cables; Crimping; Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes.	1	2	2	2

MODULE 7. A. MAINTENANCE PRACTICES

Note: This module does not apply to category B3. Relevant subject matters for category B3 are defined in module 7B.

MODULE 7A. MAINTENANCE PRACTICES	LEVEL		
	A	**B1**	**B2 B2L**
7.1. Safety Precautions-Aircraft and Workshop Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals. Also, instruction in the remedial action to be taken in the event of a fire or another accident with one or more of these hazards including knowledge on extinguishing agents.	3	3	3
7.2. Workshop Practices Care of tools, control of tools, use of workshop materials; Dimensions, allowances and tolerances, standards of workmanship; Calibration of tools and equipment, calibration standards.	3	3	3
7.3. Tools Common hand tool types; Common power tool types; Operation and use of precision measuring tools; Lubrication equipment and methods. Operation, function and use of electrical general test equipment.	3	3	3
7.4. Avionic General Test Equipment Operation, function and use of avionic general test equipment.	—	2	3
7.5. Engineering Drawings, Diagrams and Standards Drawing types and diagrams, their symbols, dimensions, tolerances and projections; Identifying title block information; Microfilm, microfiche and computerised presentations; Specification 100 of the Air Transport Association (ATA) of America; Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL; Wiring diagrams and schematic diagrams.	1	2	2
7.6. Fits and Clearances Drill sizes for bolt holes, classes of fits; Common system of fits and clearances; Schedule of fits and clearances for aircraft and engines; Limits for bow, twist and wear; Standard methods for checking shafts, bearings and other parts.	1	2	1
7.7. Electrical Wiring Interconnection System (EWIS) Continuity, insulation and bonding techniques and testing; Use of crimp tools: hand and hydraulic operated; Testing of crimp joints;	1	3	3

MODULE 7A. MAINTENANCE PRACTICES	LEVEL		
	A	**B1**	**B2 B2L**
Connector pin removal and insertion; Co-axial cables: testing and installation precautions; Identification of wire types, their inspection criteria and damage tolerance. Wiring protection techniques: Cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding; EWIS installations, inspection, repair, maintenance and cleanliness standards.			
7.8. Riveting Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.	1	2	—
7.9. Pipes and Hoses Bending and belling/flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes.	1	2	—
7.10. Springs Inspection and testing of springs.	1	2	—
7.11. Bearings Testing, cleaning and inspection of bearings; Lubrication requirements of bearings; Defects in bearings and their causes.	1	2	—
7.12. Transmissions Inspection of gears, backlash; Inspection of belts and pulleys, chains and sprockets; Inspection of screw jacks, lever devices, push-pull rod systems.	1	2	—
7.13. Control Cables Swaging of end fittings; Inspection and testing of control cables; Bowden cables; aircraft flexible control systems.	1	2	—
7.14. Material handling			
7.14.1. Sheet Metal Marking out and calculation of bend allowance; Sheet metal working, including bending and forming; Inspection of sheet metal work.	—	2	—
7.14.2. Composite and non-metallic Bonding practices; Environmental conditions; Inspection methods.	—	2	—
7.15. Welding, Brazing, Soldering and Bonding			
a) Soldering methods; inspection of soldered joints.	—	2	2

MODULE 7A. MAINTENANCE PRACTICES	LEVEL		
	A	**B1**	**B2 B2L**
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/Balance limits calculation: use of relevant documents;	—	2	2
b) Preparation of aircraft for weighing; Aircraft weighing.	—	2	—
7.17. Aircraft Handling and Storage Aircraft taxiing/towing and associated safety precautions; Aircraft jacking, chocking, securing and associated safety precautions; Aircraft storage methods; Refuelling/defuelling procedures; De-icing/anti-icing procedures; Electrical, hydraulic and pneumatic ground supplies. Effects of environmental conditions on aircraft handling and operation.	2	2	2
7.18. Disassembly, Inspection, Repair and Assembly Techniques			
a) Types of defects and visual inspection techniques; Corrosion removal, assessment and reprotection;	2	3	3
b) General repair methods, Structural Repair Manual; Ageing, fatigue and corrosion control programmes;	—	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
b) Inspections following abnormal events such as heavy landings and flight through turbulence.	2	2	—
7.20. Maintenance Procedures Maintenance planning; Modification procedures; Stores procedures; Certification/release procedures; Interface with aircraft operation; Maintenance Inspection/Quality Control/Quality Assurance; Additional maintenance procedures; Control of life limited components.	1	2	2

MODULE 7B. MAINTENANCE PRACTICES

Note: The scope of this module shall reflect the technology of aeroplanes relevant to the B3 category.

MODULE 7B. MAINTENANCE PRACTICES	LEVEL
	B3
7.1. Safety Precautions-Aircraft and Workshop Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals. Also, instruction in the remedial action to be taken in the event of a fire or another accident with one or more of these hazards including knowledge on extinguishing agents.	3
7.2. Workshop Practices Care of tools, control of tools, use of workshop materials; Dimensions, allowances and tolerances, standards of workmanship; Calibration of tools and equipment, calibration standards.	3
7.3. Tools Common hand tool types; Common power tool types; Operation and use of precision measuring tools; Lubrication equipment and methods; Operation, function and use of electrical general test equipment.	3
7.4. Avionic General Test Equipment Operation, function and use of avionic general test equipment.	1
7.5. Engineering Drawings, Diagrams and Standards Drawing types and diagrams, their symbols, dimensions, tolerances and projections; Identifying title block information; Microfilm, microfiche and computerised presentations; Specification 100 of the Air Transport Association (ATA) of America; Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL; Wiring diagrams and schematic diagrams.	2
7.6. Fits and Clearances Drill sizes for bolt holes, classes of fits; Common system of fits and clearances; Schedule of fits and clearances for aircraft and engines; Limits for bow, twist and wear; Standard methods for checking shafts, bearings and other parts.	2
7.7. Electrical Cables and Connectors Continuity, insulation and bonding techniques and testing; Use of crimp tools: hand and hydraulic operated; Testing of crimp joints; Connector pin removal and insertion; Co-axial cables: testing and installation precautions; Wiring protection techniques: Cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding.	2
7.8. Riveting Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.	2

MODULE 7B. MAINTENANCE PRACTICES	LEVEL **B3**
7.9. Pipes and Hoses Bending and belling/flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes.	2
7.10. Springs Inspection and testing of springs.	1
7.11. Bearings Testing, cleaning and inspection of bearings; Lubrication requirements of bearings; Defects in bearings and their causes.	2
7.12. Transmissions Inspection of gears, backlash; Inspection of belts and pulleys, chains and sprockets; Inspection of screw jacks, lever devices, push-pull rod systems.	2
7.13. Control Cables Swaging of end fittings; Inspection and testing of control cables; Bowden cables; aircraft flexible control systems.	2
7.14. Material handling *7.14.1. Sheet Metal* Marking out and calculation of bend allowance; Sheet metal working, including bending and forming; Inspection of sheet metal work.	2
7.14.2. Composite and non-metallic Bonding practices; Environmental conditions; Inspection methods.	2
7.15. Welding, Brazing, Soldering and Bonding	
a) Soldering methods; inspection of soldered joints;	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/Balance limits calculation: use of relevant documents;	2
b) Preparation of aircraft for weighing; Aircraft weighing.	2
7.17. Aircraft Handling and Storage Aircraft taxiing/towing and associated safety precautions; Aircraft jacking, chocking, securing and associated safety precautions; Aircraft storage methods; Refuelling/defuelling procedures; De-icing/anti-icing procedures;	2

MODULE 7B. MAINTENANCE PRACTICES	LEVEL **B3**
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;	3
b) General repair methods, Structural Repair Manual; Ageing, fatigue and corrosion control programmes;	2
c) Non-destructive inspection techniques including, penetrant, radiographic, eddy current, ultrasonic and boroscope methods;	2
d) Disassembly and re-assembly techniques;	2
e) Trouble shooting techniques.	2
7.19. Abnormal Events a) Inspections following lightning strikes and HIRF penetration.	2
b) Inspections following abnormal events such as heavy landings and flight through turbulence.	2
7.20. Maintenance Procedures Maintenance planning; Modification procedures; Stores procedures; Certification/release procedures; Interface with aircraft operation; Maintenance Inspection/Quality Control/Quality Assurance; Additional maintenance procedures; Control of life limited components.	2

MODULE 8. BASIC AERODYNAMICS

MODULE 8. BASIC AERODYNAMICS	LEVEL			
	A	**B1**	**B2 B2L**	**B3**
8.1. Physics of the Atmosphere International Standard Atmosphere (ISA), application to aerodynamics.	1	2	2	1
8.2. Aerodynamics Airflow around a body; Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, upwash 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 wash out, 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.	1	2	2	1
8.3. Theory of Flight Relationship between lift, weight, thrust and drag; Glide ratio; Steady state flights, performance; Theory of the turn; Influence of load factor: stall, flight envelope and structural limitations; Lift augmentation.	1	2	2	1
8.4. Flight Stability and Dynamics Longitudinal, lateral and directional stability (active and passive).	1	2	2	1

MODULE 9. A. HUMAN FACTORS

Note: This module does not apply to category B3. Relevant subject matters for category B3 are defined in module 9B.

MODULE 9A. HUMAN FACTORS	LEVEL		
	A	**B1**	**B2 B2L**
9.1. General The need to take human factors into account; Incidents attributable to human factors/human error; 'Murphy's' law.	1	2	2
9.2. Human Performance and Limitations Vision; Hearing; Information processing; Attention and perception; Memory; Claustrophobia and physical access.	1	2	2
9.3. Social Psychology Responsibility: individual and group; Motivation and de-motivation; Peer pressure; 'Culture' issues; Team working; Management, supervision and leadership.	1	1	1
9.4. Factors Affecting Performance Fitness/health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload and underload; Sleep and fatigue, shiftwork; Alcohol, medication, drug abuse.	2	2	2
9.5. Physical Environment Noise and fumes; Illumination; Climate and temperature; Motion and vibration; Working environment.	1	1	1
9.6. Tasks Physical work; Repetitive tasks; Visual inspection; Complex systems.	1	1	1

MODULE 9A. HUMAN FACTORS	LEVEL		
	A	**B1**	**B2** **B2L**
9.7. Communication Within and between teams; Work logging and recording; Keeping up to date, currency; Dissemination of information.	2	2	2
9.8. Human Error Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e. accidents); Avoiding and managing errors.	1	2	2
9.9. Hazards in the Workplace Recognising and avoiding hazards; Dealing with emergencies.	1	2	2

MODULE 9B. HUMAN FACTORS

Note: The scope of this module shall reflect the less demanding environment of maintenance for B3 licence holders.

MODULE 9B. HUMAN FACTORS	LEVEL
	B3
9.1. General The need to take human factors into account; Incidents attributable to human factors/human error; 'Murphy's' law.	2
9.2. Human Performance and Limitations Vision; Hearing; Information processing; Attention and perception; Memory; Claustrophobia and physical access.	2
9.3. Social Psychology Responsibility: individual and group; Motivation and de-motivation; Peer pressure; 'Culture' issues; Team working; Management, supervision and leadership.	1
9.4. Factors Affecting Performance Fitness/health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload and underload; Sleep and fatigue, shiftwork; Alcohol, medication, drug abuse.	2
9.5. Physical Environment Noise and fumes; Illumination; Climate and temperature; Motion and vibration; Working environment.	1
9.6. Tasks Physical work; Repetitive tasks; Visual inspection; Complex systems.	1

MODULE 9B. HUMAN FACTORS	LEVEL **B3**
9.7. Communication Within and between teams; Work logging and recording; Keeping up to date, currency; Dissemination of information.	2
9.8. Human Error Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e. accidents); Avoiding and managing errors.	2
9.9. Hazards in the Workplace Recognising and avoiding hazards; Dealing with emergencies.	2

MODULE 10. AVIATION LEGISLATION

MODULE 10. AVIATION LEGISLATION	LEVEL			
	A	**B1**	**B2** **B2L**	**B3**
10.1. Regulatory Framework Role of the CAAT Air Nav Act BE 249 National Requirements Relationship between the various TCARs such as Part-21, Part-M, Part-145, Part-66, Part-147 and Regulation Air Ops.	1	1	1	1
10.2. Certifying Staff — Maintenance Detailed understanding of Part-66.	2	2	2	2
10.3. Approved Maintenance Organisations Detailed understanding of Part-145 and Part-M Subpart F.	2	2	2	2
10.4. Air operations General understanding of Regulation Air Ops TCAR. Air Operators Certificates; Operator's responsibilities, in particular regarding continuing airworthiness and maintenance; Aircraft Maintenance Programme; MEL//CDL; Documents to be carried on board; Aircraft placarding (markings).	1	1	1	1
10.5. Certification of aircraft, parts and appliances a) General General understanding of Part-21 and TCAR and FAR certification specifications CS-23, 25, 27, 29.	—	1	1	1
b) Documents Certificate of Airworthiness; restricted certificates of airworthiness and permit to fly; Certificate of Registration; Noise Certificate; Weight Schedule; Radio Station Licence and Approval.	—	2	2	2
10.6. Continuing airworthiness Detailed understanding of Part-21 provisions related to continuing airworthiness. Detailed understanding of Part-M.	2	2	2	2

MODULE 11. A. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

MODULE 11A. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A1	**B1.1**
11.1. Theory of Flight *11.1.1. Aeroplane Aerodynamics and Flight Controls* Operation and effect of: - roll control: ailerons and spoilers, - pitch control: elevators, stabilators, variable incidence stabilisers and canards, - yaw control, rudder limiters; Control using elevons, ruddervators; High lift devices, slots, slats, flaps, flaperons; Drag inducing devices, spoilers, lift dumpers, speed brakes; Effects of wing fences, saw tooth leading edges; Boundary layer control using, vortex generators, stall wedges or leading edge devices; Operation and effect of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels.	1	2
11.1.2. High Speed Flight Speed of sound, subsonic flight, transonic flight, supersonic flight; Mach number, critical Mach number, compressibility buffet, shock wave, aerodynamic heating, area rule; Factors affecting airflow in engine intakes of high speed aircraft; Effects of sweepback on critical Mach number.	1	2
11.2. Airframe Structures — General Concepts a) Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision; Aircraft bonding.	2	2
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 (ATA 52/53/56)*	1	2

MODULE 11A. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL A1	LEVEL B1.1
Construction and pressurisation sealing; Wing, stabiliser, pylon and undercarriage 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 (ATA 57) Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.	2	2
11.3.3. Stabilisers (ATA 55) Construction; Control surface attachment.	1	2
11.3.4. Flight Control Surfaces (ATA 55/57) Construction and attachment; Balancing — mass and aerodynamic.	1	2
11.3.5. Nacelles/Pylons (ATA 54) Nacelles/Pylons: - Construction, - Firewalls, - Engine mounts.	1	2
11.4. Air Conditioning and Cabin Pressurisation (ATA 21) *11.4.1. Air supply* Sources of air supply including engine bleed, APU and ground cart.	1	2
11.4.2. Air Conditioning Air conditioning systems; Air cycle and vapour cycle machines; Distribution systems; Flow, temperature and humidity control system.	1	3
11.4.3. Pressurisation Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers.	1	3
11.4.4. Safety and warning devices Protection and warning devices.	1	3
11.5. Instruments/Avionic Systems *11.5.1. Instrument Systems (ATA 31)* 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; Angle of attack indication, stall warning systems; Glass cockpit; Other aircraft system indication.	1	2

MODULE 11A. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A1	**B1.1**
11.5.2. Avionic Systems Fundamentals of system lay-outs and operation of: - Auto Flight (ATA 22), - Communications (ATA 23), - Navigation Systems (ATA 34).	1	1
11.6. Electrical Power (ATA 24) Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection; External/Ground power.	1	3
11.7. Equipment and Furnishings (ATA 25) a) Emergency equipment requirements; Seats, harnesses and belts.	2	2
b) Cabin lay-out; Equipment lay-out; Cabin Furnishing installation; Cabin entertainment equipment; Galley installation; Cargo handling and retention equipment; Airstairs.	1	1
11.8. Fire Protection (ATA 26) a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests;	1	3
b) Portable fire extinguisher.	1	2
11.9. Flight Controls (ATA 27) 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 lock systems; Balancing and rigging; Stall protection/warning system.	1	3

MODULE 11A. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A1	**B1.1**
11.10. Fuel Systems (ATA 28) System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling; *Longitudinal balance fuel systems.*	1	3
11.11. Hydraulic Power (ATA 29) System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation; Filters; Pressure Control; Power distribution; Indication and warning systems; Interface with other systems.	1	3
11.12. Ice and Rain Protection (ATA 30) 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.	1	3
11.13. Landing Gear (ATA 32) Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering; Air-ground sensing.	2	3
11.14. Lights (ATA 33) External: navigation, anti collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	2	3
11.15. Oxygen (ATA 35) System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	1	3

MODULE 11A. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A1	**B1.1**
11.16. Pneumatic/Vacuum (ATA 36) System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure and vacuum pumps; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	1	3
11.17. Water/Waste (ATA 38) Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing; Corrosion aspects.	2	3
11.18. On Board Maintenance Systems (ATA 45) Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	1	2
11.19. Integrated Modular Avionics (ATA42) Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc. Core System; Network Components.	1	2
11.20. Cabin Systems (ATA44) The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service). Includes 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 LRU's and they are typically operated via Flight Attendant Panels.	1	2

MODULE 11A. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A1	**B1.1**
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 Mass Memory System; Cabin Monitoring System; Miscellaneous Cabin System.		
11.21. Information Systems (ATA46) The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does 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 and Network Server Systems Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.	1	2

MODULE 11B. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

Note 1: This module does not apply to category B3. Relevant subject matters for category B3 are defined in module 11C.

Note 2: The scope of this Module shall reflect the technology of aeroplanes pertinent to the A2 and B1.2 subcategory.

MODULE 11B. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A2	**B1.2**
11.1. Theory of Flight		
11.1.1. Aeroplane Aerodynamics and Flight Controls Operation and effect of: - roll control: ailerons and spoilers, - pitch control: elevators, stabilators, variable incidence stabilisers and canards, - yaw control, rudder limiters; Control using elevons, ruddervators; High lift devices, slots, slats, flaps, flaperons; Drag inducing devices, spoilers, lift dumpers, speed brakes; Effects of wing fences, saw tooth leading edges; Boundary layer control using, vortex generators, stall wedges or leading edge devices; Operation and effect of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels.	1	2
11.1.2. High Speed Flight — N/A	—	—
11.2. Airframe Structures — General Concepts		
a) Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision; Aircraft bonding.	2	2
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

MODULE 11B. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A2	**B1.2**
11.3. Airframe Structures — Aeroplanes *11.3.1. Fuselage (ATA 52/53/56)* Construction and pressurisation sealing; Wing, tail-plane, pylon and undercarriage attachments; Seat installation; Doors and emergency exits: construction and operation; Windows and windscreen attachment.	1	2
11.3.2. Wings (ATA 57) Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.	1	2
11.3.3. Stabilisers (ATA 55) Construction; Control surface attachment.	1	2
11.3.4. Flight Control Surfaces (ATA 55/57) Construction and attachment; Balancing — mass and aerodynamic.	1	2
11.3.5. Nacelles/Pylons (ATA 54) Nacelles/Pylons: - Construction, - Firewalls, - Engine mounts.	1	2
11.4. Air Conditioning and Cabin Pressurisation (ATA 21) Pressurisation and air conditioning systems; Cabin pressure controllers, protection and warning devices; Heating systems.	1	3
11.5. Instruments/Avionic Systems *11.5.1. Instrument Systems (ATA 31)* 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; Angle of attack indication, stall warning systems; Glass cockpit; Other aircraft system indication.	1	2
11.5.2. Avionic Systems Fundamentals of system lay-outs and operation of: - Auto Flight (ATA 22), - Communications (ATA 23), - Navigation Systems (ATA 34).	1	1

MODULE 11B. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A2	**B1.2**
11.6. Electrical Power (ATA 24) Batteries Installation and Operation; DC power generation; Voltage regulation; Power distribution; Circuit protection; Inverters, transformers.	1	3
11.7. Equipment and Furnishings (ATA 25) *a)* Emergency equipment requirements; Seats, harnesses and belts;	2	2
b) Cabin lay-out; Equipment lay-out; Cabin Furnishing installation; Cabin entertainment equipment; Galley installation; Cargo handling and retention equipment;	1	1
11.8. Fire Protection (ATA 26) a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests;	1	3
b) Portable fire extinguisher.	1	2
11.9. Flight Controls (ATA 27) Primary controls: aileron, elevator, rudder; Trim tabs; High lift devices; System operation: manual; Gust locks; Balancing and rigging; Stall warning system.	1	3
11.10. Fuel Systems (ATA 28) System lay-out; Fuel tanks; Supply systems; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling.	1	3

MODULE 11B. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A2	**B1.2**
11.11. Hydraulic Power (ATA 29) System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical; Filters; Pressure Control; Power distribution; Indication and warning systems.	1	3
11.12. Ice and Rain Protection (ATA 30) Ice formation, classification and detection; De-icing systems: electrical, hot air, pneumatic and chemical; Probe and drain heating; Wiper systems.	1	3
11.13. Landing Gear (ATA 32) Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering; Air-ground sensing.	2	3
11.14. Lights (ATA 33) External: navigation, anti collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	2	3
11.15. Oxygen (ATA 35) System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	1	3
11.16. Pneumatic/Vacuum (ATA 36) System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	1	3
11.17. Water/Waste (ATA 38) Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing; Corrosion aspects.	2	3

MODULE 11C. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

Note: The scope of this module shall reflect the technology of aeroplanes pertinent to the B3 category.

MODULE 11C. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL **B3**
11.1. Theory of Flight Aeroplane Aerodynamics and Flight Controls Operation and effect of: - roll control: ailerons, - 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, lift dumpers, speed brakes; Effects of wing fences, saw tooth 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.	1
11.2. Airframe Structures — General Concepts a) Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision; Aircraft bonding;	2
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.	2
11.3. Airframe Structures — Aeroplanes *11.3.1. Fuselage (ATA 52/53/56)* Construction; Wing, tail-plane, pylon and undercarriage attachments; Seat installation; Doors and emergency exits: construction and operation; Window and windscreen attachment.	1
11.3.2. Wings (ATA 57) Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.	1

MODULE 11C. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL **B3**
11.3.3. Stabilisers (ATA 55) Construction; Control surface attachment.	1
11.3.4. Flight Control Surfaces (ATA 55/57) Construction and attachment; Balancing — mass and aerodynamic.	1
11.3.5. Nacelles/Pylons (ATA 54) Nacelles/Pylons: - Construction, - Firewalls, - Engine mounts.	1
11.4. Air Conditioning (ATA 21) Heating and ventilation systems.	1
11.5. Instruments/Avionic Systems *11.5.1. Instrument Systems (ATA 31)* 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; Angle of attack indication, stall warning systems; Glass cockpit; Other aircraft system indication.	1
11.5.2. Avionic Systems Fundamentals of system lay-outs and operation of: - Auto Flight (ATA 22), - Communications (ATA 23), - Navigation Systems (ATA 34).	1
11.6. Electrical Power (ATA 24) Batteries Installation and Operation; DC power generation; Voltage regulation; Power distribution; Circuit protection; Inverters, transformers.	2
11.7. Equipment and Furnishings (ATA 25) Emergency equipment requirements; Seats, harnesses and belts.	2
11.8. Fire Protection (ATA 26) Portable fire extinguisher.	2

MODULE 11C. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL **B3**
11.9. Flight Controls (ATA 27) Primary controls: aileron, elevator, rudder; Trim tabs; High lift devices; System operation: manual; Gust locks; Balancing and rigging; Stall warning system.	3
11.10. Fuel Systems (ATA 28) System lay-out; Fuel tanks; Supply systems; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling.	2
11.11. Hydraulic Power (ATA 29) System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical; Filters; Pressure Control; Power distribution; Indication and warning systems.	2
11.12. Ice and Rain Protection (ATA 30) Ice formation, classification and detection; De-icing systems: electrical, hot air, pneumatic and chemical; Probe and drain heating; Wiper systems.	1
11.13. Landing Gear (ATA 32) Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering.	2
11.14. Lights (ATA 33) External: navigation, anti collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	2

MODULE 11C. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL **B3**
11.15. Oxygen (ATA 35) System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	2
11.16. Pneumatic/Vacuum (ATA 36) System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure and vacuum pumps Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	2

MODULE 12. HELICOPTER AERODYNAMICS, STRUCTURES AND SYSTEMS

MODULE 12. HELICOPTER AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A3 A4	**B1.3 B1.4**
12.1. Theory of Flight — Rotary Wing Aerodynamics Terminology; Effects of gyroscopic precession; Torque reaction and directional control; Dissymmetry of lift, Blade tip stall; Translating tendency and its correction; Coriolis effect and compensation; Vortex ring state, power settling, overpitching; Auto-rotation; Ground effect.	1	2
12.2. Flight Control Systems Cyclic control; Collective control; Swashplate; Yaw control: Anti-Torque Control, Tail rotor, bleed air; Main Rotor Head: Design and Operation features; Blade Dampers: Function and construction; Rotor Blades: Main and tail rotor blade construction and attachment; Trim control, fixed and adjustable stabilisers; System operation: manual, hydraulic, electrical and fly-by-wire; Artificial feel; Balancing and rigging.	2	3
12.3. Blade Tracking and Vibration Analysis Rotor alignment; Main and tail rotor tracking; Static and dynamic balancing; Vibration types, vibration reduction methods; Ground resonance.	1	3
12.4. Transmission Gear boxes, main and tail rotors; Clutches, free wheel units and rotor brake; Tail rotor drive shafts, flexible couplings, bearings, vibration dampers and bearing hangers.	1	3

MODULE 12. HELICOPTER AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A3 A4	**B1.3 B1.4**
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
12.6. Air Conditioning (ATA 21) *12.6.1. Air supply* Sources of air supply including engine bleed and ground cart.	1	2
12.6.2. Air conditioning Air conditioning systems; Distribution systems; Flow and temperature control systems; Protection and warning devices.	1	3
12.7. Instruments/Avionic Systems *12.7.1. Instrument Systems (ATA 31)* 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.	1	2

MODULE 12. HELICOPTER AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A3 A4	**B1.3 B1.4**
12.7.2. Avionic Systems Fundamentals of system layouts and operation of: Auto Flight (ATA 22); Communications (ATA 23); Navigation Systems (ATA 34).	1	1
12.8. Electrical Power (ATA 24) Batteries Installation and Operation; DC power generation, AC power generation; Emergency power generation; Voltage regulation, Circuit protection. Power distribution; Inverters, transformers, rectifiers; External/Ground power.	1	3
12.9. Equipment and Furnishings (ATA 25) a) Emergency equipment requirements; Seats, harnesses and belts; Lifting systems;	2	2
b) Emergency flotation systems; Cabin lay-out, cargo retention; Equipment lay-out; Cabin Furnishing Installation.	1	1
12.10. Fire Protection (ATA 26) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.	1	3
12.11. Fuel Systems (ATA 28) System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling.	1	3
12.12. Hydraulic Power (ATA 29) System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation; Filters; Pressure Control; Power distribution; Indication and warning systems; Interface with other systems.	1	3

MODULE 12. HELICOPTER AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A3 A4	**B1.3 B1.4**
12.13. Ice and Rain Protection (ATA 30) Ice formation, classification and detection; Anti-icing and De-icing systems: electrical, hot air and chemical; Rain repellent and removal; Probe and drain heating; Wiper system.	1	3
12.14. Landing Gear (ATA 32) Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, Tyres, brakes; Steering; Air-ground sensing; Skids, floats.	2	3
12.15. Lights (ATA 33) External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	2	3
12.16. Pneumatic/Vacuum (ATA 36) System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	1	3
12.17. Integrated Modular Avionics (ATA42) Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc. Core System; Network Components.	1	2
12.18. On Board Maintenance Systems (ATA45) Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	1	2

MODULE 12. HELICOPTER AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A3 A4	**B1.3 B1.4**
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. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does 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 and Network Server Systems. Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.		

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL
	B2 **B2L**
13.1. Theory of Flight a) Aeroplane Aerodynamics and Flight Controls Operation and effect of: - roll control: ailerons and spoilers, - pitch control: elevators, stabilators, variable incidence stabilisers and canards, - yaw control, rudder limiters; Control using elevons, ruddervators; High lift devices: slots, slats, flaps; Drag inducing devices: spoilers, lift dumpers, speed brakes; Operation and effect of trim tabs, servo tabs, control surface bias;	1
b) High Speed Flight Speed of sound, subsonic flight, transonic flight, supersonic flight; Mach number, critical Mach number;	1
c) Rotary Wing Aerodynamics Terminology;	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 (ATA 22) Fundamentals of automatic flight control including working principles and current terminology; Command signal processing; Modes of operation: roll, pitch and yaw channels; Yaw dampers; Stability Augmentation System in helicopters; Automatic trim control; Autopilot navigation aids interface; Autothrottle systems; Automatic Landing Systems: principles and categories, modes of operation, approach, glideslope, land, go-around, system monitors and failure conditions.	3
13.4. Communication/Navigation (ATA 23/34) Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter; Working principles of following systems: - Very High Frequency (VHF) communication, - High Frequency (HF) communication, - Audio, - Emergency Locator Transmitters,	3

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL **B2** **B2L**
- 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), - Very Low Frequency and hyperbolic navigation (VLF/Omega), - Doppler navigation, - Area navigation, RNAV systems, - Flight Management Systems, - Global Positioning System (GPS), Global Navigation Satellite Systems (GNSS), - Inertial Navigation System, - Air Traffic Control transponder, secondary surveillance radar, - Traffic Alert and Collision Avoidance System (TCAS), - Weather avoidance radar, - Radio altimeter, - ARINC communication and reporting. - ADS-B - Datalink	
13.5. Electrical Power (ATA 24) Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection; External/Ground power.	3
13.6. Equipment and Furnishings (ATA 25) Electronic emergency equipment requirements; Cabin entertainment equipment.	3
13.7. Flight Controls (ATA 27) 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;	2

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL **B2** **B2L**
b) System operation: electrical, fly-by-wire.	3
13.8. Instruments (ATA 31) Classification; Atmosphere; Terminology; Pressure measuring devices and systems; Pitot static systems; Altimeters; Vertical speed indicators; Airspeed indicators; Machmeters; Altitude reporting/alerting systems; Air data computers; Instrument pneumatic systems; Direct reading pressure and temperature gauges; Temperature indicating systems; Fuel quantity indicating systems; Gyroscopic principles; Artificial horizons; Slip indicators; Directional gyros; Ground Proximity Warning Systems; Compass systems; Flight Data Recording systems; Electronic Flight Instrument Systems; Instrument warning systems including master warning systems and centralised warning panels; Stall warning systems and angle of attack indicating systems; Vibration measurement and indication; Glass cockpit.	3
13.9. Lights (ATA 33) External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	3
13.10. On Board Maintenance Systems (ATA 45) Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	3
13.11. Air Conditioning and Cabin Pressurisation (ATA21) *13.11.1. Air supply* Sources of air supply including engine bleed, APU and ground cart;	2

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL **B2** **B2L**
13.11.2. Air Conditioning Air conditioning systems;	2
Air cycle and vapour cycle machines;	3
Distribution systems;	1
Flow, temperature and humidity control system.	3
13.11.3. Pressurisation Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers.	3
13.11.4. Safety and warning devices Protection and warning devices.	3
13.12. Fire Protection (ATA 26) a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests;	3
b) Portable fire extinguisher.	1
13.13. Fuel Systems (ATA 28)	
System lay-out;	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 (ATA 29)	
System lay-out;	1
Hydraulic fluids;	1
Hydraulic reservoirs and accumulators;	1
Pressure generation: electrical, mechanical, pneumatic;	3
Emergency pressure generation;	3
Filters;	1
Pressure control;	3
Power distribution;	1
Indication and warning systems;	3
Interface with other systems.	3
13.15. Ice and Rain Protection (ATA 30)	
Ice formation, classification and detection;	2
Anti-icing systems: electrical, hot air and chemical;	2
De-icing systems: electrical, hot air, pneumatic, chemical;	3
Rain repellent;	1
Probe and drain heating;	3
Wiper Systems.	1

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL **B2** **B2L**
13.16. Landing Gear (ATA 32)	
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
Air-ground sensing	3
13.17. Oxygen (ATA 35)	
System lay-out: cockpit, cabin;	3
Sources, storage, charging and distribution;	3
Supply regulation;	3
Indications and warnings.	3
13.18. Pneumatic/Vacuum (ATA 36	
System lay-out;	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 (ATA 38) Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing.	2
13.20. Integrated Modular Avionics (ATA42) Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc.; Core System; Network Components.	3
13.21. Cabin Systems (ATA44) The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service). Includes 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 LRU's 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.	3

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL **B2** **B2L**
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 Mass Memory System; Cabin Monitoring System; Miscellaneous Cabin System.	
13.22. Information Systems (ATA46) The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does 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 and Network Server Systems. Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.	3

MODULE 14. PROPULSION

MODULE 14. PROPULSOIN	LEVEL **B2** **B2L**
14.1.Turbine Engines a) Constructional arrangement and operation of turbojet, turbofan, turboshaft and turbopropeller engines;	1
b) Electronic Engine control and fuel metering systems (FADEC).	2
14.2. Engine Indicating Systems Exhaust gas temperature/Interstage turbine temperature systems; Engine speed; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure, temperature and flow; Manifold pressure; Engine torque; Propeller speed.	2
14.3. Starting and Ignition Systems Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements.	2

MODULE 15. GAS TURBINE ENGINE

MODULE 15. GAS TURBINE ENGINE	LEVEL	
	A	**B1**
15.1. Fundamentals Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; The relationship between force, work, power, energy, velocity, acceleration; Constructional arrangement and operation of turbojet, turbofan, turboshaft, turboprop.	1	2
15.2. Engine Performance Gross thrust, net thrust, choked nozzle thrust, thrust distribution, resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption; Engine efficiencies; By-pass ratio and engine pressure ratio; Pressure, temperature and velocity of the gas flow; Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations.	—	2
15.3. Inlet Compressor inlet ducts Effects of various inlet configurations; Ice protection.	2	2
15.4. Compressors Axial and centrifugal types; Constructional features and operating principles and applications; Fan balancing; Operation: Causes and effects of compressor stall and surge; Methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades; Compressor ratio.	1	2
15.5. Combustion Section Constructional features and principles of operation.	1	2
15.6. Turbine Section Operation and characteristics of different turbine blade types; Blade to disk attachment; Nozzle guide vanes; Causes and effects of turbine blade stress and creep.	2	2
15.7. Exhaust Constructional features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers.	1	2
15.8. Bearings and Seals Constructional features and principles of operation.	—	2

MODULE 15. GAS TURBINE ENGINE	LEVEL	
	A	**B1**
15.9. Lubricants and Fuels Properties and specifications; Fuel additives; Safety precautions.	1	2
15.10. Lubrication Systems System operation/lay-out and components.	1	2
15.11. Fuel Systems Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components.	1	2
15.12. Air Systems Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.	1	2
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/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 Operation and applications; Water injection, water methanol; Afterburner systems.	—	1
15.16. Turbo-prop Engines Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Overspeed safety devices.	1	2
15.17. Turbo-shaft Engines Arrangements, drive systems, reduction gearing, couplings, control systems.	1	2
15.18. Auxiliary Power Units (APUs) Purpose, operation, protective systems.	1	2
15.19. Powerplant Installation Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.	1	2

MODULE 15. GAS TURBINE ENGINE	LEVEL	
	A	**B1**
15.20. Fire Protection Systems Operation of detection and extinguishing systems.	1	2
15.21. Engine Monitoring and Ground Operation Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Trend (including oil analysis, vibration and boroscope) monitoring; Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer; Compressor washing/cleaning; Foreign Object Damage.	1	3
15.22. Engine Storage and Preservation Preservation and depreservation for the engine and accessories/systems.	—	2

MODULE 16. PISTON ENGINE

MODULE 16. PISTON ENGINE	LEVEL		
	A	**B1**	**B3**
16.1. Fundamentals Mechanical, thermal and volumetric efficiencies; Operating principles — 2 stroke, 4 stroke, Otto and Diesel; Piston displacement and compression ratio; Engine configuration and firing order.	1	2	2
16.2. Engine Performance Power calculation and measurement; Factors affecting engine power; Mixtures/leaning, pre-ignition.	1	2	2
16.3. Engine Construction Crank case, crank shaft, cam shafts, sumps; Accessory gearbox; Cylinder and piston assemblies; Connecting rods, inlet and exhaust manifolds; Valve mechanisms; Propeller reduction gearboxes.	1	2	2
16.4. Engine Fuel Systems *16.4.1. Carburettors* Types, construction and principles of operation; Icing and heating.	1	2	2
16.4.2. Fuel injection systems Types, construction and principles of operation.	1	2	2
16.4.3. Electronic engine control Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components.	1	2	2
16.5. Starting and Ignition Systems Starting systems, pre-heat systems; Magneto types, construction and principles of operation; Ignition harnesses, spark plugs; Low and high tension systems.	1	2	2
16.6. Induction, Exhaust and Cooling Systems Construction and operation of: induction systems including alternate air systems; Exhaust systems, engine cooling systems — air and liquid.	1	2	2
16.7. Supercharging/Turbocharging Principles and purpose of supercharging and its effects on engine parameters; Construction and operation of supercharging/turbocharging systems; System terminology; Control systems; System protection.	1	2	2

MODULE 16. PISTON ENGINE	LEVEL		
	A	**B1**	**B3**
16.8. Lubricants and Fuels Properties and specifications; Fuel additives; Safety precautions.	1	2	2
16.9. Lubrication Systems System operation/lay-out and components.	1	2	2
16.10. Engine Indication Systems Engine speed; Cylinder head temperature; Coolant temperature; Oil pressure and temperature; Exhaust Gas Temperature; Fuel pressure and flow; Manifold pressure.	1	2	2
16.11. Powerplant Installation Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.	1	2	2
16.12. Engine Monitoring and Ground Operation Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Inspection of engine and components: criteria, tolerances, and data specified by engine manufacturer.	1	3	2
16.13. Engine Storage and Preservation Preservation and depreservation for the engine and accessories/systems.	—	2	1

MODULE 17A. PROPELLER

Note: This module does not apply to category B3. Relevant subject matters for category B3 are defined in module 17B.

MODULE 17A. PROPELLER	LEVEL	
	A	B1
17.1 Fundamentals Blade element theory; High/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.	1	2
17.2 Propeller Construction Construction methods and materials used in wooden, composite and metal propellers; Blade station, blade face, blade shank, blade back and hub assembly; Fixed pitch, controllable pitch, constant speeding propeller; Propeller/spinner installation.	1	2
17.3 Propeller Pitch Control Speed control and pitch change methods, mechanical and electrical/electronic; Feathering and reverse pitch; Overspeed protection.	1	2
17.4 Propeller Synchronising Synchronising and synchrophasing equipment.	—	2
17.5 Propeller Ice Protection Fluid and electrical de-icing equipment.	1	2
17.6 Propeller Maintenance Static and dynamic balancing; Blade tracking; Assessment of blade damage, erosion, corrosion, impact damage, delamination; Propeller treatment/repair schemes; Propeller engine running.	1	3
17.7 Propeller Storage and Preservation Propeller preservation and depreservation.	1	2

MODULE 17B. PROPELLER

Note: The scope of this Module shall reflect the propeller technology of aeroplanes pertinent to the B3 category.

MODULE 17B. PROPELLER	LEVEL
	B3
17.1 Fundamentals Blade element theory; High/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.	2
17.2 Propeller Construction Construction methods and material 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/spinner installation.	2
17.3 Propeller Pitch Control Speed control and pitch change methods, mechanical and electrical/electronic; Feathering and reverse pitch; Overspeed protection.	2
17.4 Propeller Synchronising Synchronising and synchrophasing equipment.	2
17.5 Propeller Ice Protection Fluid and electrical de-icing equipment.	2
17.6 Propeller Maintenance Static and dynamic balancing; Blade tracking; Assessment of blade damage, erosion, corrosion, impact damage, delamination; Propeller treatment/repair schemes; Propeller engine running.	2
17.7 Propeller Storage and Preservation Propeller preservation and depreservation.	2

Appendix II – Basic Examination standard (except for category L licence)

1. General

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

1.2. Each multi-choice question shall have three alternative answers of which only one shall be the correct answer and the candidate shall 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 shall be allowed 20 minutes to answer each such question.

1.4. Suitable essay questions shall be drafted and evaluated using the knowledge syllabus in Appendix I Modules 7A, 7B, 9A, 9B 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 the important points known as Key Points.

1.7. The pass mark for each 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 candidates answer shall 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 only or the essay part only is failed, then it is only necessary to retake the multi-choice or essay part, as appropriate.

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

1.11. A failed module examination may not be retaken by a candidate for at least 90 days after the date of the examination. However, if the candidate undergoes a course of retraining, tailored to the failed subjects of a module, conducted by an MTO, the examination may be retaken after 30 days.

1.12. The time periods required by point 66.A.25 apply to each individual module examination, with the exception of those module examinations which were passed as part of another category licence, where the licence has already been issued.

1.13. The maximum number of consecutive attempts for each module is three. Further sets of three attempts are allowed with a 1 year waiting period between sets.

The applicant shall confirm in writing to the CAAT approved AMEL/Part 66 examination center or the CAAT to which they apply for an examination, the number and dates of attempts during the last year and the CAAT approved AMEL/Part 66 examination center or CAAT where these attempts took place. The CAAT approved AMEL/Part 66 examination center or CAAT is responsible for checking the number of attempts within the applicable timeframes.

2.1. 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 and B2L: 32 multi-choice and 0 essay questions. Time allowed 40 minutes.

Category B3: 28 multi-choice and 0 essay questions. Time allowed 35 minutes.

2.2. 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 and B2L: 52 multi-choice and 0 essay questions. Time allowed 65 minutes.

Category B3: 28 multi-choice and 0 essay questions. Time allowed 35 minutes.

2.3. 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 and B2L: 52 multi-choice and 0 essay questions. Time allowed 65 minutes.

Category B3: 24 multi-choice and 0 essay questions. Time allowed 30 minutes.

2.4. MODULE 4 — ELECTRONIC FUNDAMENTALS

Category B1: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.

Category B2 and B2L: 40 multi-choice and 0 essay questions. Time allowed 50 minutes.

Category B3: 8 multi-choice and 0 essay questions. Time allowed 10 minutes.

2.5. 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 and B2L: 72 multi-choice and 0 essay questions. Time allowed 90 minutes.

Category B3: 16 multi-choice and 0 essay questions. Time allowed 20 minutes.

2.6. 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 and B2L: 60 multi-choice and 0 essay questions. Time allowed 75 minutes.

Category B3: 60 multi-choice and 0 essay questions. Time allowed 75 minutes.

2.7. MODULE 7A — 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 and B2L: 60 multi-choice and 2 essay questions. Time allowed 75 minutes plus 40 minutes.

MODULE 7B — MAINTENANCE PRACTICES

Category B3: 60 multi-choice and 2 essay questions. Time allowed 75 minutes plus 40 minutes.

2.8. 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 and B2L: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.

Category B3: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.

2.9. MODULE 9A – 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 and B2L: 20 multi-choice and 1 essay question. Time allowed 25 minutes plus 20 minutes.

MODULE 9B — HUMAN FACTORS

Category B3: 16 multi-choice and 1 essay questions. Time allowed 20 minutes plus 20 minutes.

2.10. 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 and B2L: 40 multi-choice and 1 essay question. Time allowed 50 minutes plus 20 minutes.

Category B3: 32 multi-choice and 1 essay questions. Time allowed 40 minutes plus 20 minutes.

2.11. MODULE 11A – TURBINE 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.

MODULE 11B – PISTON AEROPLANE AERODYNAMICS. STRUCTURES AND SYSTEMS

Category A: 72 multi-choice and 0 essay questions. Time allowed 90 minutes.

Category B1: 100 multi-choice and 0 essay questions. Time allowed 125 minutes.

MODULE 11C — PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

Category B3: 60 multi-choice and 0 essay questions. Time allowed 75 minutes.

2.12. 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.

2.13. MODULE 13 – AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS

Category B2: 180 multi-choice and 0 essay questions. Time allowed 225 minutes. Questions and time allowed may be split into two examinations as appropriate.

Category B2L:

System rating	Number of multiple-choice questions	Time allowed (minutes)
Basic requirements (Submodules 13.1, 13.2, 13.5 and 13.9)	28	35
COM/NAV (Submodule 13.4(a))	24	30
INSTRUMENTS (Submodule 13.8)	20	25
AUTOFLIGHT (Submodules 13.3(a) and 13.7)	28	35
SURVEILLANCE (Submodule 13.4(b))	8	10
AIRFRAME SYSTEMS (Submodules 13.11 to 13.18)	32	40

2.14. MODULE 14 – PROPULSION

Category B2 and B2L : 24 multi-choice and 0 essay questions. Time allowed 30 minutes

NOTE: The B2L examination for module 14 is only applicable to the 'Instruments' and 'Airframe Systems' ratings.

2.15. 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.

2.16. 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 B3: 68 multi-choice and 0 essay questions. Time allowed 85 minutes.

2.17. MODULE 17A – PROPELLER

Category A: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.

Category B1: 32 multi-choice and 0 essay questions. Time allowed 40 minutes.

MODULE 17B – PROPELLER

Category B3: 28 multi-choice and 0 essay questions. Time allowed 35 minutes.

Appendix III – Aircraft type training and examination standard – On the job training

1. General

Aircraft type training shall consist of theoretical training and examination, and, except for the category C ratings, practical training and assessment.

(a) Theoretical training and examination shall comply with the following requirements:

(i) Shall be conducted by CAAT approved AMEL/Part 66 examination center or, when conducted by other organisations, as directly approved by the CAAT.

(ii) Shall comply, except as permitted by the differences training described in point (c), with:

the relevant elements defined in the mandatory part of the operational suitability data or, if such elements are not available, the standard described in point 3.1, and the type training examination standard described in point 4.1.

(iii) Shall have been started and completed within the 3 years preceding the application for a type rating endorsement.

(b) Practical training and assessment shall comply with the following requirements:

(i) Shall be conducted by CAAT approved AMEL/Part 66 examination center or, when conducted by other organisations, as directly approved by CAAT.

(ii) Shall comply, except as permitted by the differences training described in point (c), with: the relevant elements defined in the mandatory part of the operational suitability data established or, if such elements are not available, the standard described in point 3.2, and the type training assessment standard described in point 4.2.

(iii) Shall include a representative cross section of maintenance activities relevant to the aircraft type.

(iv) Shall include demonstrations using equipment, components, simulators, other training devices or aircraft.

(v) Shall have been started and completed within the 3 years preceding the application for a type rating endorsement.

(c) Differences training

(i) Differences training is the training required in order to cover the differences between two different aircraft type ratings of the same manufacturer as determined.

(ii) Differences training has to be defined on a case-to-case basis taking into account the requirements contained in this Appendix III in respect of both theoretical and practical elements of type rating training.

(iii) A type rating shall only be endorsed on a licence after differences training when the applicant also complies with one of the following conditions:

— having already endorsed on the licence the aircraft type rating from which the differences are being identified, or

— having completed the type training requirements for the aircraft from which the differences are being identified.

2. Aircraft type training levels

The three levels listed below define the objectives, the depth of training and the level of knowledge 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: Upon completion of Level 1 training, the student will be able to:

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

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

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

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

  (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; apply knowledge in a practical manner using detailed procedures;

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

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

  (d) identify the locations of the principal components;

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

  (f) perform the procedures for servicing associated with the aircraft for the following systems: Fuel, Power Plants, Hydraulics, Landing Gear, Water/Waste, and Oxygen;

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

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

– Level 3: Detailed description, operation, component location, removal/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 training, 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 to interpret results from various sources and measurements and apply corrective action where appropriate;

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

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

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

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

3. Aircraft type training standard

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.

3.1 Theoretical element

(a) Objective:

On completion of a theoretical training course the student shall 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 shall be able to demonstrate the use of manuals and approved procedures, including the knowledge of relevant inspections and limitations.

(b) Level of training:

Training levels are those levels defined in point 2 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 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 shall be at the higher level.

(c) Duration:

The theoretical training minimum tuition hours are contained in the following table:

Category	Hours
Aeroplanes with a maximum take-off mass above 30000 kg:	
B1.1	150
B1.2	120
B2	100
C	30
Aeroplanes with a maximum take-off mass equal or less than 30000 kg and above 5700 kg:	
B1.1	120
B1.2	100
B2	100
C	25
Aeroplanes with a maximum take-off mass of 5700 kg and below[1]	
B1.1	80
B1.2	60
B2	60
C	15
Helicopters[2]	
B1.3	120
B1.4	100
B2	100
C	25

For the purpose of the table above, a tuition hour means 60 minutes of teaching and exclude any breaks, examination, revision, preparation and aircraft visit.

These hours apply only to theoretical courses for complete aircraft/engine combinations according to the type rating as defined by the CAAT.

(d) Justification of course duration:

Training courses carried out in a maintenance training organisation approved in accordance with Part-147 and courses directly approved by the CAAT shall justify their hour duration and the coverage of the full syllabus by a training needs analysis based on:

- the design of the aircraft type, its maintenance needs and the types of operation,
- detailed analysis of applicable chapters — see contents table in point 3.1(e) below,
- detailed competency analysis showing that the objectives as stated in point 3.1(a) above are fully met.

Where the training needs analysis shows that more hours are needed, course lengths shall be longer than the minimum specified in the table.

Similarly, tuition hours of differences courses or other training course combinations (such as combined B1/B2 courses), and in cases of theoretical type training courses below the figures given in

[1] For non-pressurised piston engine aeroplanes below 2000 kg MTOM the minimum duration can be reduced by 50 %.

[2] For helicopters in group 2 (as defined in point 66.A.42) the minimum duration can be reduced by 30 %.

point 3.1(c) above, these shall be justified to the CAAT by the training needs analysis as described above.

In addition, the course must describe and justify the following:

– The minimum attendance required to the trainee, in order to meet the objectives of the course.

– The maximum number of hours of training per day, taking into account pedagogical and human factors principles.

If the minimum attendance required is not met, the certificate of recognition shall not be issued. Additional training may be provided by the training organisation in order to meet the minimum attendance time.

(e) Content:

As a minimum, the elements in the Syllabus below that are specific to the aircraft type shall be covered. Additional elements introduced due to type variations, technological changes, etc. shall also be included.

The training syllabus shall be focused on mechanical and electrical aspects for B1 personnel, and electrical and avionic aspects for B2.

Chapters	Aeroplanes turbine		Aeroplanes piston		Helicopter turbine		Helicopter piston		Avionics
Licence category	B1	C	B1	C	B1	C	B1	C	B2
Introduction module:									
05 Time limits/maintenance checks	1	1	1	1	1	1	1	1	1
06 Dimensions/Areas (MTOM, etc.)	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	1	1	1	1	1	1	1	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
20 Standard practices — only type particular	1	1	1	1	1	1	1	1	1
Helicopters									
18 Vibration and Noise Analysis (Blade tracking)	—	—	—	—	3	1	3	1	—
60 Standard Practices Rotor	—	—	—	—	3	1	3	1	—
62 Rotors	—	—	—	—	3	1	3	1	1
62A Rotors — Monitoring and indicating	—	—	—	—	3	1	3	1	3
63 Rotor Drives	—	—			3	1	3	1	1
63A Rotor Drives - Monitoring and indicating	—	—	—	—	3	1	3	1	3
64 Tail Rotor	—	—	—	—	3	1	3	1	1

Chapters	Aeroplanes turbine		Aeroplanes piston		Helicopter turbine		Helicopter piston		Avionics
64A Tail rotor — Monitoring and indicating	—	—	—	—	3	1	3	1	3
65 Tail Rotor Drive	—	—	—	—	3	1	3	1	1
65A Tail Rotor Drive — Monitoring and indicating	—	—	—	—	3	1	3	1	1
66 Folding Blades/Pylon	—	—	—	—	3	1	3	1	3
67 Rotors Flight Control	—	—	—	—	3	1	3	1	—
53 Airframe Structure (Helicopter)	—	—	—	—	3	1	3	1	—
25 Emergency Flotation Equipment	—	—	—	—	3	1	3	1	
Airframe structures									
51 Standard practices and structures (damage classification, assessment and repair)	3	1	3	1	—	—	—	—	1
53 Fuselage	3	1	3	1	—	—	—	—	1
54 Nacelles/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
27A Flight Control Surfaces (All)	3	1	3	1	—	—	—	—	1
52 Doors	3	1	3	1	—	—	—	—	1
Zonal and Station Identification Systems.	1	1	1	1	1	1	1	1	1
Airframe systems:									
21 Air Conditioning	3	1	3	1	3	1	3	1	3
21A Air Supply	3	1	3	1	3	1	3	1	3
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	3	1	3	1	3	1	3	1	3
23 Communications	3	1	3	1	3	1	3	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 Equipment including 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 Sys.Operation:: Electrical/Fly-by-Wire	3	1	—	—	—	—	—	—	3
28 Fuel Systems	3	1	3	1	3	1	3	1	2
28A Fuel Systems — Monitoring and indicating	3	1	3	1	3	1	3	1	3

Chapters	Aeroplanes turbine		Aeroplanes piston		Helicopter turbine		Helicopter piston		Avionics
29 Hydraulic Power	3	1	3	1	3	1	3	1	2
29A 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/Recording Systems	3	1	3	1	3	1	3	1	3
31A Instrument Systems	3	1	3	1	3	1	1	3	3
32 Landing Gear	3	1	3	1	3	1	3	1	2
32A 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
36A 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/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
44 Cabin Systems	2	1	2	1	2	1	2	1	3
45 On-Board Maintenance System (or covered in 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 Engine									
70 Standard Practices — Engines,	3	1	—	—	3	1	—	—	1
70A constructional arrangement and operation (Installation Inlet, Compressors, Combustion Section, Turbine Section, Bearings and Seals, Lubrication Systems).	3	1	—	—	3	1	—	—	1
70B Engine Performance	3	1	—	—	3	1	—	—	1
71 Powerplant	3	1	—	—	3	1	—	—	1
72 Engine Turbine/Turbo Prop/Ducted Fan/Unducted fan	3	1	—	—	3	1	—	—	1
73 Engine Fuel and Control	3	1	—	—	3	1	—	—	1
75 Air	3	1	—	—	3	1	—	—	1
76 Engine controls	3	1	—	—	3	1	—	—	1
78 Exhaust	3	1	—	—	3	1	—	—	1

Chapters	Aeroplanes turbine		Aeroplanes piston		Helicopter turbine		Helicopter piston		Avionics
79 Oil	3	1	—	—	3	1	—	—	1
80 Starting	3	1	—	—	3	1	—	—	1
82 Water Injections	3	1	—	—	3	1	—	—	1
83 Accessory Gear Boxes	3	1	—	—	3	1	—	—	1
84 Propulsion Augmentation	3	1	—	—	3	1	—	—	1
73A FADEC	3	1	—	—	3	1	—	—	3
74 Ignition	3	1	—	—	3	1	—	—	3
77 Engine Indicating Systems	3	1	—	—	3	1	—	—	3
49 Auxiliary Power Units (APUs)	3	1	—	—	—	—	—	—	2
Piston Engine									
70 Standard Practices — Engines	—	—			—	—	3	1	1
70A Constructional arrangement and operation (Installation, Carburettors, Fuel injection systems, Induction, Exhaust and Cooling Systems, Supercharging/Turbochargin, Lubrication Systems).	—	—	3	1	—	—	3	1	1
70B Engine Performance	—	—	3	1	—	—	3	1	1
71 Powerplant	—	—	3	1	—	—	3	1	1
73 Engine Fuel and Control	—	—	3	1	—	—	3	1	1
76 Engine Control	—	—	3	1	—	—	3	1	1
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 Gear Boxes	—	—	3	1	—	—	3	1	1
84 Propulsion Augmentation	—	—	3	1	—	—	3	1	1
73A FADEC	—	—	3	1	—	—	3	1	3
74 Ignition	—	—	3	1	—	—	3	1	3
77 Engine Indication Systems	—	—	3	1	—	—	3	1	3
Propellers									
60A 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 Synchronising	3	1	3	1	—	—	—	—	1
61D Propeller Electronic control	2	1	2	1	—	—	—	—	3
61E Propeller Ice Protection	3	1	3	1	—	—	—	—	—
61F Propeller Maintenance	3	1	3	1	—	—	—	—	1

(f) Multimedia Based Training (MBT) methods may be used to satisfy the theoretical training element either in the classroom or in a virtual controlled environment.

3.2 Practical element

(a) Objective:

The objective of practical training is to gain the required competence in performing safe 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. It includes the awareness of the use of all technical literature and documentation for the aircraft, the use of specialist/special tooling and test equipment for performing removal and replacement of components and modules unique to type, including any on-wing maintenance activity.

(b) Content:

At least 50 % of the crossed items in the table below, which are relevant to the particular aircraft type, shall be completed as part of the practical training.

Tasks crossed represent subjects that are important for practical training purposes to ensure that the operation, function, installation and safety significance of key maintenance tasks is adequately addressed; particularly where these cannot be fully explained by theoretical training alone. Although the list details the minimum practical training subjects, other items may be added where applicable to the particular aircraft type.

Tasks to be completed shall be representative of the aircraft and systems both in complexity and in the technical input required to complete that task. While relatively simple tasks may be included, other more complex tasks shall also be incorporated and undertaken as appropriate to the aircraft type.

Glossary of the table: LOC: Location; FOT: Functional/Operational Test; SGH: Service and Ground Handling; R/I: Removal/Installation; MEL: Minimum Equipment List; TS: Trouble Shooting.

Chapters	B1/B2	B1					B2				
	LOC	**FOT**	**SGH**	**R/I**	**MEL**	**TS**	**FOT**	**SGH**	**R/I**	**MEL**	**TS**
Introduction module:											
5 Time limits/maintenance checks	X/X	—	—	—	—	—	—	—	—	—	—
6 Dimensions/Areas (MTOM, etc.)	X/X	—	—	—	—	—	—	—	—	—	—
7 Lifting and Shoring	X/X	—	—	—	—	—	—	—	—	—	—
8 Levelling and weighing	X/X	—	X	—	—	—	—	X	—	—	—
9 Towing and taxiing	X/X	—	X	—	—	—	—	X	—	—	—
10 Parking/mooring, Storing and Return to Service	X/X	—	X	—	—	—	—	X	—	—	—
11 Placards and Markings	X/X	—	—	—	—	—	—	—	—	—	—
12 Servicing	X/X	—	X	—	—	—	—	X	—	—	—
20 Standard practices — only type particular	X/X	—	X	—	—	—	—	X	—	—	—
Helicopters:											
18 Vibration and Noise Analysis (Blade tracking)	X/—	—	—	—	—	X	—	—	—	—	—
60 Standard Practices Rotor — only type specific	X/X	—	X	—	—	—	—	X	—	—	—
62 Rotors	X/—	—	X	X	—	X	—	—	—	—	—
62A Rotors — Monitoring and indicating	X/X	X	X	X	X	X	—	—	X	—	X
63 Rotor Drives	X/—	X	—	—	—	X	—	—	—	—	—
63A Rotor Drives — Monitoring and indicating	X/X	X	—	X	X	X	—	—	X	—	X
64 Tail Rotor	X/—	—	X	—	—	X	—	—	—	—	—
64A Tail rotor - Monitoring and indicating	X/X	X	—	X	X	X	—	—	X	—	X
65 Tail Rotor Drive	X/—	X	—	—	—	X	—	—	—	—	—
65A Tail Rotor Drive — Monitoring and indicating	X/X	X	—	X	X	X	—	—	X	—	X
66 Folding Blades/Pylon	X/—	X	X	—	—	X	—	—	—	—	—
67 Rotors Flight Control	X/—	X	X	—	X	X	—	—	—	—	—

Chapters	B1/B2	B1					B2				
	LOC	**FOT**	**SGH**	**R/I**	**MEL**	**TS**	**FOT**	**SGH**	**R/I**	**MEL**	**TS**
53 Airframe Structure (Helicopter) Note: covered under Airframe structures											
25 Emergency Flotation Equipment	X/X	X	X	X	X	X	X	X	—	—	—
Airframe structures:											
51 Standard Practices and Structures (damage classification, assessment and repair)											
53 Fuselage	X/—	—	—	—	—	X	—	—	—	—	—
54 Nacelles/Pylons	X/—	—	—	—	—	—	—	—	—	—	—
55 Stabilisers	X/—	—	—	—	—	—	—	—	—	—	—
56 Windows	X/—	—	—	—	—	X	—	—	—	—	—
57 Wings	X/—	—	—	—	—	—	—	—	—	—	—
27A Flight Control Surfaces	X/—	—	—	—	—	X	—	—	—	—	—
52 Doors	X/X	X	X	—	—	—	—	X	—	—	—
Airframe systems:											
21 Air Conditioning	X/X	X	X	—	X	X	X	X	—	X	X
21A Air Supply	X/X	X	—	—	—	—	X	—	—	—	—
21B Pressurisation	X/X	X	—	—	X	X	X	—	—	X	X
21C Safety and warning Devices	X/X	—	X	—	—	—	—	X	—	—	—
22 Autoflight	X/X	—	—	—	X	—	X	X	X	X	X
23 Communications	X/X	—	X	—	X	—	X	X	X	X	X
24 Electrical Power	X/X	X	X	X	X	X	X	X	X	X	X
25 Equipment and Furnishings	X/X	X	X	X	—	—	X	X	X	—	—
25A Electronic Equipment including emergency equipment	X/X	X	X	X	—	—	X	X	X	—	—
26 Fire Protection	X/X	X	X	X	X	X	X	X	X	X	X
27 Flight Controls	X/X	X	X	X	X	X	X	—	—	—	—
27A Sys. Operation: Electrical/Fly-by-Wire	X/X	X	X	X	X	—	X	—	X	—	X
28 Fuel Systems	X/X	X	X	X	X	X	X	X	—	X	—
28A Fuel Systems — Monitoring and indicating	X/X	X	—	—	—	—	X	—	X	—	X

Chapters	B1/B2	B1					B2				
	LOC	FOT	SGH	R/I	MEL	TS	FOT	SGH	R/I	MEL	TS
29 Hydraulic Power	X/X	X	X	X	X	X	X	X	—	X	—
29A Hydraulic Power — Monitoring and indicating	X/X	X	—	X	X	X	X	—	X	X	X
30 Ice and Rain Protection	X/X	X	X	—	X	X	X	X	—	X	X
31 Indicating/Recording Systems	X/X	X	X	X	X	X	X	X	X	X	X
31A Instrument Systems	X/X	X	X	X	X	X	X	X	X	X	X
32 Landing Gear	X/X	X	X	X	X	X	X	X	X	X	—
32A Landing Gear — Monitoring and indicating	X/X	X	—	X	X	X	X	—	X	X	X
33 Lights	X/X	X	X	—	X	—	X	X	X	X	—
34 Navigation	X/X	—	X	—	X	—	X	X	X	X	X
35 Oxygen	X/—	X	X	X	—	—	X	X	—	—	—
36 Pneumatic	X/—	X	—	X	X	X	X	—	X	X	X
36A Pneumatic — Monitoring and indicating	X/X	X	X	X	X	X	X	X	X	X	X
37 Vacuum	X/—	X	—	X	X	X	—	—	—	—	—
38 Water/Waste	X/—	X	X	—	—	—	X	X	—	—	—
41 Water Ballast	X/—	—	—	—	—	—	—	—	—	—	—
42 Integrated modular avionics	X/X	—	—	—	—	—	X	X	X	X	X
44 Cabin Systems	X/X	—	—	—	—	—	X	X	X	X	X
45 On-Board Maintenance System (or covered in 31)	X/X	X	X	X	X	X	X	X	X	X	X
46 Information Systems	X/X	—	—	—	—	—	X	—	X	X	X
50 Cargo and Accessory Compartments	X/X	—	X	—	—	—	—	—	—	—	—
Turbine/Piston Engine Module:											
70 Standard Practices — Engines — only type particular	—	—	X	—	—	—	—	X	—	—	—
70A Constructional arrangement and operation (Installation Inlet, Compressors, Combustion Section,	X/X	—	—	—	—	—	—	—	—	—	—

Chapters	B1/B2	B1					B2				
	LOC	FOT	SGH	R/I	MEL	TS	FOT	SGH	R/I	MEL	TS
Turbine Section, Bearings and Seals, Lubrication Systems)											
Turbine engines:											
70B Engine Performance	—	—	—	—	—	X	—	—	—	—	—
71 Power Plant	X/—	X	X	—	—	—	—	X	—	—	—
72 Engine Turbine/Turbo Prop/Ducted Fan/ Unducted fan	X/—	—	—	—	—	—	—	—	—	—	—
73 Engine Fuel and Control	X/X	X	—	—	—	—	—	—	—	—	—
73A FADEC Systems	X/X	X	—	X	X	X	X	—	X	X	X
74 Ignition	X/X	X	—	—	—	—	X	—	—	—	—
75 Air	X/—	—	—	X	—	X	—	—	—	—	—
76 Engine Controls	X/—	X	—	—	—	X	—	—	—	—	—
77 Engine Indicating	X/X	X	—	—	X	X	X	—	—	X	X
78 Exhaust	X/—	X	—	—	X	—	—	—	—	—	—
79 Oil	X/—	—	X	X	—	—	—	—	—	—	—
80 Starting	X/—	X	—	—	X	X	—	—	—	—	—
82 Water Injection	X/—	X	—	—	—	—	—	—	—	—	—
83 Accessory Gearboxes	X/—	—	X	—	—	—	—	—	—	—	—
84 Propulsion Augmentation	X/—	X	—	—	—	—	—	—	—	—	—
Auxiliary Power Units (APUs):											
49 Auxiliary Power Units (APUs)	X/—	X	X	—	—	X	—	—	—	—	—
Piston Engines:											
70 Standard Practices — Engines — only type particular	—	—	X	—	—	—	—	X	—	—	—
70A Constructional arrangement and operation (Installation Inlet, Compressors, Combustion Section, Turbine Section, Bearings and Seals, Lubrication Systems)	X/X	—	—	—	—	—	—	—	—	—	—
70B Engine Performance	—	—	—	—	—	X	—	—	—	—	—

Chapters	B1/B2	B1					B2				
	LOC	FOT	SGH	R/I	MEL	TS	FOT	SGH	R/I	MEL	TS
71 Power Plant	X/—	X	X	—	—	—	—	X	—	—	—
73 Engine Fuel and Control	X/X	X	—	—	—	—	—	—	—	—	—
73A FADEC Systems	X/X	X	—	X	X	X	X	X	X	X	X
74 Ignition	X/X	X	—	—	—	—	X	—	—	—	—
76 Engine Controls	X/—	X	—	—	—	X	—	—	—	—	—
77 Engine Indicating	X/X	X	—	—	X	X	X	—	—	X	X
78 Exhaust	X/—	X	—	—	X	X	—	—	—	—	—
79 Oil	X/—	—	X	X	—	—	—	—	—	—	—
80 Starting	X/—	X	—	—	X	X	—	—	—	—	—
81 Turbines	X/—	X	X	X	—	X	—	—	—	—	—
82 Water Injection	X/—	X	—	—	—	—	—	—	—	—	—
83 Accessory Gearboxes	X/—	—	X	X	—	—	—	—	—	—	—
84 Propulsion Augmentation	X/—	X	—	—	—	—	—	—	—	—	—
Propellers:											
60A Standard Practices — Propeller	—	—	—	X	—	—	—	—	—	—	—
61 Propellers/ Propulsion	X/X	X	X	—	X	X	—	—	—	—	—
61A Propeller Construction	X/X	—	X	—	—	—	—	—	—	—	—
61B Propeller Pitch Control	X/—	X	—	X	X	X	—	—	—	—	—
61C Propeller Synchronising	X/—	X	—	—	—	X	—	—	—	X	—
61D Propeller Electronic control	X/X	X	X	X	X	X	X	X	X	X	X
61E Propeller Ice Protection	X/—	X	—	X	X	X	—	—	—	—	—
61F Propeller Maintenance	X/X	X	X	X	X	X	X	X	X	X	X

4. Type training examination and assessment standard

4.1 Theoretical element examination standard

After the theoretical portion of the aircraft type training has been completed, a written examination shall be performed, which shall comply with the following:

(a) Format of the examination is of the multi-choice type. Each multi-choice question shall have 3 alternative answers of which only one shall be the correct answer. The total time is based on the total number of questions and the time for answering is based upon a nominal average of 90 seconds per question.

(b) The incorrect alternatives shall seem equally plausible to anyone ignorant of the subject. All the alternatives shall be clearly related to the question and of similar vocabulary, grammatical construction and length.

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

(d) The level of examination for each chapter[1] shall be the one defined in point 2 'Aircraft type training levels'. However, the use of a limited number of questions at a lower level is acceptable.

(e) The examination shall 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 shall be at least 1 question per hour of instruction. The number of questions for each chapter and level shall be proportionate to:

- the effective training hours spent teaching at that chapter and level,
- the learning objectives as given by the training needs analysis.

CAAT will assess the number and the level of the questions when approving the course.

(g) The minimum examination pass mark is 75 %. When the type training examination is split in several examinations, each examination shall be passed with at least a 75 % mark. In order to be possible to achieve exactly a 75 % pass mark, the number of questions in the examination shall be a multiple of 4.

(h) Penalty marking (negative points for failed questions) is not to be used.

(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 more than 25% of questions at any lower level such that the intention of the higher examination level is reduced.

4.2 Practical element assessment standard

After the practical element of the aircraft type training has been completed, an assessment must be performed, which must comply with the following:

(a) The assessment shall be performed by designated assessors appropriately qualified.

(b) The assessment shall evaluate the knowledge and skills of the trainee.

5. Type examination standard

Type examination shall be conducted by training organisations appropriately approved under Part- 147.

The examination shall be oral, written or practical assessment based, or a combination thereof and it shall comply with the following requirements:

(a) Oral examination questions shall be open.

(b) Written examination questions shall be essay type or multi-choice questions.

(c) Practical assessment shall determine a person's competence to perform a task.

[1] For the purpose of this point 4, a 'chapter' means each one of the rows preceded by a number in the table contained in point 3.1(e).

(d) Examinations shall be on a sample of chapters[3] drawn from point 3 type training/examination syllabus, at the indicated level.

(e) The incorrect alternatives shall seem equally plausible to anyone ignorant of the subject. All of the alternatives shall be clearly related to the question and of similar vocabulary, grammatical construction and length.

(f) In numerical questions, the incorrect answers shall correspond to procedural errors such as corrections applied in the wrong sense or incorrect unit conversions: they shall not be mere random numbers.

(g) The examination shall ensure that the following objectives are met:

1. Properly discuss with confidence the aircraft and its systems.
2. 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.
3. Correctly use all technical literature and documentation for the aircraft.
4. Correctly use specialist/special tooling and test equipment, perform removal and replacement of components and modules unique to type, including any on-wing maintenance activity

(h) The following conditions apply to the examination:

1. The type examination shall be passed and the required practical experience shall be completed within the 3 years preceding the application for the rating endorsement on the aircraft maintenance licence.
2. Type examination shall be performed with at least one examiner present. The examiner(s) shall not have been involved in the applicant's training.

(i) A written and signed report shall be made by the examiner(s) to explain why the candidate has passed or failed.

[3] For the purpose of this point 5, a 'chapter' means each one of the rows preceded by a number in the tables contained in points 3.1(e) and 3.2(b).

6. On the Job Training

It shall be conducted at and under the control of a maintenance organisation appropriately approved for the maintenance of the particular aircraft type and shall be assessed by designated assessors appropriately qualified.

It shall have been started and completed within the 3 years preceding the application for a type rating endorsement.

(a) Objective:

The objective of OJT is to gain the required competence and experience in performing safe maintenance.

(b) Content:

OJT shall cover a cross section of tasks acceptable to the CAAT. The OJT tasks to be completed shall be representative of the aircraft and systems both in complexity and in the technical input required to complete that task. While relatively simple tasks may be included, other more complex maintenance tasks shall also be incorporated and undertaken as appropriate to the aircraft type.

Each task shall be signed off by the student and countersigned by a designated supervisor. The tasks listed shall refer to an actual job card/work sheet, etc.

The final assessment of the completed OJT is mandatory and shall be performed by a designated assessor appropriately qualified.

The following data shall be addressed on the OJT worksheets/logbook:

1. Name of Trainee;
2. Date of Birth;
3. Approved Maintenance Organisation;
4. Location;
5. Name of supervisor(s) and assessor, (including licence number if applicable);
6. Date of task completion;
7. Description of task and job card/work order/tech log, etc.;
8. Aircraft type and aircraft registration;
9. Aircraft rating applied for.

In order to facilitate the verification by the CAAT, demonstration of the OJT shall consist of (i) detailed worksheets/logbook and (ii) a compliance report demonstrating how the OJT meets the requirement of this Part.

Appendix IV – Experience and basic knowledge modules or partial modules required for extending an aircraft maintenance licence under Part-66

A. Experience requirements

Table A below shows the experience requirements, in months, for adding a new category or subcategory to a licence granted in accordance with Part-66.

The experience requirements can be reduced by 50 % if the applicant has completed an approved Part-147 basic training course relevant to a particular subcategory.

Table A

To: / From:	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2	B2L	B3	L1	L2	L3	L4	L5
A1	—	6	6	6	24	6	24	12	24	12	6	12	12	12	12	24
A2	6	—	6	6	24	6	24	12	24	12	6	12	12	12	12	24
A3	6	6	—	6	24	12	24	6	24	12	12	12	12	12	12	24
A4	6	6	6	—	24	12	24	6	24	12	12	12	12	12	12	24
B1.1	—	6	6	6	—	6	6	6	12	12	6	6	6	12	12	12
B1.2	6	—	6	6	24	—	24	6	24	12	—	—	—	12	12	12
B1.3	6	6	—	6	6	6	—	6	12	12	6	6	6	12	12	12
B1.4	6	6	6	—	24	6	24	—	24	12	6	6	6	12	12	12
B2	6	6	6	6	12	12	12	12	—	—	12	6	6	12	12	24
B2L	6	6	6	6	12	12	12	12	12	—	12	6	6	12	12	24
B3	6	—	6	6	24	6	24	12	24	12	—	—	—	12	12	12
L1	24	24	24	24	36	24	36	24	36	24	24	—	6	12	12	24
L2	24	12	24	24	36	12	36	24	36	24	12	—	—	12	12	24
L3	30	30	30	30	48	30	48	30	48	30	30	12	12	—	6	24
L4	30	30	30	30	48	30	48	30	48	30	30	12	12	—	—	24

To: From:	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2	B2L	B3	L1	L2	L3	L4	L5
L5	24	24	24	24	36	24	36	24	36	24	24	12	12	12	—	—

B. Basic knowledge modules or partial modules required

The purpose of this table is to outline the examinations required to add a new basic category/subcategory to an AML granted in accordance with this Part-66.

The syllabi prepared in accordance with Appendix I and APPENDIX V require different levels of knowledge for different licence categories within a module; therefore, there are additional examinations applicable to certain modules for licence holders wishing to extend an AML granted in accordance with this Part-66 to include another category/subcategory and an analysis of the module shall be conducted to determine the subjects missing or passed at a lower level.

Table B

To: From:	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2	B2L	B3	L1C	L1	L2C	L2	L3H	L3G	L4H	L4G	L5
A1	None	16.	12.	12, 16.	All except 9.	All except 9.	All except 9.	All except 9.	All except 9.	All except 9.	All except 2, 8, 9.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 9.
A2	11, 15.	None	12, 15.	12.	All except 9.	All except 9.	All except 9.	All except 9.	All except 9.	All except 9.	All except 2, 8, 9.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 9.
A3	11, 17.	11, 16, 17.	None	16.	All except 9.	All except 9.	All except 9.	All except 9.	All except 9.	All except 9.	All except 2, 8, 9.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 9.
A4	11, 15, 17.	11, 17.	15.	None	All except 9.	All except 9.	All except 9.	All except 9.	All except 9.	All except 9.	All except 2, 8, 9.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 2L.	All except 9.

To: From:	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2	B2L	B3	L1C	L1	L2C	L2	L3H	L3G	L4H	L4G	L5
B1.1	None	16.	12.	12, 16.	None	16.	12.	12, 16.	4, 5, 13,14	4, 5, 13SQ, 14SQ	16.	12L.	12L.	8L**, 12L.	8L**, 12L.	9L.	10L.	9L,11L.	10L, 11L.	8L**, 10L,11
B1.2	11,15.	None	12, 15.	12.	11, 15.	None	12, 15.	12.	4, 5,13,14	4, 5, 13SQ. 14SQ	None	12L.	12L.	8L*, 12L.	8L*, 12L.	9L.	10L.	9L,11L.	10L, 11L.	8L*, 10L,11
B1.3	11, 17.	11, 16, 17.	None	16.	11, 17.	11, 16, 17.	None	16.	4, 5,13,14	4, 5, 13SQ. 14SQ	11, 16, 17.	7L,12L.	7L,12L.	7L,8L**,12L.	7L,8L**,12L.	9L.	10L.	9L,11L.	10L, 11L.	8L**, 10L,11
B1.4	11, 15, 17.	11, 17.	15.	None	11, 15, 17.	11, 17.	15.	None	4, 5,13,14	4, 5, 13SQ. 14SQ	11, 17.	7L,12L.	7L,12L.	7L,8L*,12L.	7L,8L*,12L.	9L.	10L.	9L,11L.	10L, 11L.	8L*, 10L,11
B2	6, 7, 11, 15, 17.	6, 7, 11, 16, 17.	6, 7, 12, 15.	6, 7, 12, 16.	6, 7, 11, 15, 17.	6, 7, 11, 16, 17.	6, 7, 12, 15.	6, 7, 12, 16.	None	None	6, 7, 11, 16, 17.	5L, 7L.	4L, 5L, 6L,7L.	5L,7L, 8L.	4L,5L, 6L,7L, 8L.	9L.	10L.	9L, 11L.	10L, 11L.	6, 7, 11 or 12, 15 or 16, 17, 8L, 10L
B2L	6, 7, 11, 15, 17.	6, 7, 11, 16, 17.	6, 7, 12, 15.	6, 7, 12, 16.	6, 7, 11, 15, 17.	6, 7, 11, 16, 17.	6, 7, 12, 15.	6, 7, 12, 16.	13SQ, 14SQ.	None	6, 7, 11, 16, 17.	5L, 7L, 12LSQ.	4L, 5L, 6L, 7L, 12LSQ.	5L, 7L, 8L, 12LSQ.	4L, 5L, 6L, 7L, 8L, 12LSQ.	9L.	10L.	9L, 11L.	10L, 11L.	6, 7, 11 or 12, 15 or 16, 17, 8L, 10L

To: From:	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2	B2L	B3	L1C	L1	L2C	L2	L3H	L3G	L4H	L4G	L5
B3	11,15.	11	12,15.	12.	2,3,5,8, 11,15.	2,3,5,8, 11.	2,3,5, 8, 12,15.	2,3,5,8, 12.	2,3,4, 5, 8, 13, 14.	2,3,4, 5, 8, 13SQ.	None	12L.	12L.	8L*, 12L.	8L*, 12L.	9L.	10L.	9L, 11L.	10L, 11L.	2,3,5,8, 11 or 12, 8L*, 10L

APPENDIX V — Basic knowledge requirements for category L aircraft maintenance licence

The definitions of the different levels of knowledge required in this Appendix are the same as those contained in point 1 of Appendix I to **Part-66**.

Subcategories	Modules required for each subcategory (refer to the syllabus table below)
L1C: composite sailplanes	1L, 2L, 3L, 5L, 7L and 12L
L1: sailplanes	1L, 2L, 3L, 4L, 5L, 6L, 7L and 12L
L2C: composite powered sailplanes and composite ELA1 aeroplanes	1L, 2L, 3L, 5L, 7L, 8L and 12L
L2: powered sailplanes and ELA1 aeroplanes	1L, 2L, 3L, 4L, 5L, 6L, 7L, 8L and 12L
L3H: hot-air balloons	1L, 2L, 3L, 9L and 12L
L3G: gas balloons	1L, 2L, 3L, 10L and 12L
L4H: hot-air airships	1L, 2L, 3L, 8L, 9L, 11L and 12L
L4G: ELA2 gas airships	1L, 2L, 3L, 8L, 10L, 11L and 12L
L5: gas airships above ELA2	Basic knowledge requirements for any B1 subcategory plus 8L (for B1.1 and B1.3), 10L, 11L and 12L

TABLE OF CONTENTS:

12L ‘Radio Com/ELT/Transponder/Instruments’

MODULE 1L — BASIC KNOWLEDGE

MODULE 1L — BASIC KNOWLEDGE	Level
1L.1 Mathematics Arithmetic — Arithmetical terms and signs; — Methods of multiplication and division; — Fractions and decimals; — Factors and multiples; — Weights, measures and conversion factors; — Ratio and proportion; — Averages and percentages; — Areas and volumes, squares, cubes. Algebra — Evaluating simple algebraic expressions: addition, subtraction, multiplication and division; — Use of brackets; — Simple algebraic fractions. Geometry — Simple geometrical constructions; — Graphical representation: nature and uses of graphs.	1
1L.2 Physics Matter — Nature of matter: the chemical elements; — Chemical compounds; — States: solid, liquid and gaseous; — Changes between states. Mechanics — Forces, moments and couples, representation as vectors; — Centre of gravity; — Tension, compression, shear and torsion; — Nature and properties of solids, fluids and gases. Temperature — Thermometers and temperature scales: Celsius, Fahrenheit and Kelvin; — Heat definition.	1
1L.3 Electrics DC Circuits — Ohm's law, Kirchoff's voltage and current laws; — Significance of the internal resistance of a supply; — Resistance/resistor; — Resistor colour code, values and tolerances, preferred values, wattage ratings; — Resistors in series and parallel.	1
1L.4 Aerodynamics/aerostatics International Standard Atmosphere (ISA), application to aerodynamics and aerostatics. Aerodynamics — Airflow around a body; — Boundary layer, laminar and turbulent flow;	1

— Thrust, weight, aerodynamic resultant; — Generation of lift and drag: angle of attack, polar curve, stall. Aerostatics Effect on envelopes, wind effect, altitude and temperature effects.	
1L.5 Workplace safety and environmental protection — Safe working practices and precautions when working with electricity, gases (especially oxygen), oils and chemicals; — Labelling, storage and disposal of hazardous (to safety and environment) materials; — Remedial action in the event of a fire or another accident with one or more hazards, including knowledge of extinguishing agents.	2

MODULE 2L — HUMAN FACTORS

MODULE 2L — HUMAN FACTORS	Level
2L.1 General — The need to take human factors into account; — Incidents attributable to human factors/human error; — Murphy's Law.	1
2L.2 Human performance and limitations Vision, hearing, information processing, attention and perception, memory.	1
2L.3 Social psychology Responsibility, motivation, peer pressure, teamwork.	1
2L.4 Factors affecting performance Fitness/health, stress, sleep, fatigue, alcohol, medication, drug abuse.	1
2L.5 Physical environment Working environment (climate, noise, illumination).	1

MODULE 3L — AVIATION LEGISLATION

MODULE 3L — AVIATION LEGISLATION	Level
3L.1 Regulatory framework — Air Law; — Applicable parts of Part-M and Part-66.	1
3L.2 Repairs and modifications — Approval of changes (repairs and modifications); — Standard changes and standard repairs.	2
3L.3 Maintenance data — Airworthiness Directives (ADs), Instructions for Continuing Airworthiness (ICA) (AMM, IPC, etc.);	2

— Flight Manual; — Maintenance records	

MODULE 4L — AIRFRAME WOODEN/METAL TUBE AND FABRIC

MODULE 4L — AIRFRAME WOODEN/METAL TUBE AND FABRIC	Level
4L.1 Airframe wooden/combination of metal tube and fabric — Timber, plywood, adhesives, preservation, power line, properties, machining; — Covering (covering materials, adhesives and finishes, natural and synthetic covering materials and adhesives); — Paint, assembly and repair processes; — Recognition of damages from overstressing of wooden/metal-tube and fabric structures; — Deterioration of wood components and coverings; — Crack test (optical procedure, e.g., magnifying glass) of metal components. Corrosion and preventive methods. Health and fire safety protections.	2
4L.2 Material — Types of wood, stability, and machining properties; — Steel and light alloy tubes and fittings, fracture inspections of welded seams; — Plastics (overview, understanding of the properties); — Paints and paint removal; — Glues, adhesives; — Covering materials and technologies (natural and synthetic polymers).	2
4L.3 Identifying damage — Overstress of wood / metal-tubing and fabric structures; — Load transfers; — Fatigue strength and crack testing.	3
4L.4 Performance of practical activities — Locking of pins, screws, castellated nuts, turnbuckles; — Thimble splice; — Nicopress and Talurit repairs; — Repair of coverings; — Repair of transparencies; — Repair exercises (plywood, stringer, handrails, skins); — Aircraft Rigging. Calculation of control surface mass balance and range of movement of the control surfaces, measurement of operating forces;	2

— Performance of 100-hours/annual inspections on a wood or combination of metal-tube and fabric airframe.	

MODULE 5L — AIRFRAME COMPOSITE

MODULE 5L — AIRFRAME COMPOSITE	Level
5L.1 Airframe fibre-reinforced plastic (FRP) — Basic principles of FRP construction; — Resins (Epoxy, polyester, phenolic resins, vinyl ester resins); — Reinforcement materials glass, aramide and carbon fibres, features; — Fillers; — Supporting cores (balsa, honeycombs, foamed plastics); — Constructions, load transfers (solid FRP shell, sandwiches); — Identification of damage during overstressing of components; — Procedure for FRP projects (according to Maintenance Organisation Manual) including storage conditions for material.	2
5L.2 Material — Thermosetting plastics, thermoplastic polymers, catalysts; — Understanding properties, machining technologies, detaching, bonding, welding; — Resins for FRP: epoxy resins, polyester resins, vinyl ester resins, phenolic resins; — Reinforcement materials; — From elementary fibre to filaments (release agent, finish), weaving patterns; — Properties of individual reinforcement materials (E-glass fibre, aramide fibre, carbon fibre); — Problem with multiple-material systems, matrix; — Adhesion/cohesion, various behaviours of fibre materials; — Filling materials and pigments; — Technical requirements for filling materials; — Property change of the resin composition through the use of E-glass, micro balloon, aerosols, cotton, minerals, metal powder, organic substances; — Paint assembly and repair technologies; — Support materials; — Honeycombs (paper, FRP, metal), balsa wood, Divinycell (Contizell), development trends.	2

MODULE 5L — AIRFRAME COMPOSITE	Level
5L.3 Assembly of Fibre-Reinforced Composite-Structure Airframes — Solid shell; — Sandwiches; — Assembly of aerofoils, fuselages, control surfaces.	2
5L.4 Identifying Damage — Behaviour of FRP components in the event of overstressing; — Identifying delaminations, loose bonds; — Bending vibration frequency in aerofoils; — Load transfer; — Frictional connection and positive locking; — Fatigue strength and corrosion of metal parts; — Metal bonding, surface finishing of steel and aluminium components during bonding with FRP.	3
5L.5 Mold making — Plaster molds, mold ceramics; — GFK molds, Gel-coat, reinforcement materials, rigidity problems; — Metal molds; — Male and female molds	2
5L.6 Performance of practical activities — Locking of pin, screws, castellated nuts, turnbuckles; — Thimble splice; — Nicopress and Talurit repairs; — Repair of coverings; — Repair of solid FRP shells; — Mold fabrication/molding of a component (e.g. fuselage nose, landing gear fairing, wing tip and winglet); — Repair of sandwich shell where interior and exterior layer are damaged; — Repair of sandwich shell by pressing with a vacuum bag; — Transparency repair (PMMA) with one- and two-component adhesive;	2

MODULE 5L — AIRFRAME COMPOSITE	Level
— Bonding of transparency with the canopy frame; — Tempering of transparencies and other components; — Performance of a repair on a sandwich shell (minor repair less than 20 cm); — Aircraft Rigging. Calculation of control surface mass balance and range of movement of the control surfaces, measurement of operating forces; — Performance of 100-hour/annual inspections on an FRP airframe.	

MODULE 6L — AIRFRAME METAL

MODULE 6L — AIRFRAME METAL	Level
6L.1 Airframe metal — Metallic materials and semi-finished products, machining methods; — Fatigue strength and crack test; — Assembly of metal-construction components, riveted joints, adhesive joints; — Identification of damage to overstressed components, effects of corrosion; — Health and fire protection.	2
6L.2 Material — Steel and its alloys; — Light metals and their light alloys; — Rivet materials; — Plastics; — Colours and paints; — Metal adhesives; — Types of corrosion; — Covering materials and technologies (natural and synthetic).	2
6L.3 Identifying damage — Overstressed metal airframes, levelling, measurement of symmetry; — Load transfers; — Fatigue strength and crack test; — Identifying loose riveted joints.	3

6L.4 Assembly of metal- and composite-construction airframes — Skins; — Frames; — Stringers and longerons; — Frame construction; — Problems in multiple-material systems	2
6L.5 Fasteners — Classifications of fits and clearances; — Metric and imperial measuring systems; — Oversize bolt.	2
6L.6 Performance of practical activities — Locking of pins, screws, castellated nuts, turnbuckles; — Thimble splice; — Nicopress and Talurit repairs; — Repair of coverings, surface damage, stop drilling techniques; — Repair of transparencies; — Cutting out sheet metals (aluminiums and light alloys, steel and alloys); — Folding bending, edging, beating, smoothening, beading; — Repair riveting of metal airframes according to repair instruction or drawings; — Evaluation of rivet errors; — Aircraft Rigging. Calculation of control surface mass balance and range of movement of the control surfaces, measurement of operating forces; — Performance of 100-hour/annual inspections on a metal airframe.	2

MODULE 7L — AIRFRAME GENERAL

MODULE 7L — AIRFRAME GENERAL	Level
7L.1 Flight control system — Cockpit controls: controls in cockpit, colour markings, knob shapes; — Flight controls surfaces, flaps, air brakes surfaces, controls, hinges, bearings, brackets, pushpull rods, bell cranks, horns, pulleys, cables, chains, tubes, rollers, tracks, jack screws, surfaces,movements, lubrication, stabilisers, balancing of controls;	3

MODULE 7L — AIRFRAME GENERAL	Level
— Combination of controls: flap ailerons, flap air brakes; — Trim systems.	
7L.2 Airframe — Landing gear: characteristics of landing gears and shock absorber strut, extension, brakes,drum, disks, wheel, tyre, retraction mechanism, electrical retraction, emergency; — Wing to fuselage mounting points, empennage (fin and tail plane) to fuselage mounting points, control surface mounting points; — Permissible maintenance measures; — Towing: towing/lifting equipment/mechanism; — Cabin: seats and safety harness, cabin arrangement, windshields, windows, placards, baggage compartment, cockpit controls, cabin air system, blower; — Water ballast: water reservoirs, lines, valves, drains, vents, tests; — Fuel system: tanks, lines, filters, vents, drains, filling, selector valve, pumps, indication, tests,bonding; — Hydraulics: system layout, accumulators, pressure and power distribution, indication; — Liquid and gas: hydraulic, other fluids, levels, reservoir, lines, valves, filter; — Protections: firewalls, fire protection, lightning strike bonding, turnbuckles, locking devices,dischargers.	2
7L.3 Fasteners — Reliability of pins, rivets, screws; — Control cables, turnbuckles; — Quick-release couplings (L'Hotellier, SZD, Poland).	2
7L.4 Locking equipment — Admissibility of locking methods, locking pins, spring steel pins, locking wire, stop nuts, paint; — Quick-release couplings.	2
7L.5 Weight and balance levelling	2
7L.6 Rescue systems	2
7L.7 On-board modules — Pitot-static system, vacuum/dynamic system, hydrostatic test;	2

MODULE 7L — AIRFRAME GENERAL	Level
— Flight instruments: airspeed indicator, altimeter, vertical-speed indicator, connection and functioning, markings; — Arrangement and display, panel, electrical wires; — Gyroscopes, filters, indicating instruments; testing of function; — Magnetic compass: installation and compass swing; — Sailplanes: acoustic vertical-speed indicator, flight recorders, anticollision aid; — Oxygen system.	
7L.8 On-board modules installation and connections — Flight instruments, mounting requirements (emergency landing conditions as per CS-22); — Electric wiring, power sources, types of storage batteries, electrical parameters, electric generator, circuit breaker, energy balance, earth/ground, connectors, terminals, warnings, fuses, lamps, lightings, switches, voltmeters, ampere meters, electrical gauges.	2
7L.9 Piston engine propulsion Interface between power plant and airframe.	2
7L.10 Propeller — Inspection; — Replacement; — Balancing.	2
7L.11 Retraction system — Propeller position control; — Engine and/or propeller retraction system.	2
7L.12 Physical inspection procedures — Cleaning, use of lighting and mirrors; — Measuring tools; — Measure of controls deflection; — Torque of screws and bolts; — Wear of bearings; — Inspection equipment; — Calibration of measuring tools.	2

MODULE 8L — POWER PLANT

MODULE 7L — AIRFRAME GENERAL	Level
8L.1 Noise limits — Explanation of the concept of ‘noise level’; — Noise certificate; — Enhanced sound proofing; — Possible reduction of sound emissions.	1
8L.2 Piston engines — Four-stroke spark ignition engine, air-cooled engine, fluid-cooled engine; — Two-stroke engine; — Rotary-piston engine; — Efficiency and influencing factors (pressure–volume diagram, power curve); — Noise control devices.	2
8L.3 Propeller — Blade, spinner, backplate, accumulator pressure, hub; — Operation of propellers; — Variable-pitch propellers, ground and in-flight adjustable propellers, mechanically, electrically and hydraulically; — Balancing (static, dynamic); — Noise problems.	2
8L.4 Engine control devices — Mechanical control devices; — Electrical control devices; — Tank displays; — Functions, characteristics, typical errors and error indications.	2
8L.5 Hosepipes — Material and machining of fuel and oil hoses; — Control of life limit.	2
8L.6 Accessories — Operation of magneto ignition;	2

MODULE 7L — AIRFRAME GENERAL	Level
— Control of maintenance limits; — Operation of carburettors; — Maintenance instructions on characteristic features; — Electric fuel pumps; — Operation of propeller controls; — Electrically operated propeller control; — Hydraulically operated propeller control.	
8L.7 Ignition system — Constructions: coil ignition, magneto ignition, and thyristor ignition; — Efficiency of the ignition and preheat system; — Modules of the ignition and preheat system; — Inspection and testing of a spark plug.	2
8L.8 Induction and exhaust systems — Operation and assembly; — Silencers and heater installations; — Nacelles and cowlings; — Inspection and test; — CO emission test.	2
8L.9 Fuels and lubricants — Fuel characteristics; — Labelling, environmentally friendly storage; — Mineral and synthetic lubricating oils and their parameters: labelling and characteristics, application; — Environmentally friendly storage and proper disposal of used oil.	2
8L.10 Documentation — Manufacturer documents for the engine and propeller; — Instructions for Continuing Airworthiness (ICA); — Aircraft Flight Manuals (AFMs) and Aircraft Maintenance Manuals (AMMs); — Time Between Overhaul (TBO);	2

MODULE 7L — AIRFRAME GENERAL	Level
— Airworthiness Directives (ADs), technical notes and service bulletins.	
8L.11 Illustrative material — Cylinder unit with valve; — Carburettor; — High-tension magneto; — Differential-compression tester for cylinders; — Overheated/damaged pistons; — Spark plugs of engines that were operated differently.	2
8L.12 Practical experience — Work safety/accident prevention (handling of fuels and lubricants, start-up of engines); — Rigging-engine control rods and Bowden cables; — Setting of no-load speed; — Checking and setting the ignition point; — Operational test of magnetos; — Checking the ignition system; — Testing and cleaning of spark plugs; — Performance of the engine tasks contained in an aeroplane 100-hour/annual inspection; — Cylinder compression test; — Static test and evaluation of the engine run; — Documentation of maintenance work including replacement of components.	2
8L.13 Gas exchange in internal-combustion engines — Four-stroke reciprocating engine and control units; — Energy losses; — Ignition timing; — Direct flow behaviour of control units; — Wankel engine and control units; — Two-stroke engine and control units; — Scavenging;	2

MODULE 7L — AIRFRAME GENERAL	Level
— Scavenging blower; — Idle range and power range.	
8L.14 Ignition, combustion and carburation — Ignition; — Spark plugs; — Ignition system; — Combustion process; — Normal combustion; — Efficiency and medium pressure; — Engine knock and octane rating; — Combustion chamber shapes; — Fuel/air mix in the carburettor; — Carburettor principle, carburettor equation; — Simple carburettor; — Problems of the simple carburettor and their solutions; — Carburettor models; — Fuel/air mix during injection; — Mechanically controlled injection; — Electronically controlled injection; — Continuous injection; — Carburettor-injection comparison.	2
8L.15 Flight instruments in aircraft with injection engines — Special flight instruments (injection engine); — Interpretation of indications in a static test; — Interpretation of indications in flight at various flight levels.	2
8L.16 Maintenance of aircraft with injection engines — Documentation, manufacturer documents, etc.; — General maintenance instructions (hourly inspections); — Functional tests;	2

MODULE 7L — AIRFRAME GENERAL	Level
— Ground test run; — Test flight; — Troubleshooting in the event of faults in the injection system and their correction.	
8L.17 Workplace safety and safety provisions Work safety and safety provisions for work on injection systems.	2
8L.18 Visual aids: — Carburettor; — Components of injection system; — Aircraft with injection engine; — Tool for work on injection systems.	2
8L.19 Electrical propulsion — Energy system, accumulators, installation; — Electrical motor; — Heat, noise and vibration checks; — Testing windings; — Electrical wiring and control systems; — Pylon, extension and retraction systems; — Motor/propeller brake systems; — Motor ventilation systems; — Practical experience of 100-hour/annual inspections.	2
8L.20 Jet propulsion — Engine installation; — Pylon, extension and retraction systems; — Fire protection; — Fuel systems including lubrication; — Engine starting systems, gas assist; — Engine damage assessment; — Engine servicing; — Engine removal / refit and test;	2

MODULE 7L — AIRFRAME GENERAL	Level
— Practical experience of conditional / run time / annual inspections; — Conditional inspections.	
8L.21 Full authority digital engine control (FADEC)	2

MODULE 9L — BALLOON/AIRSHIP HOT AIR

MODULE 9L — BALLOON/AIRSHIP HOT AIR	Level
9L.1 Basic principles and assembly of hot-air balloons/airships — Assembly and individual parts; — Envelopes; — Envelope Materials; — Envelope Systems; — Conventional and special shapes; — Fuel System; — Burner, burner frame and burner support rods; — Compressed-gas cylinders and compressed-gas hoses; — Basket and alternative devices (seats); — Rigging accessories; — Maintenance and servicing tasks; — Annual/100-hour inspection; — Log Books; — Aircraft Flight Manuals (AFMs) and Aircraft Maintenance Manuals (AMMs); — Rigging and launch preparation (launch restraint); — Launch.	3
9L.2 Practical training Operating controls, maintenance and servicing jobs (according to flight manual).	3
9L.3 Envelope — Fabrics; — Seams; — Load tapes, rip stoppers; — Crown rings;	3

MODULE 9L — BALLOON/AIRSHIP HOT AIR	Level
— Parachute valve and fast-deflation systems; — Ripping panel; — Turning vent; — Diaphragms/catenaries (special shapes and airships); — Rollers, pulleys; — Control and shroud lines; — Knots; — Temperature indication label, temperature flag, envelope thermometer; — Flying wires; — Fittings, karabiners	
9L.4 Burner and fuel system — Burner coils; — Blast, liquid and pilot valves; — Burners/jets; — Pilot lights/vaporisers/jets; — Burner frame; — Fuel lines/hoses; — Fuel cylinders, valves and fittings.	3
9L.5 Basket and basket suspension (incl. alternative devices) — Types of baskets (incl. alternative devices); — Basket materials: cane and willow, hide, wood, trim materials, suspension cables; — Seats, roller bearings; — Karabiner, shackle and pins; — Burner support rods; — Fuel cylinder straps; — Accessories	3
9L.6 Equipment — Fire extinguisher, fire blanket; — Instruments (single or combined).	3

MODULE 9L — BALLOON/AIRSHIP HOT AIR	Level
9L.7 Minor repairs — Stitching; — Bonding; — Basket hide/trim repairs	3
9L.8 Procedures for physical inspection — Cleaning, use of lighting and mirrors; — Measuring tools; — Measure of controls deflection (only airships); — Torque of screws and bolts; — Wear of bearings (only airships); — Inspection equipment; — Calibration of measuring tools; — Fabric Grab Test.	2

MODULES 10L — BALLOON/AIRSHIP GAS (FREE/TETHERED)

MODULES 10L — BALLOON/AIRSHIP GAS (FREE/TETHERED)	Level
10L.1 Basic principles and assembly of gas balloons/airships — Assembly of individual parts; — Envelope and netting material; — Envelope, ripping panel, emergency opening, cords and belts; — Rigid gas valve; — Flexible gas valve (parachute); — Netting; — Load ring; — Basket and accessories (including alternative devices); — Electrostatic discharge paths; — Mooring line and drag rope; — Maintenance and servicing; — Annual inspection; — Flight papers; — Aircraft Flight Manuals (AFMs) and Aircraft Maintenance Manuals (AMMs); — Rigging and launch preparation; — Launch.	3
10L.2 Practical training — Operating controls; — Maintenance and servicing jobs (according to AMM and AFM); — Safety rules when using hydrogen as lifting gas.	3
10L.3 Envelope — Fabrics; — Poles and reinforcement of pole; — Ripping panel and cord; — Parachute and shroud lines; — Valves and cords;	3

MODULES 10L — BALLOON/AIRSHIP GAS (FREE/TETHERED)	Level
— Filler neck, Poeschel-ring and cords; — Electrostatic discharge paths	
10L.4 Valve — Springs; — Gaskets; — Screwed joints; — Control lines; — Electrostatic discharge paths	3
10L.5 Netting or rigging (without net) — Kinds of net and other lines; — Mesh sizes and angles; — Net ring; — Knotting methods; — Electrostatic discharge paths.	3
10L.6 Load ring	3
10L.7 Basket (incl. alternative devices) — Kinds of baskets (incl. alternative devices); — Strops and toggles; — Ballast system (bags and supports); — Electrostatic discharge paths.	3
10L.8 Ripping cord and valve cords	3
10L.9 Mooring line and drag rope	3
10L.10 Minor repairs — Bonding; — Splicing hemp ropes.	3
10L.11 Equipment Instruments (single or combined).	3

MODULES 10L — BALLOON/AIRSHIP GAS (FREE/TETHERED)	Level
10L.12 Tether cable (tethered gas balloons (TGB) only) — Kinds of cables; — Acceptable damage of cable; — Cable swivel; — Cable clamps.	3
10L.13Winch (tethered gas balloons only) — Kinds of winches; — Mechanical system; — Electrical system; — Emergency system; — Grounding/ballasting of winch.	3
10L.14 Procedures for physical inspection — Cleaning, use of lighting and mirrors; — Measuring tools; — Measure of controls deflection (only airships); — Torque of screws and bolts; — Wear of bearings (only airships); — Inspection equipment; — Calibration of measuring tools; — Fabric grab test.	2

MODULES 11L — AIRSHIPS HOT AIR/GAS

MODULES 11L — AIRSHIPS HOT AIR/GAS	Level
11L.1 Basic principles and assembly of small airships — Envelope, ballonnets; — Valves, openings; — Gondola; — Propulsion; — Aircraft Flight Manuals (AFMs) and Aircraft Maintenance Manuals (AMMs); — Rigging and launch preparation.	3

MODULES 11L — AIRSHIPS HOT AIR/GAS	Level
11L.2 Practical training — Operating controls; — Maintenance and servicing jobs (according to AMM and AFM).	3
11L.3 Envelope — Fabrics; — Ripping panel and cords; — Valves; — Catenary system.	3
11L.4 Gondola (incl. alternative devices) — Kinds of gondolas (incl. alternative devices); — Airframe types and materials; — Identification of damage.	3
11L.5 Electrical system — Basics about on-board electrical circuits; — Electrical sources (accumulators, fixation, ventilation, corrosion); — Lead, nickel-cadmium (NiCd) or other accumulators, dry batteries; — Generators; — Wiring, electrical connections; — Fuses; — External power source; — Energy balance.	3
11L.6 Propulsion — Fuel system: tanks, lines, filters, vents, drains, filling, selector valve, pumps, indication, tests, bonding; — Propulsion instruments; — Basics about measuring and instruments; — Revolution measuring; — Pressure measuring; — Temperature measuring;	3

MODULES 11L — AIRSHIPS HOT AIR/GAS	Level
— Available fuel/power measuring	
11L.7 Equipment — Fire extinguisher, fire blanket; — Instruments (single or combined).	3

MODULE 12L — RADIO COM/ELT/TRANSPONDER/INSTRUMENTS

MODULE 12L — RADIO COM/ELT/TRANSPONDER/INSTRUMENTS	Level
12L.1 Radio Com/ELT — Channel spacing; — Basic functional test; — Batteries; — Testing and maintenance requirements.	2
12L.2 Transponder — Basic operation; — Typical portable configuration including antenna; — Explanation of Modes A, C, S; — Testing and maintenance requirements.	2
12L.3 Instruments — Handheld altimeter/variometers; — Batteries; — Basic functional test.	2

APPENDIX VI — Basic examination standard for category L

Aircraft Maintenance Licence

(a) The standardisation basis for examinations related to the APPENDIX V basic knowledge requirements shall be as follows:

(i) all examinations must be carried out using the multiple-choice question format as specified in point (ii). 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;

(ii) each multiple-choice question must have three alternative answers of which only one 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;

(iii) the pass mark for each module is 75 %;

(iv) penalty marking (negative points for failed questions) is not to be used;

(v) the level of knowledge required in the questions must be proportionate to the level of technology of the aircraft category.

(b) The number of questions per module shall be as follows:

(i) module 1L ‘Basic knowledge’: 12 questions. Time allowed: 15 minutes;

(ii) module 2L ‘Human factors’: 8 questions. Time allowed: 10 minutes;

(iii) module 3L ‘Aviation legislation’: 24 questions. Time allowed: 30 minutes;

(iv) module 4L ‘Airframe wooden/metal tube and fabric’: 32 questions. Time allowed: 40 minutes;

(v) module 5L ‘Airframe composite’: 32 questions. Time allowed: 40 minutes;

(vi) module 6L ‘Airframe metal’: 32 questions. Time allowed: 40 minutes;

(vii) module 7L ‘Airframe general’: 64 questions. Time allowed: 80 minutes;

(viii) module 8L ‘Power plant’: 48 questions. Time allowed: 60 minutes;

(ix) module 9L ‘Balloon/Airship hot air’: 36 questions. Time allowed: 45 minutes;

(x) module 10L ‘Balloon/Airship gas (free/tethered)’: 40 questions. Time allowed: 50 minutes;

(xi) module 11L ‘Airships hot air/gas’: 36 questions. Time allowed: 45 minutes;

(xii) Module 12L ‘Radio Com/ELT/transponder/instruments’: 16 questions. Time allowed 20 minutes.