European Union Aviation Safety Agency

Notice of Proposed Amendment 2020-12

in accordance with Articles 6(3), 7 and 8
(Standard procedure: public consultation) of MB Decision No 18-2015

Review of Part-66

RMT.0255 (MDM.059)

EXECUTIVE SUMMARY

The objective of this Notice of Proposed Amendment (NPA) is to address some shortcomings that have been identified in the EASA maintenance licensing system, which impact on the effectiveness and efficiency of the current Part-66 requirements.

In particular, the objective of the amendments proposed with this NPA is to:

— facilitate the type-rating endorsement for aircraft without a Part-147 type training, referred to as well as 'legacy aircraft';

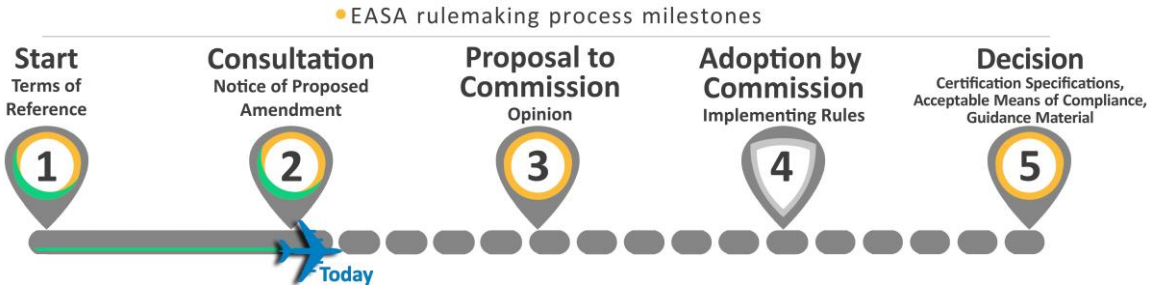
— enhance the efficiency of the on-the-job training (OJT) that is affected by the lack of its mutual recognition between licensing authorities which, consequently, creates duplication of administrative efforts;

— reduce the deficit of the practical skills of maintenance staff; and

— update the basic knowledge syllabus.

In addition, this NPA provides a suitable solution for maintenance licences with regard to new products that are certified by EASA without adding a new licence type.

Action area:	Continuing airworthiness		
Related rules:	Commission Regulation (EU) No 1321/2014 and related acceptable means of compliance (AMC) and guidance material (GM)		
Affected stakeholders:	Approved maintenance training organisations (AMTOs); aircraft maintenance licence (AML) applicants and holders; approved maintenance organisations (AMOs); competent authorities (CAs)		
Driver:	Efficiency/proportionality	**Rulemaking group:**	Yes
Impact assessment:	Yes	**Rulemaking Procedure:**	Standard



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1. About this NPA

1.1. How this NPA was developed

The European Union Aviation Safety Agency (EASA) developed this NPA in line with Regulation (EU) 2018/1139[1] (the 'Basic Regulation') and the Rulemaking Procedure[2]. This rulemaking activity is included in the European Plan for Aviation Safety (EPAS) for 2020–2024[3] under rulemaking task (RMT).0255 (MDM.059). The text of this NPA has been developed by EASA, based on the input of Rulemaking Group (RMG) RMT.0255 (MDM.059). It is hereby submitted to all interested parties[4] for consultation.

1.2. How to comment on this NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at **http://hub.easa.europa.eu/crt/**[5].

The deadline for the submission of comments is **31 March 2021**.

1.3. The next steps

Following the closing of the public commenting period, EASA will review all the comments received. Based on the comments received, EASA will consider the need to amend Commission Regulation (EU) No 1321/2014[6] and, if necessary, issue an opinion. A summary of the comments received will be provided in the opinion.

The opinion would be submitted to the European Commission, which will use it as a technical basis in order to take the decision on whether or not to amend the Regulation.

If the European Commission decides that the Regulation should be amended, EASA will issue a decision that amends the acceptable means of compliance (AMC) and guidance material (GM) to comply with the amendments introduced into the Regulation.

The comments received on this NPA and the EASA responses to them will be reflected in a comment-response document (CRD). The CRD will be published on the EASA website[7].

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1 Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91 (OJ L 212, 22.8.2018, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1535612134845&uri=CELEX:32018R1139).

2 EASA is bound to follow a structured rulemaking process as required by Article 115(1) of Regulation (EU) 2018/1139. Such a process has been adopted by the EASA Management Board (MB) and is referred to as the 'Rulemaking Procedure'. See MB Decision No 18-2015 of 15 December 2015 replacing Decision 01/2012 concerning the procedure to be applied by EASA for the issuing of opinions, certification specifications and guidance material (http://www.easa.europa.eu/the-agency/management-board/decisions/easa-mb-decision-18-2015-rulemaking-procedure).

3 https://www.easa.europa.eu/sites/default/files/dfu/EPAS_2020-2024.pdf

4 In accordance with Article 115 of Regulation (EU) 2018/1139, and Articles 6(3) and 7 of the Rulemaking Procedure.

5 In case of technical problems, please contact the CRT webmaster (crt@easa.europa.eu).

6 Commission Regulation (EU) No 1321/2014 of 26 November 2014 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organisations and personnel involved in these tasks (OJ L 362, 17.12.2014, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1602673324055&uri=CELEX:32014R1321).

7 https://www.easa.europa.eu/document-library/comment-response-documents

2. In summary — why and what

2.1. Why we need to amend the rules — issue/rationale

A survey on the maintenance licensing and training system, launched by EASA at the end of 2016[8], highlighted some shortcomings and areas of improvement for Annex III (Part-66) to Commission Regulation (EU) No 1321/2014. In particular:

(a) Difficulties in performing a type training (TT) on aircraft for which courses are not available any more. This is the case for old and out-of-production aircraft models, with few units still circulating and no business interest existing for Part-147 training organisations.

(b) Difficulties in performing the on-the-job training (OJT) due to:

(i) the lack of acceptance by the licensing authority when it is not the authority that initially approved the procedures of the OJT to a Part-145 approved maintenance organisation (AMO);

(ii) the OJT maintenance tasks, which can be selected from the AMC, not fitting well with all aircraft types;

(iii) the difficulties in finding AMOs rated on aircraft models that are compatible with the approved OJT programme;

(iv) the proportionality of the requirement in order to achieve the OJT objective.

(c) The lack of practical skills of novice maintenance staff. The current rule requires that applicants for an aircraft maintenance licence (AML) should pass the exams without the requirement to attend a regular basic training where practical skills are assessed throughout the training.

(d) The basic knowledge modules of Part-66 Appendix I do not adequately capture the state of the art of the current technology used in aviation.

In addition to the issues identified by the survey, there is also the need to:

— complement the licence categories and subcategories so that aircraft with electrical propulsion are covered; and

— implement the output of RMT.0281 (MDM.082) 'New training methods or new teaching technologies (Part-66/Part-147)'[9].

Last, but equally important, some points of Part-66 need to be clarified and corrected.

2.2. What we want to achieve — objectives

The overall objectives of the EASA system are defined in Article 1 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issues outlined in Section 2.1.

The specific objective of this proposal is to improve the efficiency, the proportionality, and the level playing field of the Part-66 maintenance licensing system. In particular, to:

(a) enhance the efficiency of the licensing system for Group 1 'legacy aircraft' (popular term used to identify old aircraft models for which no Part-147 TT exists any more);

(b) improve the quality of the OJT: focused more on certifying staff competence and responsibilities; enhance the criteria for the selection of tasks; give credit for tasks performed

[8] https://www.easa.europa.eu/sites/default/files/dfu/18D50946_Evaluation%20Report%20Part-66_147%20%28to%20AB%29.pdf

[9] https://www.easa.europa.eu/document-library/terms-of-reference-and-group-compositions/tor-rmt0281-mdm082

on similar aircraft, and render the OJT programme recognised by the licensing authority when it is already approved by another authority;

(c) require that self-trained applicants for the basic AML demonstrate an appropriate level of practical skills;

(d) modernise the content of the basic syllabus modules and make it easier to update;

(e) provide suitable solutions as regards the licence(s) that are applicable to aircraft with electrical propulsion without adding complexity to the maintenance licensing system.

2.3. How we want to achieve it — overview of the proposals

With the support of RMT.0255 (MDM.059) working group (WG), EASA has identified certain measures that could address or mitigate the issues mentioned in Section 2.1:

(a) The introduction of flexibility provisions at regulation level to facilitate the acquisition of the type rating for 'legacy aircraft' and identify equivalent type-rating endorsement means; also, define the criteria for lower-complexity aircraft in order to reclassify aircraft from Group 1 to other groups;

(b) The redefinition of the OJT requirements and structure to fulfil the OJT objectives in a more flexible way;

(c) The practical assessment of candidates before acquiring the AML;

(d) The removal of obsolete elements and the addition of new technology features in the basic knowledge modules; improvement of the structure and organisation of the modules in order to render their future updates easier;

(e) The definition of a new aircraft group that encompasses aircraft with electrical propulsion and assignment of the applicable licence category.

2.4. What are the expected benefits and drawbacks of the proposals

The table below synthesises the benefits and drawbacks for each proposal.

Obj.	Proposal	Benefits	Drawbacks
(a)	Allow the mutual recognition of TT approved one-off by NAAs beyond the Part-147 approval. Introduction of the Certificate of Recognition (CoR).	The TT, approved as per point 66.B.130 'Procedure for the direct approval of aircraft type training', is recognised everywhere in the EU Member States.	No specific drawbacks.
	Amend the criteria for Group 1 aircraft, adding the condition for 'pressurised aeroplanes' that can operate above FL290.	Small and old aeroplane models, simple-construction and other than complex motor-powered aircraft (CMPA), e.g. Cessna 400 series, will be moved to Group 3 together with other similar aircraft. For few legacy aircraft, a type examination and demonstration of practical experience will replace the need for an individual TT.	No specific drawbacks.
(b)	Revise the OJT standard in Appendix III. Revise Appendix II to the AMC.	More effective and efficient OJT programme, focused also on certifying staff competencies and responsibilities. Easier and more flexible selection of the OJT tasks.	No specific drawbacks.
	When the competent authority for the licence is different from the competent authority for the AMO, which provides the OJT, the licensing authority shall accept the AMO's previously approved OJT programme.	No duplication of efforts for the OJT programme approval. Positive impact because AML holders will not spend time and money to travel in order to find a suitable AMO. Providing specialised OJT programmes could be also a business opportunity for many AMOs.	No specific drawbacks.
(c)	Add the requirement for the assessment of practical skills. Add 'Practical Assessment' modules in Appendix I (for B1, B2 and B3) and in Appendix VII (for L), required only for applicants without a regular Part-147 basic training.	The practical skills will be checked also for self-trained students: improvement in the competencies expected and therefore positive safety considerations. Additional business opportunities for Part-147 organisations.	No major drawbacks. Additional burden for applicants without approved training course.
(d)	Update the contents of the Appendix I modules and optimise the structure. Simplify and combine some modules. Align some licence categories (e.g. B1 and B2).	Basic knowledge requirement updated and in line with the current aviation technologies. Differences between B1 and B2 licence categories reduced.	No major drawbacks. Slight increase of the requirements for licence applicants.
	Move some descriptive content of the basic knowledge modules to AMC level. Major elements of the syllabus (title of paragraphs, subparagraphs and knowledge levels) are retained in the IR.	Easier update of the modules according to technological evolution. It would give more flexibility to adapt the required changes to the syllabus (without having to amend the IR).	No major drawbacks. Risk of deviating from the AMC, thus leading to less uniform training content.

Obj.	Proposal	Benefits	Drawbacks
(e)	1. Create new 'Group E' in 66.A.5 that will include those electrical aircraft that are not covered by the other groups. 2. Create an 'Electrical Propulsion' module (Module E) that lists a series of subjects related to electrical propulsion technology. It will be necessary to pass Module E before adding the Group E rating in the licence. 3. Existing licence holders could obtain the Group E rating after successful examination of the 'Electrical Propulsion' module.	Easy to extend the scope of existing licences. More job opportunities for the holders of traditional AML categories.	No major drawbacks. Minor impact for those applicants who want to maintain only electrical aircraft and are not interested in existing licences, since there is no direct route to apply for an AML for electrical aircraft. However, it is not expected that such needs would arise in the coming years. This will be reviewed when relevant.

As regards 'Objective a':

The addition of the 'pressurised aircraft' requirement to classify aircraft in Group 1, operating above FL290, is considered by EASA a proposal with a low impact because it would affect only other than CMPA (small piston-engine aeroplanes, single-pilot, MTOM < 5.7 t and without fly-by-wire technology).

Specific request to stakeholders

Stakeholders are invited to bring to EASA's attention any other qualitative/quantitative information on other products that can be affected by this proposal or other justified conditions for the classification of aircraft in Group 1.

As regards 'Objective b':

The proposal to include OJT in the AMOs' scope (Part-145 or CAO), allowing AMOs to issue a certificate of recognition (CoR), was discarded. The core business of a maintenance organisation is not to provide training; therefore, the inefficient implementation of the OJT might affect the complete approval of the organisation and impact the bilateral agreements, including compliance with the ICAO provisions. In addition, the competent authorities of the maintenance organisations would need additional resources qualified for the OJT approval. The potential benefits could be achieved through other solutions.

The OJT requirement has always been a complicated issue. It is considered the last opportunity for the authorities to check the competencies of the candidate that are necessary to work in real operational scenarios, evaluated on the first aircraft type to be endorsed in the candidate's licence.

According to the above, the OJT requirement naturally lies between Part-66 and Part-145/-CAO and this duality is the principal cause of complications because different authorities are involved in diverse approvals.

Specific request to stakeholders

Stakeholders are invited to provide any other option for the OJT and justify it. In particular, EASA would like to explore other scenarios such as the following:

a) Remove the OJT requirements from Part-66 and move them to Part-145 under point 145.A.35 'Personnel requirements' where the AMO shall ensure that maintenance staff have adequate competencies with regard to the aircraft maintained by the organisation; or

b) Transpose the OJT requirements from Part-66 into Part-145 under the organisation qualification scheme.

In both cases all the evaluable principles of the OJT will be kept to enhance the competencies of maintenance staff.

As regards 'Objective e':

On the definition of the new aircraft group that encompasses aircraft with electrical propulsion (Group E) and assigning the applicable licence category, apart from the approach proposed above, another solution has been considered. It is about establishing brand new licences for the new Group E (e.g.: unique B1E licence applicable to all aircraft; or several licences applicable to electrical aeroplanes B1.5, electrical helicopters/rotorcraft B1.6, etc.) with a dedicated qualification path (training and experience).

This solution was discarded as, even though it would allow to introduce a licence for new aircraft and would not require prior knowledge on the conventional piston- or turbine-engine aircraft for applicants that aim to maintain only electrical aircraft, it would be a niche licence with limited market opportunities for the affected maintenance staff, at least in the short/medium term. In the long term, with the potential increase of aircraft affected, this impact would be mitigated.

Considering that none of the proposals would have major impacts and/or controversial items, a brief analysis of the main benefits and drawbacks has been included in this section and no detailed impact assessment (IA) has been performed, in accordance with the proportionality principle.

Question to stakeholders

Do you agree with the benefits and drawbacks mapped in Section 2.4? If you do not agree, could you please provide qualitative/quantitative input that supports this?

Stakeholders are invited to provide any other qualitative/quantitative information they may find necessary to bring to the attention of EASA.

3. Proposed amendments and rationale in detail

(f) The text of the amendment is arranged to show deleted, new or amended as well as unchanged text as follows:

— deleted text is ~~struck through~~;

— new or amended text is highlighted in blue;

— an ellipsis '[…]' indicates that the rest of the text is unchanged.

3.1. Draft regulation and draft acceptable means of compliance (AMC) and guidance material (GM)

ANNEX III (PART-66)

[…]

66.A.5 Aircraft groups

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

(1) Group 1: complex motor-powered aircraft, helicopters, helicopters with multiple engines, pressurised aeroplanes with maximum certified operating altitude exceeding FL290, aircraft equipped with fly-by-wire systems, gas airships other than ELA2 and other aircraft requiring an aircraft type rating when defined as such by the Agency.

[…]

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

(i) subgroup 2a:

– […]

– those ~~turbojet and multiple-turboprop~~ turbine-engine aeroplanes classified by the Agency in this subgroup because of their lower complexity.

[…]

(5) Group E: aircraft with electrical propulsion other than those in Group 1.

[…]

GM 66.A.5 Aircraft groups

The following table summarises the applicability of categories/subcategories of Part-66 licences versus the groups/subgroups of aircraft:

Category/subcategory Groups	A, B1 and C	B2	B2L	B3	L				
					L1C and L1	L2C and L2	L3H and L3G	L4H and L4G	L5
1 — Complex motor-powered aircraft — Multi-engine helicopters — Pressurised ~~A~~aeroplanes above FL290 — Aircraft with fly-by-wire systems — Any other aircraft as ~~when~~ defined by the Agency	X	X							
1 — Gas airships other than ELA2		X							X
2	X	X	X						

Category/subcategory Groups	A, B1 and C	B2	B2L	B3	L				
					L1C and L1	L2C and L2	L3H and L3G	L4H and L4G	L5
2a: Single ~~T~~turboprop aeroplanes 2b: Single-turbine helicopters 2c: Single-~~P~~piston engine helicopters									
3 — Piston-engine aeroplanes	X	X	X						
3 — Piston-engine aeroplanes (non-pressurised of 2 000 kg MTOM and below)	X	X	X	X					
3 — ELA1 piston-engine aeroplanes	X	X	X	X		X			
4 — Sailplanes — Powered sailplanes — Balloons — Airships not in Group 1		X X X X	X X X X		X	X X	X	X	X
E Aircraft with electrical propulsion	X	X	X	X		X			X

[…]

66.A.20 Privileges

(a) The following privileges shall apply:

[…]

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

Category C, with respect to complex motor-powered aircraft, includes the privileges of category C with respect to other than complex motor-powered aircraft.

[…]

66.A.25 Basic competency ~~knowledge~~ requirements

Competency consists of knowledge, skills and attitude. The applicant for an aircraft maintenance licence, or for the addition of an aircraft category or subcategory in the aircraft maintenance licence, shall demonstrate by examination and practical assessment that they meet the competency requirements.

(a) ~~For licences other than categories B2L and 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 Annex III (Part-66). The examination shall comply with the standard set out in~~

~~Appendix II to Annex III (Part-66) and shall be conducted either by a training organisation appropriately approved in accordance with Annex IV (Part-147), or by the competent authority.~~

The applicant shall demonstrate by examination a level of knowledge that is appropriate to the related subject modules in accordance with Appendix I (applicable to B1, B2 and B3 licences) or Appendix VII (applicable to L licences) to Annex III (Part-66).

The examination shall comply with the standard set out in Appendix II (applicable to B1, B2 and B3 licences) or Appendix VIII (applicable to L licences) to Annex III (Part-66) and shall be conducted either by:

(i) a training organisation that is appropriately approved in accordance with Annex IV (Part-147); or

(ii) a competent authority; or

(iii) another organisation as agreed by the competent authority for an aircraft maintenance licence in category L within a given subcategory.

(b) ~~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 Annex III (Part-66). The examination shall comply with the standard set out in Appendix VIII to Annex III (Part-66) and shall be conducted by a training organisation appropriately approved in accordance with Annex IV (Part-147), by the competent authority or as agreed by the competent authority.~~

~~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.~~

The applicant for an aircraft maintenance licence, as regards the addition of a different subcategory, shall demonstrate by examination a level of knowledge that is appropriate to the related subject modules in accordance with Appendix I (for B1, B2 and B3 licences) or Appendix VII (for L licences) to Annex III (Part-66).

Appendix IV to Annex III (Part-66) details the basic knowledge modules of Appendix I (for B1, B2 and B3 licences) or Appendix VII (for L licences) required for the addition of a new category or subcategory to an existing Part-66 licence.

(c) ~~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 Annex III (Part-66). The examination shall comply with the standard set out in Appendix II to Annex III (Part-66) and shall be conducted either by a training organisation appropriately approved in accordance with Annex IV (Part-147), or by the competent authority~~

In addition to demonstrating the appropriate level of knowledge, applicants that do not attend a regular Part-147 basic training course shall demonstrate they have the adequate skills, in the subcategory or system rating applied for, through a practical assessment carried out by a training organisation that is approved in accordance with Part-147 or by the licensing authority.

The practical assessment shall comply with the standard set out either in Module 18 of Appendix II (for B1, B2 and B3 licences) or in Module 13L of Appendix VIII (for L licences) to Annex III (Part-66).

The practical assessment is not required for category C licences.

(d) The ~~training courses and~~ examinations and practical assessments shall have been passed within 10 years prior to the application for an aircraft maintenance licence or the addition of a category or subcategory to such a licence. If this does not apply, examination credits may be obtained in accordance with point (e).

(e) ~~The applicant may apply to the competent authority for full or partial examination credits for the basic knowledge requirements for:~~

~~(i) basic knowledge examinations that do not meet the requirement laid down in point (d);~~

~~(ii) any other technical qualification considered by the competent authority to be equivalent to the knowledge standard of Annex III (Part-66).~~

~~Credits shall be granted in accordance with Subpart E of Section B of this Annex (Part-66)~~

The applicant may apply to the competent authority for full or partial credits for the basic knowledge requirements for:

(i) basic knowledge examinations and practical assessment passed more than 10 years before the application (see point (d));

(ii) any other national technical training, examination or practical assessment considered by the competent authority in order for the applicant to demonstrate the competencies that are equivalent to the standards of Annex III (Part-66).

The applicant shall provide evidence of the granted credits or refer to an examination credit report approved by the licensing authority in accordance with Subpart E of Section B of Annex III (Part-66).

[…]

(g) The applicant for the category C licence shall demonstrate by examination the same level of knowledge as for the modules applicable to the B1 or B2 category. The modules shall be relevant to the type of aircraft the category C licence will be applicable to.

AMC 66.A.25 Basic ~~knowledge~~ competency requirements

[…]

3. The successful accomplishment of the practical assessment should be demonstrated by a certificate of recognition (CoR) (EASA Form 148) of Appendix III to Annex IV (Part-147) issued by an approved Part-147 organisation or by the competent authority.

~~GM 66.A.25(a) Basic knowledge requirements~~

~~The levels of knowledge for each licence (sub)category are directly related to the complexity of the certifications related to the corresponding licence (sub)category, which means that category A should demonstrate a limited but adequate level of knowledge, whereas category B1, B2, B2L and B3 should demonstrate a complete level of knowledge in the appropriate subject modules.~~

GM 66.A.25(b) Basic ~~knowledge~~ competency requirements

[…]

66.A.30 Basic experience requirements

[…]
2b. for category L:

[…]

~~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.~~

3. for category C with respect to complex motor-powered aircraft (CMPA):

~~(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;~~

~~4. 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;~~

~~5. for category C obtained through the academic route: an applicant holding an academic degree in a technical discipline, from a university or other higher educational institution recognised by the competent authority, 3 years of experience working in a civil aircraft maintenance environment on a representative selection of tasks directly associated with aircraft maintenance including 6 months of observation of base maintenance tasks.~~

(i) 3 years of experience in exercising category B1.1, B1.3 or B2 privileges as certifying staff or support staff, or both, according to point 145.A.35, at a maintenance organisation in operating CMPA, including 12 months of experience as base maintenance support staff; or

(ii) 5 years of experience in exercising category B1.2, B1.4 or L5 privileges as certifying staff or support staff, or both, according to point 145.A.35, at a maintenance organisation in operating CMPA, including 12 months of experience as base maintenance support staff; or

(iii) for holders of an academic degree, 3 years of experience in working at an aircraft maintenance environment, on a representative selection of tasks that are directly associated with aircraft maintenance, including 6 months of participation in the performance of base maintenance tasks in operating CMPA.

(iv) To extend the endorsed category C with respect to other that CMPA to CMPA:

(1) 2 years of experience in exercising category B1.1, B1.2, B1.3, B1.4, B2 or L5 privileges as certifying staff or support staff, or both, according to point 145.A.35, at a maintenance organisation in operating CMPA, if the applicant is already a holder of a category C licence with respect to other than CMPA, including 6 months of experience as base maintenance support staff; or

(2) when holding a category C licence based on an academic degree, 2 years of experience in working at an aircraft maintenance environment on a representative selection of tasks that are directly associated with aircraft maintenance including 3 months of participation in the performance of base maintenance tasks in operating CMPA.

4. for category C with respect to other than CMPA:

(i) 3 years of experience in exercising category B1, B2 or B2L privileges as certifying staff or support staff, or both, according to point 145.A.35, at a maintenance organisation in operating other than CMPA, including 6 months of experience as base maintenance support staff; or

(ii) for holders of an academic degree, 3 years of experience in working at an aircraft maintenance environment, on a representative selection of tasks that are directly associated with aircraft maintenance, including 6 months of participation in the performance of base maintenance tasks in operating other than CMPA.

5. The academic degree shall be in a relevant technical discipline, issued by a university or any other higher educational institution recognised by the competent authority.

[…]

(e) ~~Notwithstanding point (a), aircraft maintenance experience gained outside a civil aircraft maintenance environment shall be accepted when such maintenance is equivalent to that required by this Annex (Part-66) as established by the competent authority. Additional experience of civil aircraft maintenance shall, however, be required to ensure adequate understanding of the civil aircraft maintenance environment~~.

Notwithstanding point (a), experience in aircraft maintenance gained outside an aircraft maintenance organisation that is approved in accordance with Part-145 or Part-CAO may be recognised when such maintenance is equivalent to that required by Annex III (Part-66) as established by the competent authority. Additional experience in aircraft maintenance gained

at an aircraft maintenance organisation that is approved in accordance with Part-145 or Part-CAO shall, however, be required in order to ensure adequate understanding of the Part-145 or Part-CAO aircraft maintenance environment.

[…]

(g) For the purpose of reducing the required amount of experience, a basic training course without Modules 1 and 2 of Appendix I to Annex III (Part-66) is considered a full basic training course when Modules 1 and 2 are demonstrated by examination or are credited by a competent authority.

[…]

AMC 66.A.30(a) Basic experience requirements

1. ~~For a category C applicant holding an academic degree the representative selection of tasks should include the observation of hangar maintenance, maintenance planning, quality assurance, record-keeping, approved spare parts control and engineering development.~~

   For a category C applicant that holds an academic degree, the participation in the performance of maintenance tasks on operating aircraft should include: maintenance, maintenance planning, quality assurance, record-keeping, approved spare parts control and engineering development.

   If a category C applicant that holds an academic degree has acquired experience on operating CMPA, the corresponding category C licence should be issued. If the experience acquired in base maintenance has been limited to other than CMPA, then only the corresponding category C licence with respect to other than CMPA should be issued.

2. ~~While an applicant to a category C licence may be qualified by having 3 years experience as category B1 or B2 certifying staff only in line maintenance, it is however recommended that any applicant to a category C holding a B1 or B2 licence demonstrate at least 12 months experience as a B1 or B2 support staff.~~

   While some of the experience required for a category C licence may be gained by working as B1 or B2 certifying staff in line maintenance, at least 12 months of the required experience should be gained on operating aircraft in a civil base maintenance environment as B1 or B2 support staff.

[…]

GM 66.A.30(a) Basic experience requirements

With respect to the required amount of experience for the academic category C licence holder, the following definitions apply:

'3 or 6 months of participation in the performance of base maintenance tasks on operating aircraft' means experience gained through the active participation in base maintenance checks at maintenance organisations.

While it is strongly recommended that the participation in the performance of maintenance on civil aircraft should be at the level required for the issue of a B1 or B2 licence, the objective of the required experience is to gain insight into the performance of base maintenance. The applicant for an academic category C licence shall be aware of the type of maintenance carried out before the signature of the supporting staff and understand their roles in the release to service after the base maintenance. This means that the future holder of a category C licence should have gained insight into all critical aircraft

systems and has become familiar with the challenges faced by category B1 and B2 support staff. It is encouraged that the future category C licence holder should participate in both simple and complex tasks during their experience acquisition in base maintenance.

'Experience in working in an aircraft maintenance environment on a representative selection of tasks that are directly associated with aircraft maintenance' means experience gained at an organisation that is approved in accordance with Part-145, Part-CAO, Part-CAMO or similar, or experience in performing comparable work that is directly related to the continuing airworthiness of aircraft within a competent authority. Similar work performed on Annex I or state aircraft may be acceptable as well.

In accordance with point 66.A.30(e), it is acceptable that part of the required experience is gained outside the European civil regulatory framework for the issue of a category C licence. However, at least 1 year of the required experience shall be in a Part-145 or Part-CAO environment. For a category C licence obtained through the academic route, this 1-year period in a Part-145 or Part-CAO environment includes the participation in the performance of base maintenance tasks for 6 months.

The table below summarises the basic experience requirements for the category C licence:

<table>
<tr><th>To:
From:</th><th>Category C
for CMPA</th><th>Category C
for other than CMPA</th></tr>
<tr><td>Holder of a licence with B1.1, B1.3, B2 or B2L</td><td>3 years of experience as certifying staff or support staff, in operating CMPA, including 12 months as support staff in base maintenance.</td><td rowspan="2">3 years of experience as certifying staff or support staff, in operating other than CMPA, including 12 months as support staff in base maintenance.</td></tr>
<tr><td>Holder of a licence with B1.2, B1.4 or B3</td><td>5 years of experience as certifying staff or support staff, in operating CMPA, including 12 months as support staff in base maintenance.</td></tr>
<tr><td>Holder of an academic degree, in a relevant technical discipline, issued by a university or any other higher educational institution recognised by the competent authority</td><td>3 years of experience in working in an aircraft maintenance environment, on a representative selection of tasks that are directly associated with aircraft maintenance of operating CMPA, including 6 months of participation in the performance of base maintenance tasks on operating CMPA.</td><td>3 years of experience in working in an aircraft maintenance environment, on a representative selection of tasks that are directly associated with aircraft maintenance of operating other than CMPA, including 6 months of participation in the performance of base maintenance tasks on operating other than CMPA.</td></tr>
<tr><td rowspan="2">Holder of a licence with category C for other than CMPA</td><td>2 years of experience as certifying staff or support staff, in operating CMPA, including 6 months as support staff in base maintenance.</td><td rowspan="2"></td></tr>
<tr><td>Holding an academic degree: 2 years of experience in working in an aircraft maintenance environment, on a representative selection of tasks that are directly associated with aircraft maintenance of operating CMPA, including 3 months of participation in the performance of base maintenance tasks on operating CMPA.</td></tr>
<tr><td>Holder of a licence with category C for CMPA</td><td></td><td>Category C for CMPA includes category C for other than CMPA.</td></tr>
</table>

[…]

AMC 66.A.30(e) Basic experience requirements

1. ~~For category A, the additional experience of civil aircraft maintenance should be a minimum of 6 months. For category B1, B2, B2L or B3, the additional experience of civil aircraft maintenance should be a minimum of 12 months.~~

   If the licensing authority has established that the experience gained outside an aircraft maintenance organisation that is approved in accordance with Part-145 or Part-CAO is equivalent to that required by Part-66, the minimum additional experience in aircraft maintenance organisation(s) that is (are) approved in accordance with Part-145 or Part-CAO should be:

   (i) for categories A and L: 6 months;

   (ii) for categories B1, B2, B2L, B3 and C: 12 months.

2. ~~Aircraft maintenance experience gained outside a civil aircraft maintenance environment may include aircraft maintenance experience gained in armed forces, coast guards, police etc. or in aircraft manufacturing~~.

   Experience in aircraft maintenance gained outside an aircraft maintenance organisation that is approved in accordance with Part-145 or Part-CAO may include experience in aircraft maintenance gained in the armed forces, coast guard, police, nationally approved organisations, organisations approved by non-EASA Member States, etc., or in aircraft manufacturing.

[…]

66.A.45 Endorsement with aircraft ratings

[…]

(i) The endorsement for Group E aircraft, for categories B1, B3 and C, requires the examination on 'Electrical Propulsion' of Module E. The endorsement is limited to the corresponding aircraft category (e.g. electrical aeroplanes for B1.1, B1.2 and B3).

The examination on Module E is not required for category L2 and L2C. For these categories, the endorsement of Group E aircraft is limited to ELA1 aircraft.

The examination on Module E is not required for categories B2 and B2L.

The standardisation basis for examinations related to Module E is as follows:

(a) Content of Module E

MODULE E. ELECTRICAL PROPULSION	LEVEL	
	B1.1 B1.2 B1.3 B1.4 B3	C
Electric engines	2	1
Energy Storage Devices	2	1
Practical Element	-	-

(b) The definitions of the different levels of knowledge required in this Appendix are the same as those contained in point 2 of Appendix III to Annex III (Part-66).

(c) The examination shall be carried out using the multiple-choice-question (MCQ) format. The incorrect alternatives must seem equally plausible to a lay person. All 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.

(d) Each multiple-choice question shall have three alternative answers of which only one shall be the correct answer and the candidate shall be allowed a period per module which is based upon a nominal average of 75 seconds per question.

(e) The pass mark shall be 75 %.

(f) Penalty marking (negative points for failed questions) shall not be used.

(g) The level of knowledge required in the questions shall be proportionate to the type of technology that is applicable to a given aircraft category.

(h) The grand total of questions of the module shall be 10.

AMC 66.A.45(i) Endorsement with aircraft ratings

(a) Content of Module E

MODULE E. ELECTRICAL PROPULSION	LEVEL	
	B1.1 B1.2 B1.3 B1.4 B3	C
Electric engines — Construction of rotating electric machines (outrunner, inrunner, rotor, stator, shaft, bearings, magnets, windings, electrical insulation, commutators, motor cooling, sensors). — Power electronics (switching devices, DC–DC converters, single-phase and multiple-phase DC–AC inverters, single-phase and multiple-phase AC–DC rectifiers).	2	1

MODULE E. ELECTRICAL PROPULSION	LEVEL	
	B1.1 B1.2 B1.3 B1.4 B3	C
— Engine control systems (control functions, speed control, torque control, position measurement, generator mode for energy recuperation, protection functions). — Wiring of electric power storage, power electronics and electric motor. — High energy and voltages risks, and associated safety procedures.		
Energy Storage Devices — Power storage systems (common high-density battery, chemistry batteries, load cycles, degradation, effects of charging and overcharging, thermal runaway). — Battery management systems (general functions, battery balancing, monitoring). — Wiring of electric power storage, power electronics and electric motor.	2	1
Practical Elements — Scheduled inspection/check of the engine and the battery(ies). — Inspection/check after lightning strike on power plant and electrical systems. — Inspection/check after power plant component overheating. — Draining/replenishing the coolant of the engine/battery cooling system. — Removal/installation of the battery. — Removal/installation of the electric motor. — Removal/installation of the coolant pumps. — Removal/installation of the power controller. — Removal/installation of the cooler. — Motor control quadrant inspection/check.	-	-

GM 66.A.45 Endorsement with aircraft ratings

[…]

Aircraft rating requirements			
Aircraft	B1/B3/L licence	B2/B2L licence	C licence
Group 1 aircraft, except airships — Complex motor-powered aircraft. — Multiple-engine helicopters. — Pressurised aeroplanes certified above FL290. — Aircraft equipped with fly-by-wire. — Other aircraft as defined by the Agency.	(For B1) **Individual TYPE RATING** Type training: — Theory + examination — Practical + assessment **PLUS** OJT (for first aircraft in the licence subcategory)	(For B2) **Individual TYPE RATING** Type training: — Theory + examination — Practical + assessment **PLUS** OJT (for first aircraft in the licence subcategory)	**Individual TYPE RATING** Type training: — Theory + examination
[…]			

Aircraft rating requirements			
Aircraft	B1/B3/L licence	B2/B2L licence	C licence
Group E: aircraft with electrical propulsion (except those classified in Group 1)	(for B1 and B3) **Group E rating** Based on the examination of Module E (for L2/L2C) **ELA1 Group E rating**	**Group E rating**	**Group E rating** Based on the examination of Module E

[…]

66.B.115 Procedure for the change of an aircraft maintenance licence to include an aircraft rating or to remove limitations

[…]

(c) In the case where the On-the-Job Training is not required, the aircraft type rating shall be endorsed based on a Certificate of Recognition issued by a maintenance training organisation approved in accordance with Annex IV (~~p~~Part-147).

In the case where the On-the-Job Training is required and the licensing competent authority is different from the competent authority of the maintenance organisation, which provides the OJT, the licensing authority shall accept the OJT programme already approved to the organisation (through Chapter 3.15 of the MOE).

[…]

AMC 66.B.115 Procedure for the change of an aircraft maintenance licence to include an aircraft rating or to remove limitations

[…]

(c) For the acceptance of the OJT programme described in Section 6 of Appendix III to Annex III (Part-66), the licensing competent authority should develop adequate procedures which may be similar to the procedure described in AMC 66.B.130 for the 'direct approval of aircraft type training'.

~~In the case where the licensing competent authority is different from the competent authority of the maintenance organisation which provides the OJT, the licensing authority may take into consideration the fact that the maintenance organisation may already have the OJT programme accepted by their own competent authority (through chapter 3.15 of the MOE, as described in AMC 145.A.70(a)).~~

[…]

66.B.130 Procedure for the direct approval of aircraft type training

[…]

(c) The Certificate of Recognition (CoR) (EASA Form 149b) of Appendix III to Annex IV (Part-147) shall be used for the recognition of completion of either the theoretical elements, the practical elements or both the theoretical and practical elements of the type-rating training course.

[…]

66.B.135 Procedure for the approval of multimedia-based training (MBT) courses

The competent authority, whenever it approves courses, including multimedia-based training (MBT) courses, which are delivered in a physical and/or virtual environment, shall verify that the aircraft basic training and the aircraft type training comply with Appendix I and Appendix III respectively. The approval procedure shall include the principles and criteria of Appendix IX 'Evaluation method for the multimedia-based training (MBT)'.

[…]

66.B.200 Examination by the competent authority

[…]

(c) Basic examinations shall follow the standard specified in Appendices I and II or in Appendices VII and VIII to this Annex (Part-66), as applicable.

The Certificate of Recognition (CoR) (EASA Form 148) of Appendix III to Annex IV (Part-147) shall be used for the recognition of completion of basic examinations.

(d) Type training examinations and type examinations shall follow the standard specified in Appendix III to this Annex (Part-66).

The Certificate of Recognition (CoR) (EASA Form 149) of Appendix III to Annex IV (Part-147) shall be used for the recognition of completion of aircraft type training examinations.

[…]

SUBPART E — EXAMINATION CREDITS

This Subpart provides the procedures for granting examination credits referred to in point 66.A.25(~~c~~e).

66.B.400 General

(a) The competent authority may only grant credit on the basis of a credit report prepared in accordance with point 66.B.405. The competent authority shall grant credits to the applicants that meet the conditions in the credit report.

(b) The credit report shall be either:

(i) developed by the competent authority; or

(ii) approved by the competent authority to ensure compliance with ~~this~~ Annex III (Part-66).~~;~~ or

(iii) developed by the competent authority of another Member State, attested by a formal statement that identifies the related credit report.

(c) Credit reports, together with any changes ~~of~~to ~~these~~them, shall be dated and kept on record by the competent authority in accordance with point 66.B.20.

66.B.405 Examination credit report

(a) […]

This comparison shall state whether compliance has been demonstrated and shall contain the justifications for each statement and the possible conditions.

[…]

APPENDICES TO ANNEX III (PART-66)

Appendix I — Basic ~~K~~knowledge and practical assessment ~~R~~requirements (except for category L licence)

[…]

2. Modularisation

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

For categories A, B1, ~~and~~ B3 and C:

Subject module	B1.1 A1	B1.2 A2	B1.3 A3	B1.4 A4	B3	C
	Turbine engine	Piston engine	Turbine engine	Piston engine	Piston-engine non-pressurised aeroplanes MTOM ≤ 2t	All
1. MATHEMATICS	X	X	X	X	X	X
2. PHYSICS	X	X	X	X	X	X
3. ELECTRICS FUNDAMENTALS	X	X	X	X	X	X
4. ELECTRONICS FUNDAMENTALS	X	X	X	X	X	X
5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS	X	X	X	X	X	X
6. MATERIALS AND HARDWARE	X	X	X	X	X	X
7. MAINTENANCE PRACTICES	X	X	X	X	X	X
8. BASIC AERODYNAMICS	X	X	X	X	X	X
9. HUMAN FACTORS	X	X	X	X	X	X
10. AVIATION LEGISLATION	X	X	X	X	X	X
11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	X	X			X	11, 15 & 17 for B1.1 11, 16 & 17 for B1.2 12 & 15 for B1.3 13 & 14 for B2
12. ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS			X	X		
13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS						
14. PROPULSION						
15. GAS TURBINE ENGINES	X		X			
16. PISTON ENGINE		X		X		
17. PROPELLER	X	X				
18. PRACTICAL ASSESSMENT	X	X	X	X	X	

Note: Module 18 is required only for applicants that do not attend a full Part-147 basic training course.

For categories B2 and B2L:

Subject module/submodules	B2	B2L
1. MATHEMATICS	X	X
2. PHYSICS	X	X
3. ELECTRICAL FUNDAMENTALS	X	X
4. ELECTRONIC FUNDAMENTALS	X	X
5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS	X	X
6. MATERIALS AND HARDWARE	X	X
7. MAINTENANCE PRACTICES	X	X
8. BASIC AERODYNAMICS	X	X
9. HUMAN FACTORS	X	X
10. AVIATION LEGISLATION	X	X
11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS		
12. AERODYNAMICS, STRUCTURES AND SYSTEMS	X	X
13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS:		
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. PROPULSION	X	X (for system rating ‘Instruments’ and ‘Airframe systems’)
15. GAS TURBINE ENGINES		
16. PISTON ENGINE AND ELEMENTS OF ELECTRICAL PROPULSION		
17. PROPELLER		
18. PRACTICAL ASSESSMENT	X	X

MODULE 1. MATHEMATICS

MODULE 1. MATHEMATICS	LEVEL	
	A1 A2 A3 A4	B1 B2 B2L B3
1.1 Arithmetic	1	2
1.2 Algebra		
(a) Simple algebraic expressions;	1	2
(b) Equations.	—	1
1.3 Geometry		
(a) Simple geometrical constructions;	—	1
(b) Graphical representation;	2	2
(c) Trigonometry.	—	2

MODULE 2. PHYSICS

MODULE 2. PHYSICS	LEVEL	
	A1 A2 A3 A4	B1 B2 B2L B3
2.1 Matter	1	2
2.2 Mechanics		
2.2.1 Statics;	1	2
2.2.2 Kinetics;	1	2
2.2.3 Dynamics		
(a) Mass, Force and Energy;	1	2
(b) Momentum and Conservation of Momentum.	1	2
2.2.4 Fluid dynamics		
(a) Gravity and density;	2	2
(b) Viscosity; compressibility on fluids; static, dynamic and total pressure.	1	2
2.3 Thermodynamics		
(a) Temperature;	2	2
(b) Heat.	1	2
2.4 Optics (Light)	—	2
2.5 Wave Motion and Sound	—	2

MODULE 3. ELECTRICS~~AL~~ FUNDAMENTALS

MODULE 3. ELECTRICS~~AL~~ FUNDAMENTALS	LEVEL		
	A1 A2 A3 A4	B1 B2 B2L	B3
3.1 Electron Theory	1	1	1
3.2 Static Electricity and Conduction	1	2	1
3.3 Electrical Terminology	1	2	1
3.4 Generation of Electricity	1	1	1

MODULE 3. ELECTRICS~~AL~~ FUNDAMENTALS	LEVEL		
	A1 A2 A3 A4	B1 B2 B2L	B3
3.5 Sources of DC Electricity	1	2	2
3.6 DC Circuits	1	2	1
3.7 Resistance/Resistor			
(a) Resistance;	—	2	1
(b) Resistors.	—	1	—
3.8 Power	—	2	1
3.9 Capacitance/Capacitor	—	2	1
3.10 Magnetism			
(a) Theory of magnetism;	—	2	1
(b) Magnetomotive force.	—	2	1
3.11 Inductance/Inductor	—	2	1
3.12 DC Motor/Generator Theory	—	2	1
3.13 AC Theory	1	2	1
3.14 Resistive (R), Capacitive (C) and Inductive (L) Circuits	—	2	1
3.15 Transformers	—	2	1
3.16 Filters	—	1	—
3.17 AC Generators	—	2	1
3.18 AC Motors	—	2	1

MODULE 4. ELECTRONICS FUNDAMENTALS

MODULE 4. ELECTRONICS FUNDAMENTALS	LEVEL		
	A1 A2 A3 A4	B1 B3	B2 B2L
4.1 Semiconductors			
4.1.1 Diodes			
(a) Diodes;	—	2	2
(b) Materials.	—	—	2
4.1.2 Transistors			
(a) Transistor;	—	1	2
(b) Construction and operation of transistors;	—	—	2
4.1.3 Integrated Circuits			
(a) Description and operation;	—	1	2
(b) Operational amplifier.	—	—	2
4.2 Printed Circuit Boards	—	1	2
4.3 Servomechanisms			
(a) Principles of operation;	—	1	2
(b) Construction operation.	—	—	2

MODULE 5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS

MODULE 5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS	LEVEL			
	A1 A2 A3 A4	B3	B1	B2 B2L
5.1 Electronic Instrument Systems	1	1	1	1
5.2 Numbering Systems	—	—	1	2
5.3 Data Conversion	—	—	1	2
5.4 Data Buses	—	—	2	2
5.5 Logic Circuits				
(a) Identification and applications;	—	—	2	2
(b) Interpretation of logic diagrams.	—	—	—	2
5.6 Basic Computer Structure				
(a) Computer terminology and technology;	1	1	2	2
(b) Computer operation.	—	—	—	2
5.7 Microprocessors	—	—	—	2
5.8 Integrated Circuits	—	—	—	2
5.9 Multiplexing	—	—	—	2
5.10 Fibre Optics	—	—	1	2
5.11 Electronic Displays	1	1	2	2
5.12 Electrostatic Sensitive Devices	1	1	2	2
5.13 Software Management Control	—	1	2	2
5.14 Electromagnetic Environment	—	1	2	2
5.15 Typical Electronic/Digital Aircraft Systems	1	1	1	1
5.16 Cybersecurity	1	1	1	1

MODULE 6. MATERIALS AND HARDWARE

MODULE 6. MATERIALS AND HARDWARE	LEVEL		
	A1 A2 A3 A4	B1 B3	B2 B2L
6.1 Aircraft Materials — Ferrous			
(a) Alloy steels used in aircraft;	1	2	1
(b) Testing of ferrous materials;	—	1	1
(c) Repair and inspection procedures.	—	2	1
6.2 Aircraft Materials — Non-Ferrous			
(a) Characteristics and heat treatments;	1	2	1
(b) Testing of non-ferrous materials;	—	1	1
(c) Repair and inspection procedures.	—	2	—
6.3 Aircraft Materials — Composite and Non-Metallic			
6.3.1 Composite and non-metallic other than wood and fabric			
(a) Characteristics;	1	2	2
(b) Detection of defects;	1	2	—
(c) Repairs.	—	2	1
6.3.2 Wooden structures	1	2	—

MODULE 6. MATERIALS AND HARDWARE	LEVEL		
	A1 A2 A3 A4	B1 B3	B2 B2L
6.3.3 Fabric covering	—	2	—
6.4 Corrosion			
(a) Chemical fundamentals;	1	1	1
(b) Types of corrosion.	2	3	2
6.5 Fasteners			
6.5.1 Screw threads	2	2	2
6.5.2 Bolts, studs and screws	2	2	2
6.5.3 Locking devices	2	2	2
6.5.4 Aircraft rivets	1	2	1
6.6 Pipes and Unions			
(a) Identification;	2	2	2
(b) Standard unions;	2	2	1
6.7 Springs	—	2	1
6.8 Bearings	1	2	2
6.9 Transmissions	1	2	2
6.10 Control Cables	1	2	1
6.11 Electrical Cables and Connectors	1	2	2

MODULE 7. MAINTENANCE PRACTICES

MODULE 7. MAINTENANCE PRACTICES	LEVEL		
	A1 A2 A3 A4	B1 B3	B2 B2L
7.1 Safety Precautions — Aircraft and Workshop	3	3	3
7.2 Workshop Practices	3	3	3
7.3 Tools	3	3	3
7.4 (Reserved)			
7.5 Engineering Drawings, Diagrams and Standards	1	2	2
7.6 Fits and Clearances	1	2	1
7.7 Electrical Wiring Interconnection System (EWIS)	1	3	3
7.8 Riveting	1	2	—
7.9 Pipes and Hoses	1	2	—
7.10 Springs	1	2	—
7.11 Bearings	1	2	—
7.12 Transmissions	1	2	—
7.13 Control Cables	1	2	—
7.14 Material handling			
7.14.1 Sheet metal	—	2	—
7.14.2 Composite and non-metallic	—	2	—
7.14.3 Additive manufacturing	1	1	1
7.15 (Reserved)			
7.16 Aircraft Weight and Balance			

MODULE 7. MAINTENANCE PRACTICES	LEVEL A1 A2 A3 A4	B1 B3	B2 B2L
(a) Centre-of-gravity calculation;	—	2	2
(b) Aircraft weighing.	—	2	—
7.17 Aircraft Handling and Storage	2	2	2
7.18 Disassembly, Inspection, Repair and Assembly Techniques			
(a) Types of defects and visual inspection techniques;	2	3	3
(b) General repair methods — structural repair manual;	—	2	—
(c) Non-destructive inspection techniques;	—	2	1
(d) Disassembly and reassembly techniques;	2	2	2
(e) Troubleshooting 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	1	2	2
7.21 Documentation & Communication	1	2	2

MODULE 8. BASIC AERODYNAMICS

MODULE 8. BASIC AERODYNAMICS	LEVEL A1 A2 A3 A4 B3	B1 B2 B2L
8.1 Physics of the Atmosphere International Standard Atmosphere (ISA), application to aerodynamics~~-~~	1	2
8.2 Aerodynamics	1	2
8.3 Theory of Flight	1	2
8.4 High-Speed Flight	1	2
8.5 Flight Stability and Dynamics	1	2

MODULE 9. HUMAN FACTORS

MODULE 9. HUMAN FACTORS	LEVEL ALL
9.1 General	2
9.2 Human Performance and Limitations	2
9.3 Social Psychology	1
9.4 Factors that Affect~~ing~~ Performance	2
9.5 Physical Environment	1
9.6 Tasks	1
9.7 Communication	2
9.8 Human Error	2
9.9 Safety Management	2

MODULE 9. HUMAN FACTORS	LEVEL
	ALL
9.10 'The Dirty Dozen' and Risk Mitigation	2

MODULE 10. AVIATION LEGISLATION

MODULE 10. AVIATION LEGISLATION	LEVEL	
	A1 A2 A3 A4	B1 B2 B2L B3
10.1 Regulatory Framework	1	1
10.2 Certifying Staff — Maintenance	2	3
10.3 Approved Maintenance Organisations	2	2
10.4 Independent Certifying Staff	-	3
10.5 Air operations	1	1
10.6 Certification of aircraft, parts and appliances		
10.7 Continuing airworthiness	2	2
10.8 Oversight principles and Safety Management Systems in Continuing Airworthiness	1	1
10.9 Maintenance and certification beyond the current EU regulations (if not superseded by EU requirements)	-	1
10.10 Cybersecurity	1	1

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL				
	A1	A2	B1.1	B1.2	B3
11.1 Theory of Flight *11.1.1 Aeroplane Aerodynamics and Flight Controls*	1	1	2	2	1
11.2 Airframe Structures — General Concepts (a) General concepts;	2	2	2	2	2
(b) Construction methods.	1	1	2	2	2
11.3 Airframe Structures — Aeroplanes *11.3.1 Fuselage, Doors, Windows (**ATA 52/53/56**)* (a) Construction principles;	1	1	2	2	1
(b) Airborne towing devices;	1	1	1	1	1
(c) Doors.	1	1	2	1	—
*11.3.2 Wings (**ATA 57**)*	1	1	2	2	1
*11.3.3 Stabilisers (**ATA 55**)*	1	1	2	2	1
*11.3.4 Flight Control Surfaces (**ATA 55/57**)*	1	1	2	2	1
*11.3.5 Nacelles/Pylons (**ATA 54**)*	1	1	2	2	1
*11.4 Air Conditioning and Cabin Pressurisation (**ATA 21**)* *11.4.1 Heating systems and ventilation systems*	—	1	—	3	1
11.4.2 Air conditioning and pressurisation systems					
11.4.3 Air supply and air conditioning					
11.4.4 Safety and warning devices	1	1	3	3	—
11.5 Instruments/Avionics Systems					

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL				
	A1	A2	B1.1	B1.2	B3
*11.5.1 Instrument Systems (**ATA 31**)*	1	1	2	2	2
11.5.2 Avionics Systems Fundamentals of system layouts and operation of: Autoflight (**ATA 22**); Communications (**ATA 23**); Navigation Systems (**ATA 34**).	1	1	1	1	1
*11.6 Electric Power (**ATA 24**)*	1	1	3	3	3
*11.7 Equipment and Furnishings (**ATA 25**)*					
(a) Emergency equipment;	2	2	2	2	2
(b) Cabin and cargo layout.	1	1	1	1	—
*11.8 Fire Protection (**ATA 26**)*					
(a) Fire and smoke detection; Fire-extinguishing systems;	1	1	1	1	—
(b) Portable fire extinguisher.	1	1	1	1	1
*11.9 Flight Controls (**ATA 27**)*					
(a) Primary and secondary flight controls.	1	1	3	3	2
(b) Actuation and protection.	1	—	3	—	—
*11.10 Fuel Systems (**ATA 28, ATA 47**)*					
(a) System layout, Indication and warning systems, Operation;	1	1	3	3	1
(b) Dumping, venting and draining, Longitudinal balance fuel systems, Inert gas systems.	1	—	3	—	—
*11.11 Hydraulic Power (**ATA 29**)*					
(a) System description;	1	1	3	3	2
(b) System operation.	1	—	3	—	—
*11.12 Ice and Rain Protection (**ATA 30**)*					
(a) Ice formation and detection. De-icing systems;	1	1	3	3	1
(b) Anti-icing systems and rain repellent.	1	—	3	—	—
*11.13 Landing Gear (**ATA 32**)*					
(a) System description and operation;	2	2	3	3	2
(b) Sensors.	2	—	3	—	—
*11.14 Lights (**ATA 33**)*	2	2	3	3	2
*11.15 Oxygen (**ATA 35**)*	1	1	3	3	2
*11.16 Pneumatic/Vacuum (**ATA 36**)*	1	1	3	3	2
*11.17 Water/Waste (**ATA 38**)*	2	2	3	3	2
*11.18 Onboard Maintenance Systems (**ATA 45**)*	1	—	2	—	—
*11.19 Integrated Modular Avionics (**ATA 42**)*	1	—	2	—	—
*11.20 Cabin Systems (**ATA 44**)*	1	—	2	—	—
*11.21 Information Systems (**ATA 46**)*	1	—	2	—	—

MODULE 12. ROTORCRAFT ~~HELICOPTER~~ AERODYNAMICS, STRUCTURES AND SYSTEMS

MODULE 12. ROTORCRAFT ~~HELICOPTER~~AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A3 A4	**B1.3 B1.4**
12.1 Theory of Flight — Rotary Wing Aerodynamics	1	2
12.2 Flight Control Systems	2	3
12.3 Blade Tracking and Vibration Analysis	1	3
12.4 Transmission	1	3
12.5 Airframe Structures (a) General concept;	2	2
(b) Construction methods of the principal elements.	1	2
12.6 Air Conditioning ***(ATA 21)*** *12.6.1 Air supply*	1	2
12.6.2 Air conditioning	1	3
12.7 Instruments/Avionics Systems *12.7.1 Instrument Systems* ***(ATA 31)***	1	2
12.7.2 Avionics Systems Fundamentals of system layouts and operation of: Autoflight **(ATA 22)**; Communications **(ATA 23)**; Navigation Systems **(ATA 34)**.	1	1
12.8 Electrical Power ***(ATA 24)***	1	3
12.9 Equipment and Furnishings ***(ATA 25)*** (a) Emergency equipment; Seats, harnesses and belts; Lifting systems;	2	2
(b) Emergency flotation systems; Cabin layout, cargo retention; Equipment layout; Cabin furnishing installation.	1	1
12.10 Fire Protection ***(ATA 26)*** (a) Fire and smoke detection systems; Fire-extinguishing systems;	1	3
(b) Portable fire extinguishers.	1	1
12.11 Fuel Systems ***(ATA 28)***	1	3
12.12 Hydraulic Power ***(ATA 29)***	1	3
12.13 Ice and Rain Protection ***(ATA 30)***	1	3
12.14 Landing Gear ***(ATA 32)***	2	3
12.15 Lights ***(ATA 33)***	2	3
12.16 (Reserved)		
12.17 Integrated Modular Avionics ***(ATA 42)***	1	2
12.18 Onboard Maintenance Systems ***(ATA 45)*** Central maintenance computers; Data-loading system; Electronic library system.	1	2
12.19 Information Systems ***(ATA 46)***	1	2

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS

C/N: Communication & Navigation; Ins.: Instruments; A/F: Autoflight; Sur.: Surveillance; A/S: Airframe & Systems

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL						
	B2	B2L Basic	B2L C/N	B2L Ins.	B2L A/F	B2L Sur.	B2L A/S
13.1 Theory of Flight							
(a) Aeroplane Aerodynamics and Flight Controls;	1	1	—	—	—	—	—
(b) Rotary Wing Aerodynamics.	1	1	—	—	—	—	—
13.2 Structures — General Concepts							
(a) Fundamentals of structural systems;	1	1	—	—	—	—	—
(b) Zonal and station identification systems;	2	2	—	—	—	—	—
(c) Electrical bonding;	2	2	—	—	—	—	—
(d) Lightning strike protection provision.	2	2	—	—	—	—	—
*13.3 Autoflight **(ATA 22)***							
(a) Fundamentals of automatic flight control;	3	—	—	—	3	—	—
(b) Autothrottle systems and automatic landing systems.	3	—	—	—	—	—	—
*13.4 Communication/Navigation **(ATA 23/34)***							
(a) Fundamentals of communication systems;	3	—	3	—	—	—	—
(b) Fundamentals of navigation systems.	3	—	—	—	—	3	—
*13.5 Electric Power **(ATA 24)***	3	3	—	—	—	—	—
*13.6 Equipment and Furnishings **(ATA 25)***	3	—	—	—	—	—	—
*13.7 Flight Controls **(ATA 27)***							
(a) Aeroplane flight controls;	2	—	—	—	2	—	—
(b) Rotorcraft flight controls;	2	—	—	—	2	—	—
(c) System operation.	3	—	—	—	3	—	—
*13.8 Instruments **(ATA 31)***	3	—	—	3	—	—	—
*13.9 Lights **(ATA 33)***	3	3	—	—	—	—	—
*13.10 Onboard Maintenance Systems **(ATA 45)***	3	-	-	-	-	-	-
*13.11 Air Conditioning and Cabin Pressurisation **(ATA 21)***							
13.11.1. Air supply	2	-	-	-	-	-	2
13.11.2. Air Conditioning							
(a) Air-conditioning systems;	2	-	-	-	-	-	2
(b) Air cycle machines;	3	-	-	-	-	-	3
(c) Distribution systems;	1	-	-	-	-	-	1
(d) Control system.	3	-	-	-	-	-	3
13.11.3. Pressurisation	3						3
13.11.4. Safety and warning devices	3						3
*13.12 Fire Protection **(ATA 26)***							
(a) Fire detection, Fire-extinguishing, System tests;	3	-	-	-	-	-	3
(b) Portable fire extinguisher.	1	-	-	-	-	-	1
*13.13 Fuel Systems **(ATA 28, ATA 47)***							
(a) System layout;	1	-	-	-	-	-	1
(b) Fuel tanks;	1	-	-	-	-	-	1
(c) Supply systems;	1	-	-	-	-	-	1
(d) Dumping, venting and draining;	1	-	-	-	-	-	1

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL						
	B2	B2L Basic	B2L C/N	B2L Ins.	B2L A/F	B2L Sur.	B2L A/S
(e) Cross-feed and transfer;	2	-	-	-	-	-	2
(f) Indications and warnings;	3	-	-	-	-	-	3
(g) Refuelling and defuelling;	2	-	-	-	-	-	2
(h) Longitudinal-balance fuel systems;	3	-	-	-	-	-	3
(i) Inert gas system.	1	-	-	-	-	-	1
13.14 Hydraulic Power ***(ATA 29)***							
(a) System layout;	1	-	-	-	-	-	1
(b) Hydraulic fluids;	1	-	-	-	-	-	1
(c) Hydraulic reservoirs and accumulators;	1	-	-	-	-	-	1
(d) Pressure generation;	3	-	-	-	-	-	3
(e) Emergency pressure generation;	3	-	-	-	-	-	3
(f) Filters;	1	-	-	-	-	-	1
(g) Pressure control;	3	-	-	-	-	-	3
(h) Power distribution;	1	-	-	-	-	-	1
(i) Indication and warning systems;	3	-	-	-	-	-	3
(j) Interface with other systems;	3	-	-	-	-	-	3
(k) Servicing.	3	-	-	-	-	-	3
13.15 Ice and Rain Protection ***(ATA 30)***							
(a) Ice formation and detection;	2	-	-	-	-	-	2
(b) Anti-icing systems;	2	-	-	-	-	-	2
(c) De-icing systems;	3	-	-	-	-	-	3
(d) Rain repellent;	1	-	-	-	-	-	1
(e) Probe and drain-heating;	3	-	-	-	-	-	3
(f) Wiper systems.	1	-	-	-	-	-	1
13.16 Landing Gear ***(ATA 32)***							
(a) Construction, shock absorbing;	1	-	-	-	-	-	1
(b) Extension and retraction systems	3	-	-	-	-	-	3
(c) Indications and warnings;	3	-	-	-	-	-	3
(d) Wheels, brakes, antiskid and automatic braking systems;	3	-	-	-	-	-	3
(e) Tyres;	1	-	-	-	-	-	1
(f) Steering;	3	-	-	-	-	-	3
(g) Air–ground sensing.	3	-	-	-	-	-	3
13.17 Oxygen ***(ATA 35)***	3	-	-	-	-	-	3
13.18 Pneumatic/Vacuum ***(ATA 36)***							
(a) System layout;	2	-	-	-	-	-	2
(b) Sources;	2	-	-	-	-	-	2
(c) Pressure control;	3	-	-	-	-	-	3
(d) Distribution;	1	-	-	-	-	-	1
(e) Indications and warnings;	3	-	-	-	-	-	3
(f) Interface with other systems.	3	-	-	-	-	-	3
13.19 Water/Waste ***(ATA 38)***	2	-	-	-	-	-	2
13.20 Integrated Modular Avionics ***(ATA 42)***	3	-	-	-	-	-	-
13.21 Cabin Systems ***(ATA 44)***	3	-	-	-	-	-	-
13.22 Information Systems ***(ATA 46)***	3	-	-	-	-	-	-

MODULE 14. PROPULSION

MODULE 14. PROPULSION	LEVEL
	B2 B2L Instruments B2L Airframe & Systems
14.1 Engines	
(a) Turbine engines;	1
(b) Auxiliary power units (APUs);	1
(c) Piston engines;	1
(d) Electric and hybrid engines;	2
(e) Engine control;	2
14.2 Electric/Electronic Engine Indication Systems	2
14.3 Propeller Systems	2
14.4 Starting and Ignition Systems	2

MODULE 15. GAS TURBINE ENGINE

MODULE 15. GAS TURBINE ENGINE	LEVEL	
	A1 A3	B1.1 B1.3
15.1 Fundamentals	1	2
15.2 Engine Performance	—	2
15.3 Inlet	2	2
15.4 Compressors	1	2
15.5 Combustion Section	1	2
15.6 Turbine Section	2	2
15.7 Exhaust	1	2
15.8 Bearings and Seals	—	2
15.9 Lubricants and Fuels	1	2
15.10 Lubrication Systems	1	2
15.11 Fuel Systems	1	2
15.12 Air Systems	1	2
15.13 Starting and Ignition Systems	1	2
15.14 Engine Indication Systems	1	2
15.15 Alternate Turbine Constructions	—	1
15.16 ~~Turbo-prop~~Turboprop Engines	1	2
15.17 ~~Turbo-shaft~~Turboshaft Engines	1	2
15.18 Auxiliary Power Units (APUs)	1	2
15.19 Power Plant Installation	1	2
15.20 Fire Protection Systems	1	2
15.21 Engine Monitoring and Ground Operation	1	3
15.22 Engine Storage and Preservation	—	2

MODULE 16. PISTON ENGINE

MODULE 16. PISTON ENGINE	LEVEL	
	A2 A4	B1.2 B1.4 B3
16.1 Fundamentals	1	2
16.2 Engine Performance	1	2
16.3 Engine Construction	1	2
16.4 Engine Fuel Systems		
16.4.1 Carburettors	1	2
16.4.2 Fuel injection systems	1	2
16.4.3 Electronic engine control	1	2
16.5 Starting and Ignition Systems	1	2
16.6 Induction, Exhaust and Cooling Systems	1	2
16.7 Supercharging/Turbocharging	1	2
16.8 Lubricants and Fuels	1	2
16.9 Lubrication Systems	1	2
16.10 Engine Indication Systems	1	2
16.11 Power Plant Installation	1	2
16.12 Engine Monitoring and Ground Operation	1	3
16.13 Engine Storage and Preservation	—	2
16.14 Alternative Piston Engine Constructions	1	1

MODULE 17. PROPELLER

MODULE 17. PROPELLER	LEVEL	
	A1 A2	B1.1 B1.2 B3
17.1 Fundamentals	1	2
17.2 Propeller Construction	1	2
17.3 Propeller Pitch Control	1	2
17.4 Propeller Synchronising	—	2
17.5 Propeller Ice Protection	1	2
17.6 Propeller Maintenance	1	3
17.7 Propeller Storage and Preservation	1	2

MODULE 18. PRACTICAL ASSESSMENT

The candidate shall demonstrate the required competencies while performing a number of maintenance tasks decided by the training organisation or by the competent authority. During the assessment, the following two types of competencies shall be evaluated:

I) General competencies applicable to every licence category and related to the following aspects:

A. safety precautions — aircraft and workshop;
B. workshop practices;
C. the use of tools;
D. the use of maintenance data (AMM, SRM, IPC, etc.), engineering drawings, diagrams and standards;
E. Documentation and communication.

II) Competencies relevant to the licence category the candidate has applied for.

3. Basic training methods

An appropriate training method, or combination of methods, shall be determined for the entire course or for each of its modules or submodules, with regard to the scope and objectives of each training phase and in consideration of the benefits and limitations of the available training methods.

Multimedia-based training (MBT) methods may be used in order to achieve the training objectives either in a physical or in a virtually controlled environment.

GM to Section 1 of Appendix I

With respect to complex motor-powered aircraft, the applicant for an academic category C licence should provide either the examinations or credits for Modules 1 to 12 and 15 to 17 at B1 level (where there is a difference between B1.1/B1.2/B1.3/B1.4, the highest level should be chosen) or Modules 1 to 10, 13 and 14 at B2 level.

With respect to other than complex motor-powered aircraft, the applicant for an academic category C licence should provide either the examinations or credits for Modules 1 to 12 and 15 to 17 at any B1 level or Modules 1 to 10, 13 and 14 at B2 level.

AMC to Section 2 of Appendix I to Part-66 — Modularisation

MODULE 1. MATHEMATICS

MODULE 1. MATHEMATICS	LEVEL	
	A1 A2 A3 A4	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
1.2 *Algebra* (a) Evaluating simple algebraic expressions, addition, subtraction, multiplication and division, use of brackets, simple algebraic fractions;	1	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
1.3 *Geometry* (a) Simple geometrical constructions;	—	1
(b) Graphical representation: nature and uses of graphs, graphs of equations/functions;	2	2
(c) Simple trigonometry: trigonometrical relationships, use of tables and rectangular and polar coordinates.	—	2

MODULE 2. PHYSICS

MODULE 2. PHYSICS	LEVEL	
	A1 A2 A3 A4	B1 B2 B2L B3
2.1 *Matter* Nature of matter: the chemical elements, structure of atoms, molecules; Chemical compounds; States: solid, liquid and gaseous; Changes between states.	1	2
2.2 *Mechanics* 2.2.1 *Statics* Forces, moments and couples, representation as vectors; Centre of gravity; Elements of theory of stress, strain and elasticity: tension, compression, shear and torsion; Nature and properties of solid, fluid and gas matter; Pressure and buoyancy in liquids (barometers).	1	2
2.2.2 *Kinetics*	1	2

MODULE 2. PHYSICS	LEVEL A1 A2 A3 A4	LEVEL B1 B2 B2L B3
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
(b) Momentum, conservation of momentum; Impulse; Gyroscopic principles; Friction: nature and effects, coefficient of friction (rolling resistance).	1	2
2.2.4 *Fluid dynamics* (a) Specific gravity and density;	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
2.3 *Thermodynamics* (a) Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin; Heat definition;	2	2
(b) Heat capacity, specific heat; Heat transfer: convection, radiation and conduction; Volumetric expansion; First and second law of thermodynamics; Gases: ideal gases laws; specific heat at constant volume and constant pressure, work done by expanding gas; Isothermal, adiabatic expansion and compression, engine cycles, constant volume and constant pressure, refrigerators and heat pumps; Latent heats of fusion and evaporation, thermal energy, heat of combustion.	1	2
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
2.5 *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

MODULE 3. ELECTRICS FUNDAMENTALS

MODULE 3. ELECTRICS FUNDAMENTALS	LEVEL		
	A1 A2 A3 A4	B1 B2 B2L	B3
3.1 *Electron Theory* Structure and distribution of electrical charges within atoms, molecules, ions and compounds; Molecular structure of conductors, semiconductors and insulators.	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 in vacuum.	1	2	1
3.3 *Electricity — 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	1
3.4 *Generation of Electricity* Production of electricity by the following methods: light, heat, friction, pressure, chemical reaction, magnetism and motion.	1	1	1
3.5 *Sources of DC Electricity* Construction and basic chemical reaction of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, lithium cells, nickel cells other alkaline cells; Cells connected in series and in parallel; Internal resistance and its effect on a battery; Construction, materials and operation of thermocouples; Operation of photocells.	1	2	2
3.6 *DC Circuits* Ohm's law, Kirchhoff's voltage and current laws; Calculations using the above laws to find resistance, voltage and current; Significance of the internal resistance of a supply.	1	2	1
3.7 *Resistance/Resistor* (a) Resistance and factors that affect it; Specific resistance; Resistor colour code, values and tolerances, preferred values, wattage ratings; Resistors in series and in parallel; Calculation of total resistance using series, parallel and series–parallel combinations; Operation and use of potentiometers and rheostats; Operation of Wheatstone Bridge;	—	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	—
3.8 *Power*	—	2	1

MODULE 3. ELECTRICS FUNDAMENTALS	LEVEL A1 A2 A3 A4	LEVEL B1 B2 B2L	LEVEL B3
Power, work and energy (kinetic and potential); Dissipation of power by a resistor; Power formula; Calculations involving power, work and energy.			
3.9 *Capacitance/Capacitor* Operation and function of a capacitor; Factors that affect the 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 in parallel circuits; Exponential charge and discharge of a capacitor, time constants; Testing of capacitors.	—	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; Electromagnet construction and principles of operation; Handclasp rules to determine: magnetic field around current-carrying conductor;	—	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	1
3.11 *Inductance/Inductor* Faraday's law; Action of inducing a voltage in a conductor that moves 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 that affect mutual inductance: number of turns in coil, physical size of coil, permeability of coil, position of coils with respect to each other; Lenz's law and polarity determining rules; Back EMF, self-induction; Saturation point; Principal uses of inductors.	—	2	1
3.12 *DC Motor/Generator Theory*	—	2	1

MODULE 3. ELECTRICS FUNDAMENTALS	LEVEL		
	A1 A2 A3 A4	B1 B2 B2L	B3
Basic motor and generator theory; Construction and purpose of components in a DC generator; Operation of and factors that affect output and direction of current flow in DC generators; Operation of and factors that affect output power, torque, speed and direction of rotation of DC motors; Series wound, shunt wound and compound motors; Starter generator construction.			
3.13 *AC Theory* Sinusoidal waveform: phase, period, frequency, cycle; Instantaneous, average, root mean square, peak, peak-to-peak current values and calculations of these values in relation to voltage, current and power; Triangular/Square waves; Single-/Three-phase principles.	1	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	1
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; Line and phase voltages and currents; Power in a three-phase system; Primary and secondary current, voltage, turn ratio, power, efficiency; Auto-transformers.	—	2	1
3.16 *Filters* Operation, application and uses of the following filters: low pass, high pass, band pass, band stop.	—	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 connection advantages and uses; Permanent magnet generators.	—	2	1
3.18 *AC Motors* Construction, principles of operation and characteristics of: AC synchronous and induction motors both single-phase and polyphase; Methods of speed control and direction of rotation;	—	2	1

MODULE 3. ELECTRICS FUNDAMENTALS	LEVEL		
	A1 A2 A3 A4	B1 B2 B2L	B3
Methods of producing a rotating field: capacitor, shaded or split pole.			

MODULE 4. ELECTRONICS FUNDAMENTALS

MODULE 4. ELECTRONICS FUNDAMENTALS	LEVEL		
	A1 A2 A3 A4	B1 B3	B2 B2L
4.1 *Semiconductors* 4.1.1 *Diodes* (a) Diode symbols; Diode characteristics and properties; Diodes in series and in parallel; Main characteristics and use of silicon-controlled rectifiers (thyristors), light-emitting diodes (LEDs), photo-conductive diodes, rectifier diodes; Functional testing of diodes.	—	2	2
(b) Materials, electron configuration, electrical properties; P and N type materials: effects of impurities on conduction, majority and minority characters; P–N junction in a semiconductor, development of a potential across a P–N 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 (LED), 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
(b) Construction and operation of PNP and NPN transistors; Base, collector and emitter configurations; Testing of transistors; Basic appreciation of other transistor types, including types of FET and their uses; Application of transistors: amplifier classes (A, B, C); Simple circuits including: bias, decoupling, feedback and stabilisation; Multistage circuit principles: cascades, push–pull, oscillators, multivibrators, flip-flop circuits; Operation and amplifier stages connecting methods: resistive, capacitive, direct, inverting, non-inverting and adding.	—	—	2

MODULE 4. ELECTRONICS FUNDAMENTALS	LEVEL A1 A2 A3 A4	B1 B3	B2 B2L
4.1.3 *Integrated Circuits* (a) Description and operation of logic circuits and linear circuits/operational amplifiers;	—	1	2
(b) Introduction to operation and function of an operational amplifier used as: integrator, differentiator, voltage follower, comparator; 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 principles: open- and closed-loop systems, servomechanism, feedback, follow-up, null, overshoot, damping, deadband, hunting, proximity switches, analogue transducers, synchro systems and components, digital tachometers and encoders, inductance and capacitance transmitters;	—	1	2
(b) 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; Construction, operation and use of servomechanism and PID controller; Fault-finding of servo defects, reversal of synchro leads, hunting.	—	—	2

MODULE 5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS

MODULE 5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS	LEVEL A1 A2 A3 A4	B3	B1	B2 B2L
5.1 *Electronic Instrument Systems* Typical arrangements of systems and cockpit layout of electronic instrument systems.	1	1	1	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;	—	—	2	2

MODULE 5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS	LEVEL			
	A1 A2 A3 A4	B3	B1	B2 B2L
Applications used for aircraft systems, schematic diagrams.				
(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	1	2	2
(b) Computer operation, layout and interface of the major components in a microcomputer including their associated bus systems; Information contained in single- and multi-address instruction words; Memory-associated terms; Operation of typical memory devices; Operation, advantages and disadvantages of the various data storage systems.	—	—	—	2
5.7 *Microprocessors*	—	—	—	2
Functions performed and overall operation of a microprocessor; Basic operation of each of the following microprocessor elements: control and processing unit, clock, register, arithmetic logic unit.				
5.8 *Integrated Circuits*	—	—	—	2
Operation and use of encoders and decoders; Function of encoder types.				
5.9 *Multiplexing*	—	—	—	2
Operation, application and identification in logic diagrams of multiplexers and demultiplexers.				
5.10 *Fibre Optics*	—	—	1	2
Advantages and disadvantages of fibre optic data transmission over electrical wire propagation; Fibre optic data bus; Fibre-optic-related terms; Terminations; Couplers, control terminals, remote terminals; Application of fibre optics in aircraft systems.				
5.11 *Electronic Displays*	1	1	2	2
Principles of operation of common types of displays used in modern aircraft, including cathode-ray tubes (CRTs), light-emitting diodes (LEDs) and liquid crystal displays (LCDs).				
5.12 *Electrostatic-Sensitive Devices*	1	1	2	2
Special handling of components sensitive to electrostatic discharges; Awareness of risks and possible damage, component and personnel anti-static protection devices.				
5.13 *Software Management Control*	—	1	2	2
Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programs.				
5.14 *Electromagnetic Environment*	—	1	2	2

MODULE 5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS	LEVEL			
	A1 A2 A3 A4	B3	B1	B2 B2L
Influence of the following phenomena on maintenance practices for electronic systems: EMC — Electromagnetic Compatibility, EMI — Electromagnetic Interference, HIRF — High-Intensity Radiated Field, Lightning/lightning protection.				
5.15 *Typical Electronic/Digital Aircraft Systems*	1	1	1	1
General arrangement of typical electronic/digital aircraft systems and associated BITE (Built-In Test Equipment), such as: (a) ACARS — ARINC Communication and Addressing and Reporting System FBW — Fly-by-Wire FMS — Flight Management System IRS — Inertial Reference System; (b) ECAM — Electronic Centralised Aircraft Monitoring EICAS — Engine Indication and Crew Alerting System EFIS — Electronic Flight Instrument System GNSS — Global Navigation Satellite System TCAS — Traffic Alert Collision Avoidance System Integrated Modular Avionics Cabin Systems Information Systems				
5.16 *Cybersecurity*	1	1	1	1
Introduction of high-level concepts for aviation cybersecurity. Possible cybersecurity threat conditions in the aircraft maintenance domain.				

MODULE 6. MATERIALS AND HARDWARE

MODULE 6. MATERIALS AND HARDWARE	LEVEL		
	A1 A2 A3 A4	B1 B3	B2 B2L
6.1 *Aircraft Materials — Ferrous*			
(a) Characteristics, properties and identification of common alloy steels used in aircraft; Heat treatment and application of alloy steels.	1	2	1
(b) Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.	—	1	1
(c) Repair and inspection procedures for ferrous materials, structures and airframes.	—	2	1
6.2 *Aircraft Materials — Non-Ferrous*			

MODULE 6. MATERIALS AND HARDWARE	LEVEL A1 A2 A3 A4	LEVEL B1 B3	LEVEL B2 B2L
(a) Characteristics, properties and identification of common non-ferrous materials used in aircraft; Heat treatment and application of non-ferrous materials.	1	2	1
(b) Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.	—	1	1
(c) Repair and inspection procedures for non-ferrous materials, structures and airframes.	—	2	—
6.3 *Aircraft Materials — Composite and Non-Metallic* 6.3.1 *Composite and non-metallic materials other than wood and fabric* (a) Characteristics, properties and identification of common composite and non-metallic materials, other than wood, used in aircraft; Sealant and bonding agents.	1	2	2
(b) Detection of defects/deterioration in composite and non-metallic materials.	1	2	—
(c) Repair of and inspection procedures for composite and non-metallic materials, structures and airframes.	—	2	1
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 structures; Types of defects in wood material and wooden structures; Detection of defects in wooden structures; Repair of wooden structures.	1	2	—
6.3.3 *Fabric covering* Characteristics, properties and types of fabrics used in aeroplanes; Inspection methods for fabrics; Types of defects in fabrics; Repair of fabric covering.	—	2	—
6.4 *Corrosion* (a) Chemical fundamentals; Formation by: galvanic action process, microbiological contamination, mechanical stress.	1	1	1
(b) Types of corrosion and their identification; Causes of corrosion; Material types, and their susceptibility to corrosion.	2	3	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
6.5.2 *Bolts, studs and screws*	2	2	2

MODULE 6. MATERIALS AND HARDWARE	LEVEL A1 A2 A3 A4	LEVEL B1 B3	LEVEL B2 B2L
Bolt types: specification, identification and marking of aircraft bolts, international standards; Nuts: self-locking, anchor, standard types; Machine screws: aircraft specifications; Studs: types and uses, insertion and removal; Self-tapping screws, dowels.			
6.5.3 *Locking devices* Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick-release fasteners, keys, circlips, cotter pins.	2	2	2
6.5.4 *Aircraft rivets* Types of solid and blind rivets: specifications and identification, heat treatment.	1	2	1
6.6 *Pipes and Unions* (a) Identification and types of rigid and flexible pipes and their connectors used in aircraft;	2	2	2
(b) Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes.	2	2	1
6.7 *Springs* Types of springs, materials, characteristics and applications.	—	2	1
6.8 *Bearings* Purpose of bearings, loads, material, construction; Types of bearings and their application.	1	2	2
6.9 *Transmissions* Gear types and their application; Gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns; Belts and pulleys, chains and sprockets.	1	2	2
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
6.11 *Electrical Cables and Connectors* Cable types, construction and characteristics; High-tension and coaxial cables; Crimping; Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes.	1	2	2

MODULE 7. MAINTENANCE PRACTICES

MODULE 7. MAINTENANCE PRACTICES	LEVEL		
	A1 A2 A3 A4	B1 B3	B2 B2L
7.1 *Safety Precautions — Aircraft and Workshop* Aspects of safe working practices including precautions to be taken when working with electricity, gases (especially oxygen), oils, and chemicals. Fuel tank safety and fuel tank entry procedures and precautions. Awareness and precautions as regards aircraft equipped with ballistic recovery systems. Also, instructions 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 of fire-extinguishing agents.	3	3	3
7.2 *Workshop Practices* Care of tools, control of tools, use of workshop materials; Dimensions, allowances and tolerances, workmanship standards; 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 (Reserved)			
7.5 *Engineering Drawings, Diagrams and Standards* Drawing types and diagrams, their symbols, dimensions, tolerances and projections; Identification of 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 for 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; Connector pin removal and insertion; Coaxial 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;	1	3	3

MODULE 7. MAINTENANCE PRACTICES	LEVEL A1 A2 A3 A4	B1 B3	B2 B2L
High-Intensity Radiated Fields (HIRF) and protection principles; Soldering of electrical wires, 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 for 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	—
7.14.3 *Additive manufacturing* Common additive manufacturing techniques and their influence on the mechanical properties of the finished part; Inspection of additive manufactured parts and common production failures.	1	1	1
7.15 *(Reserved)*			
7.16 *Aircraft Weight and Balance* (a) Calculation of centre of gravity/balance limits: use of relevant documents.	—	2	2

MODULE 7. MAINTENANCE PRACTICES	LEVEL A1 A2 A3 A4	B1 B3	B2 B2L
(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, magnetic particle, ultrasonic and boroscope inspections; Including practical training in colour contrast penetrant inspection;	—	2	1
(d) Disassembly and reassembly techniques;	2	2	2
(e) Troubleshooting 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
7.21 *Documentation & Communication* Documentation: elements and criteria for writing of work reports, troubleshooting reports and shift handover instructions. Communication: clear, comprehensive and concise.	1	2	2

MODULE 8. BASIC AERODYNAMICS

MODULE 8. BASIC AERODYNAMICS	LEVEL	
	A1 A2 A3 A4 B3	B1 B2 B2L
8.1 *Physics of the Atmosphere* International Standard Atmosphere (ISA), and its application to aerodynamics.	1	2
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
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
8.4 *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 that affect airflow in engine intakes of high-speed aircraft; Effects of sweepback on critical Mach number.	1	2
8.5 *Flight Stability and Dynamics* Longitudinal, lateral and directional stability (active and passive).	1	2

MODULE 9. HUMAN FACTORS

MODULE 9. HUMAN FACTORS	LEVEL
	ALL
9.1 *General* The need to take human factors into account when performing maintenance; Incidents attributable to human factors/human error; Murphy's law.	2
9.2 *Human Performance and Limitations*	2

MODULE 9. HUMAN FACTORS	LEVEL ALL
Vision; Hearing; Information processing; Attention and perception; Memory; Claustrophobia and physical access.	
9.3 *Social Psychology* Accountability and responsibility: individual and group; Motivation and demotivation; Peer pressure; Cultural issues; Teamwork; Management, supervision and leadership.	1
9.4 *Factors that Affect Performance* Fitness/health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload, underload and workload management; Sleep and fatigue, shift work; Alcohol, medication, drug abuse; Lack of manpower.	2
9.5 *Physical Environment* Noise and fumes; Illumination; Climate and temperature; Motion and vibration; Working environment; Situational awareness.	1
9.6 *Tasks* Physical work; Repetitive tasks, complacency; Visual inspection; Complex systems; Critical maintenance tasks and error-capturing methods; Technical documentation — access, use and quality.	1
9.7 *Communication* Within and between teams; Work logging and recording; Shift handover; Keeping up to date, currency; Dissemination of information.	2
9.8 *Human Error* Error models and theories; Types of error in maintenance tasks;	2

MODULE 9. HUMAN FACTORS	LEVEL ALL
Implications of errors (e.g. accidents); Organisational errors; Avoiding and managing errors.	
9.9 *Safety Management* Risk management; Occurrence reporting; Safety culture Just culture; Identifying, avoiding and reporting hazards; Organisational human factors programme: professionalism and integrity, error-provoking behaviour, reporting errors, disciplinary policy, error investigation, action to address problems, feedback, assertiveness; Dealing with emergencies.	2
9.10 *The 'Dirty Dozen' and Risk Mitigation* The 'Dirty Dozen' — the twelve most common human-factor errors in maintenance: Lack of communication, Lack of teamwork, Lack of assertiveness, Complacency, Fatigue, Stress, Lack of knowledge, Lack of resources, Lack of awareness, Distraction, Pressure, Norms. Risk-mitigation methods.	2

MODULE 10. AVIATION LEGISLATION

MODULE 10. AVIATION LEGISLATION	LEVEL A1 A2 A3 A4	LEVEL B1 B2 B2L B3
10.1 *Regulatory Framework* Role of: — the International Civil Aviation Organization (ICAO); — the European Commission (EC); — the European Union Aviation Safety Agency (EASA); — the European Union Member States and national aviation authorities; — the bilateral agreements concluded by the European Commission; — Regulation (EU) 2018/1139 (the Basic Regulation) and its implementing acts: Regulations (EU) No 748/2012 (Initial Airworthiness) and (EU) No 1321/2014 (Continuing Airworthiness);	1	1

MODULE 10. AVIATION LEGISLATION	LEVEL A1 A2 A3 A4	LEVEL B1 B2 B2L B3
— the relationship between the regulations (hard law) and the AMC, GM and CSs (soft law); — the occurrence reporting according to Regulation (EU) No 376/2014; — the relationship between the various Annexes (Parts) relating to Initial and Continuing Airworthiness (such as Part 21, Part-M, Part-145, Part-66, Part-147, Part-T, Part-ML, Part-CAMO and Part-CAO) and Regulations (EU) No 965/2012 (the Air Operations Regulation) and (EU) No 1178/2011 (the Air Crew Regulation).		
10.2 *Certifying Staff — Maintenance* Deep understanding of Part-66 maintenance licences with the associated privileges and authorisations, and how to exercise them properly for the different aircraft categories.	2	3
10.3 *Approved Maintenance Organisations* General understanding of Part-145 and Part-CAO.	2	2
10.4 *Independent Certifying Staff* Privileges, responsibilities, record-keeping, limitations and oversight according to Part-M, Part-66 and Part-ML.	-	3
10.5 *Air Operations* General understanding of Regulation (EU) No 965/2012 (the Air Operations Regulation); Differences between commercial and non-commercial air operations and their influence on aircraft maintenance; Air Operator Certificates (AOCs) and self-declaration authorisations; Air operator responsibilities, in particular regarding continuing airworthiness and maintenance; Specialised operations/specific approvals: ETOPS; CAT I/II/III and BRNAV.	1	1
Minimum Equipment List (MEL) and Configuration Deviation List (CDL); Aircraft placarding and markings; Documents to be carried on board: — Certificate of Airworthiness / Restricted Certificate of Airworthiness; — Airworthiness Review Certificate; — Permit to Fly; — Certificate of Registration; — Noise Certificate; — Weight and Balance report; — Radio Station Licence.	-	2
10.6 *Certification of Aircraft, Parts and Appliances* Basic understanding of Part 21 and the following EASA certification specifications: CS-22, CS-23, CS-25, CS-27, CS-29 and CS-STAN.	—	1
10.7 *Continuing Airworthiness* General understanding of the Part 21 provisions on continuing airworthiness; General understanding of Part-M, Part-ML and Part-CAMO; Aircraft Maintenance Programme.	2	2
10.8 *Oversight principles and Safety Management Systems in Continuing Airworthiness*	1	1
10.9 *Maintenance and certification beyond current EU regulations (if not superseded by EU requirements)*	-	1

MODULE 10. AVIATION LEGISLATION	LEVEL A1 A2 A3 A4	LEVEL B1 B2 B2L B3
Maintenance of European Union aircraft that are not within the scope of Regulation (EU) 2018/1139 (Annex I aircraft); European military airworthiness requirement licence (EMAR) 66; Applicable national and international requirements for component maintenance, welding, painting, NDT, etc. (if not superseded by EU requirements).		
10.10 *Cybersecurity* Regulation (EU) …/… on the introduction of organisation requirements for the management of information security risks related to aeronautical information systems used in civil aviation	1	1

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL A1	A2	B1.1	B1.2	B3
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	1	2	2	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 provisions; Aircraft bonding.	2	2	2	2	2
(b) Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, skinning, anti-corrosive protection, wing, empennage and engine attachments;	1	1	2	2	2

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL				
	A1	A2	B1.1	B1.2	B3
Structure assembly techniques: riveting, bolting, bonding; Methods of surface protection, such as chromating, anodising, painting; Surface cleaning; Airframe symmetry: methods of alignment and symmetry checks.					
11.3 *Airframe Structures — Aeroplanes* 11.3.1 *Fuselage, Doors, Windows (**ATA 52/53/56**)* (a) 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.	1	1	2	2	1
(b) Airborne towing devices (glider, banner, target).	1	1	1	1	1
(c) Doors and emergency exits: safety devices; Cargo loading system.	1	1	2	1	-
11.3.2 *Wings (**ATA 57**)* Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.	1	1	2	2	1
11.3.3 *Stabilisers (**ATA 55**)* Construction; Control surface attachment.	1	1	2	2	1
11.3.4 *Flight Control Surfaces (**ATA 55/57**)* Construction and attachments; Balancing — mass and aerodynamics.	1	1	2	2	1
11.3.5 *Nacelles/Pylons (**ATA 54**)* Nacelles/Pylons: — Construction, — Firewalls, — Engine mounts.	1	1	2	2	1
11.4 *Air Conditioning and Cabin Pressurisation (**ATA 21**)* 11.4.1 *Heating and ventilation systems*	-	1	-	3	1
11.4.2 *Air conditioning and pressurisation systems* Air-conditioning systems; Pressurisation systems; Cabin pressure controllers.	1	1	3	3	-
11.4.3 *Air supply and air conditioning* Sources of air supply including engine bleed, APU and ground cart; Air cycle and vapour cycle machines;	1	-	3	-	-

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL				
	A1	A2	B1.1	B1.2	B3
Distribution systems; Flow, temperature and humidity control system; Control and indication including control and safety valves.					
11.4.4 *Safety and warning devices* Protection and warning devices.	1	1	3	3	-
11.5 *Instruments / Avionics Systems* 11.5.1 *Instrument Systems (**ATA 31**)* Pitot static: altimeter, airspeed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Angle-of-attack indication, stall-warning systems; Glass cockpit; Indications of other aircraft systems	1	1	2	2	2
11.5.2 *Avionics Systems* Fundamentals of system layouts and operation of: Autoflight (**ATA 22**); Communications (**ATA 23**): — Very High Frequency (VHF) communications, — High Frequency (HF) communications, — Satellite Communications (SATCOM), — Controller–pilot data link communications (CPDLC), — Audio systems, — Emergency Locator Transmitters (ETLs), — Cockpit Voice Recorder (CVR); Navigation Systems (**ATA 34**): — 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), — Area navigation (RNAV) systems, — Flight Management Systems, — Satellite Navigation Systems, — 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; Types and use of avionics general test equipment.	1	1	1	1	1
11.6 *Electrical Power (**ATA 24**)*	1	1	3	3	3

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL				
	A1	A2	B1.1	B1.2	B3
Installation and operation of batteries; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers; Circuit protection; External/Ground power.					
11.7 *Equipment and Furnishings (**ATA 25**)* (a) Emergency equipment requirements; Seats, harnesses and belts.	2	2	2	2	2
(b) Cabin layout; Equipment layout; Cabin furnishing installation; Galley installation; Cargo handling and retention equipment; Airstairs.	1	1	1	1	-
11.8 *Fire Protection (**ATA 26**)* (a) Fire and smoke detection and warning systems; Fire-extinguishing systems; System tests.	1	1	1	1	-
(b) Portable fire extinguisher.	1	1	1	1	1
11.9 *Flight Controls (**ATA 27**)* (a) Primary controls: aileron, elevator, rudder, spoiler; Trim control, trim tabs; High-lift devices; System operation: manual; Gust locks and gust lock systems; Artificial feel, yaw damper, Mach trim, rudder limiter; Balancing and rigging; Stall-warning system.	1	1	3	3	2
(b) Active load control; Lift dump, speed brakes; Hydraulic, pneumatic, electrical, fly-by-wire systems; Stall protection.	1	-	3	-	-
11.10 *Fuel Systems (**ATA 28, ATA 47**)* (a) System layout; Fuel tanks; Supply systems; Indications and warnings; Refuelling and defuelling;	1	1	3	3	1

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL				
	A1	A2	B1.1	B1.2	B3
Cross-feed and transfer.					
(b) Dumping, venting and draining; Longitudinal balance fuel systems; Inert gas systems.	1	-	3	-	-
11.11 *Hydraulic Power (**ATA 29**)* (a) System layout; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric and mechanical; Filters; Pressure control; Power distribution; Indication and warning systems; Servicing.	1	1	3	3	2
(b) Pressure generation: pneumatic; Emergency pressure generation; Interface with other systems.	1	-	3	-	-
11.12 *Ice and Rain Protection (**ATA 30**)* (a) Ice formation, classification and detection; De-icing systems: electrical, hot-air, pneumatic and chemical; Probe and drain heating; Wiper systems.	1	1	3	3	1
(b) Rain repellent; Anti-icing systems: electrical, hot-air and chemical.	1	-	3	-	-
11.13 *Landing Gear (**ATA 32**)* (a) Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering; Tail protection (skids).	2	2	3	3	2
(b) Air–ground sensing.	2	-	3	-	-
11.14 *Lights (**ATA 33**)* External: navigation, anticollision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	2	2	3	3	2

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL				
	A1	A2	B1.1	B1.2	B3
11.15 *Oxygen* ***(ATA 35)*** System layout: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	1	1	3	3	2
11.16 *Pneumatic/Vacuum* ***(ATA 36)*** System layout; Sources: engine/APU (Auxiliary Power Unit), compressors, reservoirs, ground supply; Pressure and vacuum pumps; Pressure control; Distribution; Indications and warnings; Interface with other systems.	1	1	3	3	2
11.17 *Water/Waste* ***(ATA 38)*** Water system layout, supply, distribution, servicing and draining; Toilet system layout, flushing and servicing; Corrosion aspects.	2	2	3	3	2
11.18 *Onboard 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* ***(ATA 42)*** Functions that may be typically integrated in the Integrated Modular Avionics (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc.; Core system; network components.	1	-	2	-	-
11.20 *Cabin Systems* ***(ATA 44)*** The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System (CIDS)) and between the aircraft cabin and ground stations (Cabin Network Service (CNS)). They include voice, data, music and video transmissions. The CIDS provides an interface between cockpit/cabin crew and cabin systems. These systems support data exchange between the different related Line Replaceable Units (LRUs) and they are typically operated via Flight Attendant Panels (FAPs). The CNS typically consists of a server which interfaces, among others, with the following systems:	1	-	2	-	-

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL				
	A1	A2	B1.1	B1.2	B3
— Data/Radio Communication; — Cabin Core System (CCS); — In-Flight Entertainment System (IFES); — External Communication System (ECS); — Cabin Mass Memory System (CMMS); — Cabin Monitoring System (CMS); — Miscellaneous Cabin Systems (MCSs). The CNS may host functions such as: — access to predeparture/departure reports; — email/intranet/internet access; passenger database; — In-Flight Entertainment System; — External Communication System; — Cabin Mass Memory System; — Cabin Monitoring System; — Miscellaneous Cabin System.					
11.21 *Information Systems (**ATA 46**)* The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. The information systems include units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. The information systems do not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display. Typical examples include Air Traffic and Information Management Systems 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 12. ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS

MODULE 12. ROTORCRAFT 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 setting, 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-rotor 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
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;	2	2

MODULE 12. ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL A3 A4	LEVEL B1.3 B1.4
System installation provisions; Lightning strike protection provisions.		
(b) Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, 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/Avionics Systems* 12.7.1 *Instrument Systems (**ATA 31**)* Pitot static: altimeter, airspeed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Vibration indicating systems / health and usage monitoring systems (HUMS); Glass cockpit; Indications of other aircraft systems	1	2
12.7.2 *Avionics Systems* Fundamentals of system layouts and operation of: Autoflight (**ATA 22**); Communications (**ATA 23**): — Very High Frequency (VHF) communications, — High Frequency (HF) communications, — Satellite communications (SATCOM), — Controller–pilot data link communications (CPDLC), — Audio systems,	1	1

MODULE 12. ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL A3 A4	LEVEL B1.3 B1.4
— Emergency Locator Transmitters (ELTs), — Cockpit Voice Recorder (CVR); Navigation Systems (**ATA 34**): — 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), — Area navigation (RNAV) systems, — Flight Management Systems, — Satellite Navigation Systems, — 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. Types and use of avionics general test equipment.		
12.8 *Electric Power (**ATA 24**)* Installation and operation of batteries; 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 layout, cargo retention; Equipment layout; Cabin furnishing installation.	1	1
12.10 *Fire Protection (**ATA 26**)* (a) Fire and smoke detection and warning systems; Fire-extinguishing systems; System tests.	1	3
(b) Portable fire extinguishers.	1	1
12.11 *Fuel Systems (**ATA 28**)*	1	3

MODULE 12. ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL	
	A3 A4	**B1.3 B1.4**
System layout; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling.		
12.12 *Hydraulic Power (**ATA 29**)* System layout; 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; Servicing.	1	3
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; Internal: cabin, cockpit, cargo; Emergency.	2	3
12.16 *(Reserved)*		
12.17 *Integrated Modular Avionics (**ATA 42**)*	1	2

MODULE 12. ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL A3 A4	LEVEL B1.3 B1.4
Functions that may be typically integrated in the Integrated Modular Avionics (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc.; Core System; Network Components.		
12.18 *Onboard Maintenance Systems (**ATA 45**)* Central maintenance computers; Data-loading system; Electronic library system.	1	2
12.19 *Information Systems (**ATA 46**)* The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. They include units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. They do not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display. Typical examples include Air Traffic and Information Management Systems and Network Server Systems. Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Miscellaneous Information System.	1	2

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS

C/N: Communication & Navigation; Ins.: Instruments; A/F: Autoflight; Sur.: Surveillance; A/S: Airframe & Systems

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL B2	B2L Basic	B2L C/N	B2L Ins.	B2L A/F	B2L Sur.	B2L A/S
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, and — yaw control: rudder limiters; Control using elevons, ruddervators; High-lift devices: slots, slats, flaps; Drag-inducing devices: spoilers, lift dumpers, speed brakes;	1	1	-	-	-	-	-

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL						
	B2	B2L Basic	B2L C/N	B2L Ins.	B2L A/F	B2L Sur.	B2L A/S
Operation and effect of trim tabs, servo tabs and control surface bias.							
(b) *Rotary Wing Aerodynamics* Terminology; Operation and effect of cyclic, collective and anti-torque controls.	1	1	-	-	-	-	-
13.2 *Structures — General Concepts* (a) Fundamentals of structural systems;	1	1	-	-	-	-	-
(b) Zonal and station identification systems;	2	2	-	-	-	-	-
(c) Electrical bonding;	2	2	-	-	-	-	-
(d) Lightning strike protection provisions.	2	2	-	-	-	-	-
13.3 *Autoflight (**ATA 22**)*							
(a) 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.	3	-	-	-	3	-	-
(b) 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**)*							
(a) Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter; Working principles of the following systems: — Very High Frequency (VHF) communications; — High Frequency (HF) communications; — Satellite communications (SATCOM); — Controller–pilot data link communications (CPDLC); — Audio systems; — Emergency Locator Transmitters (ELTs); — Cockpit Voice Recorder (CVR); — Very High Frequency Omnidirectional Range (VOR); — Automatic Direction Finding (ADF); — Instrument Landing System (ILS); — Flight Director Systems (FDSs), Distance-Measuring Equipment (DME);	3	-	3	-	-	-	-

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL						
	B2	B2L Basic	B2L C/N	B2L Ins.	B2L A/F	B2L Sur.	B2L A/S
— Area navigation (RNAV) systems; — Flight Management Systems (FMSs); — Global Navigation Satellite Systems (GNSSs), Global Positioning System (GPS), Ground-based Augmentation System (GBAS), Satellite-based Augmentation System (SBAS) such as the European Geostationary Navigation Overlay Service (EGNOS) and the Wide Area Augmentation System (WAAS); — Data Link and Two-Way Data Link.							
(b) — Air Traffic Control transponder, secondary surveillance radar; — Traffic Alert and Collision Avoidance System (TCAS); — Weather avoidance radar; — Radio altimeter; — Automatic Dependent Surveillance — Broadcast (ADS-B) and its other associated services such as FIS-B, TIS-B and multilink; — Inertial Navigation System (INS); — ARINC (Aircraft Radio Incorporated) communication and reporting.	3	-	-	-	-	3	-
13.5 *Electric Power (**ATA 24**)*							
Installation and operation of batteries; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection; External/Ground power.	3	3	-	-	-	-	-
13.6 *Equipment and Furnishings (**ATA 25**)*							
Electronic emergency equipment requirements.	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	-	-	-	2	-	-
(b)	2	-	-	-	2	-	-

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL						
	B2	B2L Basic	B2L C/N	B2L Ins.	B2L A/F	B2L Sur.	B2L A/S
Rotorcraft controls: cyclic control, collective control, swashplate, yaw control.							
(c)	3	-	-	-	3	-	-
System operation: electrical, fly-by-wire.							
13.8 *Instruments (**ATA 31**)*	3	-	-	3	-	-	-
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;							
Gyroscopic principles;							
Artificial horizons;							
Slip indicators;							
Directional gyros;							
Ground Proximity Warning Systems (GPWSs);							
Compass systems;							
Flight Data Recording Systems (FDRSs);							
Electronic Flight Instrument Systems (EFISs) — typical system arrangements and cockpit layout;							
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;							
Types and use of avionics general test equipment.							
13.9 *Lights (**ATA 33**)*							
External: navigation, landing, taxiing, ice;	3	3	-	-	-	-	-
Internal: cabin, cockpit, cargo;							
Emergency.							
13.10 *Onboard Maintenance Systems (**ATA 45**)*							
Central maintenance computers;	3	-	-	-	-	-	-
Data-loading system;							
Electronic library system;							
Printing system;							

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL						
	B2	B2L Basic	B2L C/N	B2L Ins.	B2L A/F	B2L Sur.	B2L A/S
Structure monitoring system (damage-tolerance monitoring).							
13.11 *Air Conditioning and Cabin Pressurisation (**ATA 21**)*							
13.11.1. *Air supply*	2						2
Sources of air supply including engine bleed, APU and ground cart.							
13.11.2. *Air Conditioning*							
(a) Air-conditioning systems;	2	-	-	-	-	-	2
(b) Air cycle and vapour cycle machines;	3	-	-	-	-	-	3
(c) Distribution systems;	1	-	-	-	-	-	1
(d) Flow, temperature and humidity control system.	3	-	-	-	-	-	3
13.11.3. *Pressurisation*	3						3
Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers.							
13.11.4. *Safety and warning devices*	3						3
Protection and warning devices.							
13.12 *Fire Protection (**ATA 26**)*							
(a) Fire and smoke detection and warning systems; Fire-extinguishing systems; System tests.	3	-	-	-	-	-	3
(b) Portable fire extinguisher.	1	-	-	-	-	-	1
13.13 *Fuel Systems (**ATA 28, ATA 47**)*							
(a) System layout;	1	-	-	-	-	-	1
(b) Fuel tanks;	1	-	-	-	-	-	1
(c) Supply systems;	1	-	-	-	-	-	1
(d) Dumping, venting and draining;	1	-	-	-	-	-	1
(e) Cross-feed and transfer;	2	-	-	-	-	-	2
(f) Indications and warnings;	3	-	-	-	-	-	3
(g) Refuelling and defuelling;	2	-	-	-	-	-	2
(h) Longitudinal balance fuel systems;	3	-	-	-	-	-	3
(i) Inert gas system.	1	-	-	-	-	-	1
13.14 *Hydraulic Power (**ATA 29**)*							
(a) System layout;	1	-	-	-	-	-	1
(b) Hydraulic fluids;	1	-	-	-	-	-	1
(c) Hydraulic reservoirs and accumulators;	1	-	-	-	-	-	1

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL						
	B2	B2L Basic	B2L C/N	B2L Ins.	B2L A/F	B2L Sur.	B2L A/S
(d) Pressure generation: electrical, mechanical, pneumatic;	3	-	-	-	-	-	3
(e) Emergency pressure generation;	3	-	-	-	-	-	3
(f) Filters;	1	-	-	-	-	-	1
(g) Pressure control;	3	-	-	-	-	-	3
(h) Power distribution;	1	-	-	-	-	-	1
(i) Indication and warning systems;	3	-	-	-	-	-	3
(j) Interface with other systems;	3	-	-	-	-	-	3
(k) Servicing.	3	-	-	-	-	-	3
13.15 *Ice and Rain Protection (**ATA 30**)*							
(a) Ice formation, classification and detection;	2	-	-	-	-	-	2
(b) Anti-icing systems: electrical, hot-air, chemical;	2	-	-	-	-	-	2
(c) De-icing systems: electrical, hot-air, pneumatic, chemical;	3	-	-	-	-	-	3
(d) Rain repellent;	1	-	-	-	-	-	1
(e) Probe and drain heating;	3	-	-	-	-	-	3
(f) Wiper systems.	1	-	-	-	-	-	1
13.16 *Landing Gear (**ATA 32**)*							
(a) Construction, shock absorbing;	1	-	-	-	-	-	1
(b) Extension and retraction systems: normal and emergency;	3	-	-	-	-	-	3
(c) Indications and warnings;	3	-	-	-	-	-	3
(d) Wheels, brakes, antiskid and automatic braking systems;	3	-	-	-	-	-	3
(e) Tyres;	1	-	-	-	-	-	1
(f) Steering;	3	-	-	-	-	-	3
(g) Air–ground sensing.	3	-	-	-	-	-	3
13.17 *Oxygen (**ATA 35**)* System layout: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	3	-	-	-	-	-	3
13.18 *Pneumatic/Vacuum (**ATA 36**)*							
(a) System layout;	2	-	-	-	-	-	2
(b) Sources: engine/APU, compressors, reservoirs, ground supply;	2	-	-	-	-	-	2
(c) Pressure control;	3	-	-	-	-	-	3
(d) Distribution;	1	-	-	-	-	-	1
(e) Indications and warnings;	3	-	-	-	-	-	3
(f) Interfaces with other systems.	3	-	-	-	-	-	3
13.19 *Water/Waste (**ATA 38**)*							

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL						
	B2	B2L Basic	B2L C/N	B2L Ins.	B2L A/F	B2L Sur.	B2L A/S
Water system layout, supply, distribution, servicing and draining; Toilet system layout, flushing and servicing.	2	-	-	-	-	-	2
13.20 *Integrated Modular Avionics (**ATA 42**)* Core system; Network components; *Note:* Functions that may be typically integrated into the Integrated Modular Avionics (IMA) modules are, among others: — Beed 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 Built-In Test Equipment (BITE); — Fuel management; — Braking control; — Steering control; — Landing gear extension and retraction; — Tyre pressure indication; — Oleo pressure indication; — Brake temperature monitoring.	3	-	-	-	-	-	-
13.21 *Cabin Systems (**ATA 44**)* The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System (CIDS)) and between the aircraft cabin and ground stations (Cabin Network Service (CNS)). They include voice, data, music and video transmissions. The CIDS provides an interface between cockpit/cabin crew and cabin systems. These systems support data exchange between the different related Line Replaceable Units (LRUs) and they are typically operated via Flight Attendant Panels (FAPs). The CNS typically consists of a server which interfaces, among others, with the following systems: — Data/Radio Communication; — Cabin Core System (CCS); — In-Flight Entertainment System (IFES); — External Communication System (ECS); — Cabin Mass Memory System (CMMS);	3	-	-	-	-	-	-

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	LEVEL						
	B2	B2L Basic	B2L C/N	B2L Ins.	B2L A/F	B2L Sur.	B2L A/S
— Cabin Monitoring System (CMS); — Miscellaneous Cabin Systems (MCSs). The CNS may host functions such as: — access to predeparture/departure reports; — email/intranet/internet access; — passenger database.							
13.22 *Information Systems (**ATA 46**)* The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. They include units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller, but they do not include units or components installed for other uses and shared with other systems, such as flight deck printer or general-use display. Typical examples include: — Air Traffic and Information Management Systems and Network Server Systems; — Aircraft General Information System; — Flight Deck Information System; — Maintenance Information System; — Passenger Cabin Information System; — Miscellaneous Information Systems.	3	-	-	-	-	-	-

MODULE 14. PROPULSION

MODULE 14. PROPULSION	LEVEL B2 B2L Instruments B2L Airframe & Sys
14.1 *Engines*	
(a) Constructional arrangement and operation of turbojet, turbofan, turboshaft and turboprop engines;	1
(b) Constructional arrangement and operation of auxiliary power units (APUs);	1
(c) Constructional arrangement and operation of piston engines;	1
(d) Constructional arrangement and operation of electric and hybrid engines, their electric energy storage and control systems;	2
(e) Electronic engine control and fuel-metering systems (full authority digital engine control (FADEC)).	2
14.2 *Electric/Electronic Engine Indication Systems*	2

MODULE 14. PROPULSION	LEVEL B2 B2L Instruments B2L Airframe & Sys
Exhaust gas temperature / Interstage turbine temperature systems; Cylinder head temperature, engine coolant temperature, engine speed; Engine thrust indication: engine pressure ratio, engine turbine discharge pressure or jet pipe pressure systems; Vibration measurement systems; Oil pressure and temperature; Fuel pressure, temperature and flow; Manifold pressure; Engine torque.	
14.3 *Propeller Systems* Propeller speed indication; Speed control and pitch change methods, electrical/electronic; Synchronising and synchrophasing equipment; Electrical anti-icing/de-icing equipment.	2
14.4 *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	
	A1 A3	B1.1 B1.3
15.1 *Fundamentals* Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; The relationship between force, work, power, energy, velocity and acceleration; Constructional arrangement and operation of turbojet, turbofan, turboshaft, turboprop and geared turbofan.	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

MODULE 15. GAS TURBINE ENGINE	LEVEL A1 A3	LEVEL B1.1 B1.3
15.4 *Compressors* Axial and centrifugal types; Constructional features, 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
15.9 *Lubricants and Fuels* Properties and specifications of standard, alternate and drop-in fuel; Properties and specifications of lubricants; Fuel additives; Safety precautions.	1	2
15.10 *Lubrication Systems* System operation/layout and components.	1	2
15.11 *Fuel Systems* Operation of engine control and fuel-metering systems including electronic engine control (full authority digital engine control (FADEC)) and electronic power augmentation; System layout 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*	1	2

MODULE 15. GAS TURBINE ENGINE	LEVEL A1 A3	LEVEL B1.1 B1.3
Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements.		
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 *Alternate turbine constructions* Geared Turbofan (GTF); Variable fan blades; Open rotor/propfan; Hybrid turbine-electric concepts and electric power augmentation; Future trends and developments.	—	1
15.16 *Turboprop Engines* Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Overspeed safety devices.	1	2
15.17 *Turboshaft 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 *Power Plant 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
15.20 *Fire Protection Systems* Operation of fire-detection and fire-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 the engine manufacturer;	1	3

MODULE 15. GAS TURBINE ENGINE	LEVEL A1 A3	LEVEL B1.1 B1.3
Compressor washing/cleaning; Foreign object damage (FOD).		
15.22 *Engine Storage and Preservation* Preservation and depreservation for the engine and its accessories/systems.	—	2

MODULE 16. PISTON ENGINE

MODULE 16. PISTON ENGINE	LEVEL A2 A4	LEVEL B1.2 B1.4 B3
16.1 *Fundamentals* Mechanical, thermal and volumetric efficiencies; Operating principles: 2-stroke, 4-stroke, Otto, Diesel, and Rotary (Wankel); Piston displacement and compression ratio; Engine configuration and firing order.	1	2
16.2 *Engine Performance* Power calculation and measurement; Factors that affect engine power; Mixtures/leaning, pre-ignition.	1	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
16.4 *Engine Fuel Systems* 16.4.1 *Carburettors* Types, construction and principles of operation; Icing and heating.	1	2
16.4.2 *Fuel injection systems* Types, construction and principles of operation.	1	2
16.4.3 *Electronic engine control* Operation of engine control and fuel-metering systems including electronic engine control (full authority digital engine control (FADEC)); System layout and components.	1	2
16.5 *Starting and Ignition Systems* Starting systems, preheat systems; Magneto types, construction and principles of operation; Ignition harnesses, spark plugs;	1	2

MODULE 16. PISTON ENGINE	LEVEL A2 A4	LEVEL B1.2 B1.4 B3
Low- and high-tension systems.		
16.6 *Induction, Exhaust and Cooling Systems* Construction and operation of induction systems including alternate air systems; Exhaust systems, engine cooling systems — air and liquid.	1	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
16.8 *Lubricants and Fuels* Properties and specifications of standard, alternate and drop-in fuel; Properties and specifications of lubricants; Fuel additives; Safety precautions.	1	2
16.9 *Lubrication Systems* System operation/layout and components.	1	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
16.11 *Power Plant 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
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
16.13 *Engine Storage and Preservation* Preservation and depreservation for the engine and its accessories/systems.	—	2
16.14 *Alternate Piston Engine Constructions* Hybrid piston-electric concepts and electric power augmentation.	1	1

MODULE 17. PROPELLER

MODULE 17. PROPELLER	LEVEL	
	A1 A2	B1.1 B1.2 B3
17.1 *Propeller 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/thrust face 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 18. PRACTICAL ASSESSMENT

I. General competencies

A. Safety precautions — aircraft and workshop:

Working practices with:

— electricity;

— gases, especially oxygen;

— oils and chemicals;

— fuel tank safety, fuel tank entry procedures and precautions;

— aircraft jacking, chocking and securing;

— ground supplies of electrical, hydraulic and pneumatic energy.

B. Workshop practices:

— Care and control of tools;

— Use of workshop equipment and materials;

— Use and handling of calibrated tools and equipment.

C. Use of tools:

— Handling of hand-tool types;

— Handling of power-tool types;

— Operation and use of precision-measuring tools;

— Lubrication equipment;

— Operation, function and use of electrical/general test equipment as well as common avionics test equipment when assessed for B2.

D. Use of maintenance data (AMM, SRM, IPC, etc.), engineering drawings, diagrams and standards:

— Understanding and application of maintenance instructions;

— Use of symbols, tolerances and projections;

— Identification of title block information;

— Use of the Air Transport Association (ATA) Specification 100 (including ISO, AN, MS, NAS and MIL);

— Use of wiring and schematic diagrams;

— Conversion of units for size, volume, weight, and momentum.

E. Documentation and communication:

— Use of the applicable documentation;

— Writing of work reports, aircraft technical logs and troubleshooting reports;

— Demonstration of good oral and written communication during shift handover;

— Demonstration of clear and comprehensive communication with colleagues.

II. Competencies related to the licence category the candidate applies for

Table (a) applicable to the licence categories A1, A2, A3 and A4:

Table (a)

#	AMM or SRM Task
(1)	Replacement of wheel assemblies
(2)	Replacement of wheel brake units
(3)	Replacement of emergency equipment
(4)	Replacement of ovens, boilers and beverage makers
(5)	Replacement of internal and external lights, filaments and flash tubes
(6)	Replacement of windscreen wiper blades
(7)	Replacement of passenger and cabin crew seats, seat belts and harnesses
(8)	Closing of cowlings and refitment of quick access inspection panels
(9)	Replacement of toilet system components but excluding gate valves
(10)	Simple repairs and replacement of internal compartment doors and placards but excluding doors that form part of a pressure structure
(11)	Simple repairs and replacement of overhead storage compartment doors and cabin furnishing items
(12)	Replacement of static wicks
(13)	Replacement of aircraft main and APU batteries
(14)	Replacement of in-flight entertainment system components other than public address
(15)	Routine lubrication and replenishment of all system fluids and gases
(16)	Deactivation only of subsystems and aircraft components as permitted by the operator's minimum equipment list where such deactivation is agreed by the competent authority as a simple task
(17)	Inspection for and removal of de-icing/anti-icing fluid residues, including removal/closure of panels, cowls or covers or the use of special tools

Table (b) is applicable to licence categories B1, B2, B2L and B3.

Table (b)

Subject	B1 B3	B2 B2L
Application of Fits and Clearances		
Ability to drill required sizes for bolt holes and check the appropriate classes of fits.	X	X
Application of limits for bow, twist and wear, standard methods for checking shafts, bearings.		
Electrical Wiring Interconnection System (EWIS)		
Inspection of aircraft cables looming for defects, splicing exercises, measure continuity, insulation and bonding practices and techniques and testing; use of crimp tools, testing of crimp joints.	X	X
Connector pin removal and insertion; Coaxial cables: testing and installation precautions.		
Identification of wire types, their inspection criteria and damage tolerance.		

Subject	B1 B3	B2 B2L
Wiring protection techniques: cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding; Soldering of electrical wires.		
EWIS installations, inspection, repair, maintenance and cleanliness standards.		
Riveting and sheet metal work; composite		
Riveted joints, rivet spacing and pitch; tools used for riveting and dimpling.	X	—
Inspection of riveted joints. Marking out and calculation of bend allowance.		
Sheet metal working, including bending and forming; Inspection of sheet metal work.		
Composite: application of bonding practices, environmental conditions and inspection methods.		
Pipes and Hoses		
Ability to bend and belling/flaring aircraft pipes. Inspection and testing of aircraft pipes and hoses. Installation and clamping of pipes.	X	—
Springs		
Inspection and testing of springs.	X	—
Bearings		
Inspection and cleaning of bearings, and lubrication requirements of bearings.	X	—
Transmissions		
Inspection of gears, backlash; inspection of belts and pulleys, chains and sprockets; inspection of screw jacks, lever devices, and push–pull rod systems.	X	—
Control cables		
Ability to inspect swage of end fittings; inspection and installation and testing of control cables.	X	—
Inspection of Bowden cables and aircraft flexible control systems.	X	—
Welding, Brazing, Soldering and Bonding		
Visual inspection of welded and brazed joints.	X	
Visual inspection of soldered joints.	X	X
Aircraft Weight and Balance		
Prepare aircraft for weighing.	X	X
General Disassembly, Inspection, Repair and Assembly Techniques		
Ability to carry out an inspection: daily/weekly and individual MPD/Chapter 4 & 5 tasks.	X	X
Identify types of defects and carry out inspection/testing techniques according to AMM, SRM, SB, ADs.		X
Ability to carry out corrosion assessment and removal, and reprotection.		X
Ability to use general repair methods and methods from the structural repair manual.		—
Ability to use colour contrast penetrant inspection techniques.		—

Subject	B1 B3	B2 B2L
Apply disassembly and reassembly techniques including use of lock wiring/torqueing techniques.		X
Ability to apply troubleshooting/fault-finding techniques.		X
Carry out inspections following lightning strikes and HIRF penetration abnormal events such as heavy landings and flight through turbulence.		X
Servicing of Aircraft Systems		
Ability to check tyre pressure and correct it if required, replenish and fill up: hydraulic systems, engine oil, oxygen servicing.	X	X

AMC to Section 3 of Appendix I to Part-66 'Basic training requirements'

3. Basic training methods

Training methods are categorised as follows: 'instructor-centred', 'student-centred', and 'blended training'.

The actual training method and training tools should be adapted to suit the training subject and be chosen considering their intrinsic characteristics such as but not limited to their efficiency and the pedagogical benefits of the training method / training tool.

Basic Training Modules 7, 9, 11, 12, 13, 15, 16 and 17 should not normally be taught solely through a student-centred method unless provisions are in place to verify the actual and progressive acquisition of knowledge, skills and attitude by the student.

[…]

Appendix II — Basic Examination and Assessment Standard (except for category L licence)

1. General

[…]

1.4. Suitable essay questions shall be drafted and evaluated using the knowledge syllabus in Appendix I Modules 7~~A, 7B~~, 9~~A, 9B~~ and 10.

[…]

1.11. A failed ~~module~~ examination may not be retaken for at least 90 days following the date of the failed ~~module~~ examination, except in the case of a maintenance training organisation approved in accordance with Annex IV (Part-147) which conducts a course of retraining tailored to the failed subjects in the particular module when the failed ~~module~~ 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.~~

Basic knowledge examinations with a maximum allowed time of more than 90 or more than 180 minutes may be split in two and three partial exams respectively.

Each partial exam shall:

(a) be complementary to the other partial exam or exams taken by the candidate, ensuring that the combination of partial exams meets the examination requirements for the subject module;

(b) be similarly sized;

(c) be passed with 75 % or more of the questions answered correctly;

(d) have a multiple of four questions;

(e) be listed on the same certificate of recognition that will be issued after the last partial exam has been successfully passed; the certificate of recognition shall list the dates and the results of the partial exams — without averaging the results;

(f) be taken within the same organisation, following the normal examination provisions for retaking failed exams, etc.

The applicant shall provide a written statement to the approved maintenance training organisation or the competent authority to which they apply for an examination, the number and dates of attempts during the 12 months preceding the examination, and the organisation or the competent authority where these attempts took place. The maintenance training organisation or the competent authority is responsible for checking the number of attempts within the applicable time frames.

[…]

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 maximum number of attempts for each examination is 3 in a 12-month period.

[…]

2. Number of questions per module

2.1. MODULE 1 — MATHEMATICS

Category A: 16 multiple-choice and 0 essay questions. Time allowed: 20 minutes.

Category B1, B2, B2L and B3: 32 multiple-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 and B3: 32 multiple-choice and 0 essay questions. Time allowed: 40 minutes.

Category B1, B2 and B2L: 52 multiple-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 — ELECTRICS~~AL~~ FUNDAMENTALS

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

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

Category B1, B2 and B2L: 52 multiple-choice and 0 essay questions. Time allowed: 65 minutes.

~~Category B2 and B2L: 52 multi-choice and 0 essay questions. Time allowed 65 minutes.~~

2.4. MODULE 4 —ELECTRONICS FUNDAMENTALS

Category B1 and B3: 20 multiple-choice and 0 essay questions. Time allowed: 25 minutes.

Category B2 and B2L: 40 multiple-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 and B3: 20 multiple-choice and 0 essay questions. Time allowed: 25 minutes.

Category B1: 40 multiple-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 multiple-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 multiple-choice and 0 essay questions. Time allowed: 65 minutes.

Category B1 and B3: 80 multiple-choice and 0 essay questions. Time allowed: 100 minutes.

Category B2 and B2L: 60 multiple-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 7 — MAINTENANCE PRACTICES

Category A: 76 multiple-choice and 2 essay questions. Time allowed: 95 minutes plus 40 minutes.

Category B1 and B3: 80 multiple-choice and 2 essay questions. Time allowed: 100 minutes plus 40 minutes.

Category B2 and B2L: 60 multiple-choice and 2 essay questions. Time allowed: 75 minutes plus 40 minutes.

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

2.8. MODULE 8 — BASIC AERODYNAMICS

Category A, B3, B1, B2 and B2L: 24 multiple-choice and 0 essay questions. Time allowed: 30 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 9 — HUMAN FACTORS

Category A, B1, B3, B2 and B2L: 28 multiple-choice and 1 essay questions. Time allowed: 35 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 multiple-choice and 1 essay questions. Time allowed: 40 minutes plus 20 minutes.

Category B1, B3, B2 and B2L: 44 multiple-choice and 1 essay questions. Time allowed: 55 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 11 — TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

Category A1: 108 multiple-choice and 0 essay questions. Time allowed: 135 minutes.

Category A2: 72 multiple-choice and 0 essay questions. Time allowed: 90 minutes.

Category B1.1: 140 multiple-choice and 0 essay questions. Time allowed: 175 minutes.

Category B1.2: 100 multiple-choice and 0 essay questions. Time allowed: 125 minutes.

Category B3: 60 multiple-choice and 0 essay questions. Time allowed: 75 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~~

2.12. MODULE 12 — ~~HELICOPTER~~ ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS:

Category A: 100 multiple-choice and 0 essay questions. Time allowed: 125 minutes.

Category B1.3 and B1.4: 128 multiple-choice and 0 essay questions. Time allowed: 160 minutes.

2.13. MODULE 13 — AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS

Category B2: 188 multiple-choice and 0 essay questions. Time allowed: 235 minutes.

Category B2L:

System rating	Number of multiple-choice questions	Time allowed (in minutes)
Basic requirements (Submodules 13.1, 13.2, 13.5 and 13.9)	32	40
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)	52	65

2.14. MODULE 14 — PROPULSION

Category B2 and B2L: 32 multiple-choice and 0 essay questions. Time allowed: 40 minutes.

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

2.15. MODULE 15 — GAS TURBINE ENGINE

Category A1 and A3: 60 multiple-choice and 0 essay questions. Time allowed: 75 minutes.

Category B1.1 and B1.3: 92 multiple-choice and 0 essay questions. Time allowed: 115 minutes.

2.16. MODULE 16 — PISTON ENGINE

Category A2 and A4: 52 multiple-choice and 0 essay questions. Time allowed: 65 minutes.

Category B3, B1.2 and B1.4: 76 multiple-choice and 0 essay questions. Time allowed: 95 minutes.

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

2.17. MODULE 17 — PROPELLER

Category A1 and A2: 20 multiple-choice and 0 essay questions. Time allowed: 25 minutes.

Category B3, B1.1 and B1.2: 32 multiple-choice and 0 essay questions. Time allowed: 40 minutes.

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

3. MODULE 18 — Practical assessment

The practical assessment shall include an introductory phase where the training organisation, which conducts the assessment, instructs the candidate on the facilities, access to the documents, material and tooling.

The training organisation or the competent authority shall decide on the group of practical maintenance tasks to be performed by the candidate, and the practical assessment shall be based on the observation of the candidate's performance while carrying out the tasks.

The practical assessment is considered passed when the candidate has demonstrated adequate proficiency in the practical skills that are required for the assigned elements to the standard that, if performed during actual aircraft maintenance, the aircraft is considered airworthy.

Three consecutive attempts are allowed. After the third failed attempt, an approved skills training is necessary addressing all the criteria of Module 18.

For the purpose of the practical assessment, the competencies to be assessed are the following:

Mental skills

— The candidate can apply existing knowledge in practice.

— The candidate can apply existing knowledge to other subjects.

— The candidate can understand complex systems.

— The candidate can demonstrate good decision-making.

— The candidate can demonstrate good communication skills (both orally and in writing).

Technical skills

— The candidate demonstrates good craftsmanship (reliable handling of tools, measuring equipment, technics, AMM procedures, safety precautions, application of maintenance-required skills).

— The candidate handles reliably IT systems.

AMC to Appendix II — Number of questions per subject

The tables below show the acceptable number of questions for the submodules. Justified deviations from these values are also acceptable, provided the sum of the questions complies with the total number for the module.

1. MODULE 1 — MATHEMATICS

MODULE 1. MATHEMATICS	Nr of questions	
	A1 A2 A3 A4	B3 B1.1 B1.2 B1.3 B1.4 B2 B2L
Total number for the module:	16	32
1.1 *Arithmetic*	6	6
Arithmetical terms and signs, methods of multiplication and division, fractions and decimals, factors and multiples, weights, measures and conversion factors, ratio and proportion, averages and percentages, areas and volumes, squares, cubes, square and cube roots.	—	—
1.2 *Algebra*	—	—
(a) Evaluating simple algebraic expressions, addition, subtraction, multiplication and division, use of brackets, simple algebraic fractions.	5	4
(b) Linear equations and their solutions;	—	12
Indices and powers, negative and fractional indices;	—	—
Binary and other applicable numbering systems;	—	—
Simultaneous equations and second-degree equations with one unknown;	—	—
Logarithms.	—	—
1.3 *Geometry*	—	—
(a) Simple geometrical constructions.	—	3
(b) Graphical representation: nature and uses of graphs, graphs of equations/functions.	5	4
(c) Simple trigonometry: trigonometrical relationships, use of tables and rectangular and polar coordinates.	—	3

2. MODULE 2 — PHYSICS

MODULE 2. PHYSICS	Nr of questions	
	A1 A2 A3 A4	B3 B1.1 B1.2 B1.3 B1.4 B2 B2L
Total number for the module:	32	52
2.1 *Matter*	4	5
Nature of matter: the chemical elements, structure of atoms, molecules;		
Chemical compounds;		
States: solid, liquid and gaseous;		
Changes between states.		
2.2 *Mechanics*		

MODULE 2. PHYSICS	Nr of questions	
	A1 A2 A3 A4	B3 B1.1 B1.2 B1.3 B1.4 B2 B2L
Total number for the module:	32	52
2.2.1 *Statics*		
Forces, moments and couples, representation as vectors;		
Centre of gravity;		
Elements of theory of stress, strain and elasticity: tension, compression, shear and torsion;	6	7
Nature and properties of solid, fluid and gas matter;		
Pressure and buoyancy in liquids (barometers).		
2.2.2 *Kinetics*		
Linear movement: uniform motion in a straight line, motion under constant acceleration (motion under gravity);		
Rotational movement: uniform circular motion (centrifugal/centripetal forces);	6	7
Periodic motion: pendular movement;		
Simple theory of vibration, harmonics and resonance;		
Velocity ratio, mechanical advantage and efficiency.		
2.2.3 *Dynamics*		
(a) Mass;	4	5
Force, inertia, work, power, energy (potential, kinetic and total energy), heat, efficiency.		
(b) Momentum, conservation of momentum;		
Impulse;	4	4
Gyroscopic principles;		
Friction: nature and effects, coefficient of friction (rolling resistance).		
2.2.4 *Fluid dynamics*		
(a) Specific gravity and density.	2	2
(b) Viscosity, fluid resistance, effects of streamlining;		
Effects of compressibility on fluids;	2	3
Static, dynamic and total pressure: Bernoulli's Theorem, venturi.		
2.3 *Thermodynamics*		
(a) Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin; Heat definition.	2	2
(b) Heat capacity, specific heat;		
Heat transfer: convection, radiation and conduction;		
Volumetric expansion;		
First and second law of thermodynamics;		
Gases: ideal gases laws; specific heat at constant volume and constant pressure, work done by expanding gas;	2	8
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.		

MODULE 2. PHYSICS	Nr of questions	
	A1 A2 A3 A4	B3 B1.1 B1.2 B1.3 B1.4 B2 B2L
Total number for the module:	32	52
2.4 *Optics (Light)*	—	5
Nature of light, speed of light;		
Laws of reflection and refraction: reflection at plane surfaces, reflection by spherical mirrors, refraction, lenses;		
Fibre optics.		
2.5 *Wave Motion and Sound*	—	4
Wave motion: mechanical waves, sinusoidal wave motion, interference phenomena, standing waves;		
Sound: speed of sound, production of sound, intensity, pitch and quality, Doppler effect.		

3. MODULE 3 — ELECTRICS FUNDAMENTALS

MODULE 3. ELECTRICS FUNDAMENTALS	Nr of questions		
	A1 A2 A3 A4	B3	B1.1 B1.2 B1.3 B1.4 B2 B2L
Total number for the module:	20	24	52
3.1 *Electron Theory*			
Structure and distribution of electrical charges within atoms, molecules, ions and compounds;	2	2	2
Molecular structure of conductors, semiconductors and insulators.			
3.2 *Static Electricity and Conduction*			
Static electricity and distribution of electrostatic charges;			
Electrostatic laws of attraction and repulsion;	3	2	3
Units of charge, Coulomb's law;			
Conduction of electricity in solids, liquids, gases and in vacuum.			
3.3 *Electricity — Terminology*			
The following terms, their units and the factors that affect them: potential difference, electromotive force, voltage, current, resistance, conductance, charge, conventional current flow, electron flow.	3	2	2
3.4 *Generation of Electricity*			
Production of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.	3	2	2
3.5 *DC Sources of Electricity*			
Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, lithium cells, nickel cells, other alkaline cells;			
Cells connected in series and in parall;	3	3	3
Internal resistance and its effect on a battery;			
Construction, materials and operation of thermocouples;			
Operation of photocells.			
3.6 *DC Circuits*			
Ohm's law, Kirchhoff's voltage and current laws;	1	1	2
Calculations using the above laws to find resistance, voltage and current;			
Significance of the internal resistance of a supply.			
3.7 *Resistance/Resistor*			
(a) Resistance and factors that affect it;			
Specific resistance;			
Resistor colour code, values and tolerances, preferred values, wattage ratings;			
Resistors in series and in parallel;	—	1	3
Calculation of total resistance using series, parallel, and series–parallel combinations;			
Operation and use of potentiometers and rheostats;			
Operation of Wheatstone Bridge.			

MODULE 3. ELECTRICS FUNDAMENTALS	Nr of questions		
	A1 A2 A3 A4	B3	B1.1 B1.2 B1.3 B1.4 B2 B2L
(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.	—	—	2
3.8 *Power* Power, work and energy (kinetic and potential); Dissipation of power by a resistor; Power formula; Calculations involving power, work and energy.	—	1	3
3.9 *Capacitance/Capacitor* Operation and function of a capacitor; Factors that affect the 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; Calculation of capacitance and voltage in serial and parallel circuits; Exponential charge and discharge of a capacitor, time constants; Testing of capacitors.	—	1	4
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 materials; Electromagnet construction and principles of operation; Handclasp rules to determine the magnetic field around a current-carrying conductor.	—	1	3
(b) Magnetomotive force, field strength, magnetic flux density, permeability, hysteresis loop, retentivity, coercive force reluctance, saturation point, eddy currents; Precautions for the care and storage of magnets.	—	1	1
3.11 *Inductance/Inductor* Faraday's law; The action of inducing voltage in a conductor that moves in a magnetic field; Induction principles;	—	1	4

MODULE 3. ELECTRICS FUNDAMENTALS	Nr of questions		
	A1 A2 A3 A4	B3	B1.1 B1.2 B1.3 B1.4 B2 B2L
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 that affect mutual inductance: number of turns in coil, physical size of coil, permeability of coil, position of coils with respect to each other;			
Lenz's law and polarity determining rules;			
Back EMF, self-induction;			
Saturation point;			
Principal uses of inductors.			
3.12 *DC Motor/Generator Theory*			
Basic motor and generator theory;			
Construction and purpose of components in DC generators;			
Operation of and factors that affect the output and direction of current flow in DC generators;	—	1	3
Operation of and factors that affect output power, torque, speed and direction of rotation of DC motors;			
Series wound, shunt wound and compound motors;			
Starter generator construction.			
3.13 *AC Theory*			
Sinusoidal waveform: phase, period, frequency, cycle;			
Instantaneous, average, root mean square, peak, peak-to-peak current values and calculation of these values in relation to voltage, current and power;	5	1	3
Triangular/Square waves;			
Single-/three-phase principles.			
3.14 *Resistive (R), Capacitive (C) and Inductive (L) Circuits*			
Phase relationship of voltage and current in L, C and R circuits, parallel, series and series–parallel;	—	1	3
Power dissipation in L, C and R circuits;			
Impedance, phase angle, power factor and current calculations;			
True power, apparent power, and reactive power calculations.			
3.15 *Transformers*			
Transformer construction principles and operation;			
Transformer losses and methods for overcoming them;			
Transformer action under load and no-load conditions;	—	1	3
Power transfer, efficiency, polarity markings;			
Line and phase voltages and currents;			
Power in a three-phase system;			

MODULE 3. ELECTRICS FUNDAMENTALS	Nr of questions		
	A1 A2 A3 A4	B3	B1.1 B1.2 B1.3 B1.4 B2 B2L
Primary and secondary current, voltage, turn ratio, power, efficiency; Auto transformers.			
3.16 *Filters* Operation, application and uses of the following filters: low pass, high pass, band pass, and band stop.	—	—	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-connection advantages and uses; Permanent magnet generators.	—	1	3
3.18 *AC Motors* Construction, principles of operation and characteristics of AC synchronous and induction motors both single-phase and polyphase; Methods of speed control and direction of rotation; Methods of producing a rotating field: capacitor, shaded or split pole;	—	1	2

4 MODULE 4 — ELECTRONICS FUNDAMENTALS

MODULE 4. ELECTRONICS FUNDAMENTALS	Nr of questions	
	B1.1 B1.2 B1.3 B1.4 B3	B2 B2L
Total number for the module:	20	40
4.1 *Semiconductors*		
4.1.1 *Diodes*		
(a) Diode symbols; Diode characteristics and properties; Diodes in series and in parallel; Main characteristics and use of silicon-controlled rectifiers (thyristors), light-emitting diodes, photo-conductive diodes, rectifier diodes; Functional testing of diodes.	8	8
(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, rectifier diodes, Zener diode.	—	7
4.1.2 *Transistors*		
(a) Transistor symbols; Component description and orientation; Transistor characteristics and properties.	4	4
(b) Construction and operation of PNP and NPN transistors; Base, collector and emitter configurations; Testing of transistors; Basic appreciation of other transistor types, including types of FET 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. Operation and amplifier stages connecting methods: resistive capacitive, direct, inverting, non-inverting and adding;	—	7
4.1.3 *Integrated Circuits*		
(a) Description and operation of logic circuits and linear circuits;	3	2

MODULE 4. ELECTRONICS FUNDAMENTALS	Nr of questions	
	B1.1 B1.2 B1.3 B1.4 B3	B2 B2L
(b) Introduction to the operation and function of an operational amplifier used as: integrator, differentiator, voltage follower, comparator;	—	4
Advantages and disadvantages of positive and negative feedback.		
4.2 *Printed Circuit Boards*	2	3
Description and use of printed circuit boards.		
4.3 *Servomechanisms*		
(a) Understanding of the following principles: open- and closed-loop systems, servomechanism, feedback, follow-up, null, overshoot, damping, deadband, hunting, proximity switches, analogue transducers, synchro systems and components, digital tachometers and encoders, inductance and capacitance transmitters;	3	2
(b) 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;	—	3
Construction, operation and use of servomechanism and PID controller. Fault-finding of servo defects, reversal of synchro leads, hunting.		

5. MODULE 5 — DIGITAL TECHNIQUES / ELECTRONIC INSTRUMENT SYSTEMS

MODULE 5. DIGITAL TECHNIQUES / ELECTRONIC INSTRUMENT SYSTEMS	Nr of questions			
	A1 A2 A3 A4	B3	B1.1 B1.2 B1.3 B1.4	B2 B2L
Total number for the module:	20	20	40	72
5.1 *Electronic Instrument Systems*				
Typical system arrangements and cockpit layout of electronic instrument systems.	4	4	4	4
5.2 *Numbering Systems*	—	—	3	5
Numbering systems: binary, octal and hexadecimal;				
Demonstration of conversions between the following systems: decimal and binary, octal and hexadecimal, and vice versa.				
5.3 *Data Conversion*	—	—	3	4
Analogue data, digital data;				
Operation and application of analogue-to-digital and digital-to-analogue converters, inputs and outputs, and limitations of the various types.				
5.4 *Data Buses*	—	—	3	5
Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications.				
Aircraft network/ethernet.				

MODULE 5. DIGITAL TECHNIQUES / ELECTRONIC INSTRUMENT SYSTEMS	Nr of questions			
	A1 A2 A3 A4	B3	B1.1 B1.2 B1.3 B1.4	B2 B2L
5.5 *Logic Circuits*				
(a) Identification of common logic gate symbols, tables and equivalent circuits;	—	—	3	4
Applications used for aircraft systems, schematic diagrams.				
(b) Interpretation of logic diagrams.	—	—	—	4
5.6 *Basic Computer Structure*				
(a) Computer terminology (including bit, byte, software, hardware, CPU, IC, and various memory devices such as RAM, ROM, PROM);	6	2	4	2
Computer technology (as applied in aircraft systems).				
(b)	—	—	—	6
Computer operation, layout and interface of the major components in a microcomputer including their associated bus systems;				
Information contained in single- and multi-address instruction words;				
Memory-associated terms;				
Operation of typical memory devices;				
Operation, advantages and disadvantages of the various data storage systems.				
5.7 *Microprocessors*	—	—	—	4
Functions performed and overall operation of a microprocessor;				
Basic operation of each of the following microprocessor elements: control and processing unit, clock, register, arithmetic logic unit.				
5.8 *Integrated Circuits*	—	—	—	5
Operation and use of encoders and decoders;				
Function of encoder types.				
5.9 *Multiplexing*	—	—	—	4
Operation, application and identification of multiplexers and demultiplexers in logic diagrams.				
5.10 *Fibre Optics*	—	—	3	3
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.				

MODULE 5. DIGITAL TECHNIQUES / ELECTRONIC INSTRUMENT SYSTEMS	Nr of questions			
	A1 A2 A3 A4	B3	B1.1 B1.2 B1.3 B1.4	B2 B2L
5.11 *Electronic Displays* Principles of operation of common types of displays used in modern aircraft, including cathode ray tubes (CRTs), light-emitting diodes (LEDs) and liquid crystal displays (LCDs).	2	2	2	4
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.	6	6	4	5
5.13 *Software Management Control* Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programs.	—	1	3	3
5.14 *Electromagnetic Environment* Influence of the following phenomena on maintenance practices for electronic systems: EMC — Electromagnetic Compatibility; EMI — Electromagnetic Interference; HIRF — High-Intensity Radiated Field; Lightning/lightning protection.	—	1	3	4
5.15 *Typical Electronic/Digital Aircraft Systems* General arrangement of typical electronic/digital aircraft systems and associated built-in test equipment (BITE), such as:				
(a) ACARS-ARINC Communication and Addressing and Reporting System (ARINC: Aeronautical Radio Incorporated); FBW — Fly-by-Wire; FMS — Flight Management System; IRS — Inertial Reference System.	1	1	2	3
(b) ECAM — Electronic Centralised Aircraft Monitoring; EICAS — Engine Indication and Crew Alerting System; EFIS — Electronic Flight Instrument System; GPS — Global Positioning System; GNSS — Global Navigation Satellite System; TCAS — Traffic Alert and Collision Avoidance System; Integrated Modular Avionics; Cabin Systems; Information Systems.	1	3	3	3

MODULE 5. DIGITAL TECHNIQUES / ELECTRONIC INSTRUMENT SYSTEMS	Nr of questions			
	A1 A2 A3 A4	B3	B1.1 B1.2 B1.3 B1.4	B2 B2L
5.16 *Cybersecurity*				
Introduction of high-level concepts for aviation cybersecurity. Possible cybersecurity threat conditions in the aircraft maintenance domain.	—	—	—	—

6. MODULE 6 — MATERIALS AND HARDWARE

MODULE 6. MATERIALS AND HARDWARE	Nr of questions		
	A1 A2 A3 A4	B3 B1.1 B1.2 B1.3 B1.4	B2 B2L
Total number for the module:	52	100	60
6.1 *Aircraft Materials — Ferrous*			
(a) Characteristics, properties and identification of common alloy steels used in aircraft; Heat treatment and application of alloy steels.	3	3	3
(b) Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.	—	2	2
(c) Repair and inspection procedures for ferrous materials, structures and airframes.	—	2	—
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.	3	4	3
(b) Testing of non-ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.	—	3	3
(c) Repair and inspection procedures for non-ferrous materials, structures and airframes.	—	2	—
6.3 *Aircraft Materials — Composite and Non-Metallic*			
6.3.1 *Composite and non-metallic other than wood and fabric*			
(a) Characteristics, properties and identification of common composite and non-metallic materials, other than wood, used in aircraft; Sealant and bonding agents.	2	4	3
(b) Detection of defects/deterioration in composite and non-metallic materials.	2	4	—
(c) Repair and inspection procedures for composite and non-metallic materials, structures and airframes.	—	2	2
6.3.2 *Wooden structures*	3	4	—

MODULE 6. MATERIALS AND HARDWARE	Nr of questions		
	A1 A2 A3 A4	B3 B1.1 B1.2 B1.3 B1.4	B2 B2L
Construction methods for wooden airframe structures; Characteristics, properties and types of wood and glue used in aeroplanes; Preservation and maintenance of wooden structures; Types of defects in wood material and wooden structures; Detection of defects in wooden structures; Repair of wooden structures.			
6.3.3 *Fabric covering* Characteristics, properties and types of fabrics used in aeroplanes; Inspection methods for fabric; Types of defects in fabric; Repair of fabric covering.	—	4	—
6.4 *Corrosion*			
(a) Fundamentals of chemistry; Formation by galvanic action process, microbiological contaminant, stress.	3	3	3
(b) Types of corrosion and their identification; Causes of corrosion; Material types and their susceptibility to corrosion.	4	5	3
6.5 *Fasteners*			
6.5.1 *Screw threads* Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; Measurement of screw threads.	4	4	3
6.5.2 *Bolts, studs and screws* Bolt types: specification, identification and marking of aircraft bolts, international standards; Nuts: self-locking, anchor, standard types; Machine screws: aircraft specifications; Studs: types and uses, insertion and removal; Self-tapping screws, dowels.	6	6	5
6.5.3 *Locking devices*	2	2	2
Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick-release fasteners, keys, circlips, cotter pins.			
6.5.4 *Aircraft rivets* Types of solid and blind rivets: specifications and identification, heat treatment.	2	3	2
6.6 *Pipes and Unions*			

MODULE 6. MATERIALS AND HARDWARE	Nr of questions		
	A1 A2 A3 A4	B3 B1.1 B1.2 B1.3 B1.4	B2 B2L
(a) Identification and types of rigid and flexible pipes and their connectors used in aircraft.	1	1	1
(b) Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes.	2	2	2
6.7 *Springs*	—	1	1
Types of springs, materials, characteristics, and applications.			
6.8 *Bearings*	2	4	3
Purpose of bearings, loads, material, construction;			
Types of bearings and their application.			
6.9 *Transmissions*	3	4	4
Gear types and their application;			
Gear ratios, reduction, and multiplication gear systems, driven and driving gears, idler gears, mesh patterns;			
Belts and pulleys, chains, and sprockets.			
6.10 *Control Cables*	5	5	4
Types of cables;			
End fittings, turnbuckles, and compensation devices;			
Pulleys and cable system components;			
Bowden cables;			
Aircraft flexible control systems.			
6.11 *Electrical Cables and Connectors*	5	6	11
Cable types, construction, and characteristics;			
High-tension and coaxial cables;			
Crimping;			
Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes.			

7. MODULE 7 — MAINTENANCE PRACTICES

MODULE 7. MAINTENANCE PRACTICES	Nr of questions		
	A1 A2 A3 A4	B1.1 B1.2 B1.3 B1.4 B3	B2 B2L
Total number for the module:	76	80	60
7.1 *Safety Precautions — Aircraft and Workshop*			
Aspects of safe working practices including precautions to be taken when working with electricity, gases (especially oxygen), oils, and chemicals.			
Fuel tank safety and fuel tank entry procedures and precautions.	4	4	4
Awareness and precautions as regards aircraft equipped with ballistic recovery systems.			
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 of fire-extinguishing agents.			
7.2 *Workshop Practices*			
Care of tools, control of tools, use of workshop materials;	4	4	4
Dimensions, allowances and tolerances, workmanship standards;			
Calibration of tools and equipment, calibration standards.			
7.3 *Tools*			
Common hand-tool types;			
Common power-tool types;	6	6	6
Operation and use of precision-measuring tools;			
Lubrication equipment and lubrication methods;			
Operation, function and use of electrical general test equipment.			
7.4 *Reserved*			
7.5 *Engineering Drawings, Diagrams and Standards*			
Drawing types and diagrams, their symbols, dimensions, tolerances, and projections;			
Identification of title block information;			
Microfilm, microfiche, and computerised presentations;	6	6	6
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.			
7.6 *Fits and Clearances*			
Drill sizes for bolt holes, classes of fits;			
Common system of fits and clearances;	5	5	5
Schedule of fits and clearances for aircraft and engines;			
Limits for bow, twist, and wear;			
Standard methods for checking shafts, bearings, and other parts.			
7.7 *Electrical Wiring Interconnection System (EWIS)*			
Continuity, insulation and bonding techniques and testing;	4	4	8
Use of crimp tools: hand and hydraulic operated;			

MODULE 7. MAINTENANCE PRACTICES	Nr of questions		
	A1 A2 A3 A4	B1.1 B1.2 B1.3 B1.4 B3	B2 B2L
Testing of crimp joints;			
Connector pin removal and insertion;			
Coaxial 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;			
High-Intensity Radiated Fields (HIRF) and protection principles;			
Soldering of electrical wires;			
EWIS installations, inspection, repair, maintenance and cleanliness standards.			
7.8 *Riveting*			
Riveted joints, rivet spacing and pitch;	4	3	-
Tools used for riveting and dimpling;			
Inspection of riveted joints.			
7.9 *Pipes and Hoses*			
Bending and belling/flaring aircraft pipes;	4	3	-
Inspection and testing of aircraft pipes and hoses;			
Installation and clamping of pipes.			
7.10 *Springs*	1	1	-
Inspection and testing of springs.			
7.11 *Bearings*			
Testing, cleaning, and inspection of bearings;	4	3	-
Lubrication requirements for bearings;			
Defects in bearings and their causes.			
7.12 *Transmissions*			
Inspection of gears, backlash;	3	3	-
Inspection of belts and pulleys, chains and sprockets;			
Inspection of screw jacks, lever devices, push–pull rod systems.			
7.13 *Control Cables*			
Swaging of end fittings;	4	3	-
Inspection and testing of control cables;			
Bowden cables, aircraft flexible control systems.			
7.14 *Material handling*			
7.14.1 *Sheet Metal*			
Marking-out and calculation of bend allowance;	-	2	-
Sheet metal working, including bending and forming;			
Inspection of sheet metal work.			
7.14.2 *Composite and non-metallic*	-	2	-
Bonding practices;			

MODULE 7. MAINTENANCE PRACTICES	Nr of questions		
	A1 A2 A3 A4	B1.1 B1.2 B1.3 B1.4 B3	B2 B2L
Environmental conditions; Inspection methods.			
7.14.3 *Additive manufacturing* Common additive-manufacturing techniques and their influence on the mechanical properties of the finished part; Inspection of additive-manufactured parts and common production failures.	2	4	2
7.15 *Reserved*			
7.16 *Aircraft Weight and Balance*			
(a) Calculation of centre of gravity/balance limits: use of relevant documents.	—	2	2
(b) Preparation of aircraft for weighing; Aircraft weighing.	—	1	—
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.	7	5	6
7.18 *Disassembly, Inspection, Repair and Assembly Techniques*			
(a) Types of defects and visual inspection techniques;	2	2	2
Corrosion removal, assessment and reprotection.			
(b) General repair methods, structural repair manual; Ageing, fatigue and corrosion control programmes.	-	2	-
(c) Non-destructive inspection techniques including penetrant, radiographic, eddy current, magnetic particle, ultrasonic and boroscope inspections, including practical training in colour contrast penetrant inspection.	-	1	1
(d) Disassembly and reassembly techniques.	2	1	1
(e) Troubleshooting techniques.	-	1	1
7.19 *Abnormal Events*			
(a) Inspections following lightning strikes and HIRF penetration.	2	1	2
(b) Inspections following abnormal events such as heavy landings and flight through turbulence.	2	1	-
7.20 *Maintenance Procedures* Maintenance planning; Modification procedures; Stores procedures; Certification/release procedures; Interface with aircraft operation;	6	6	6

MODULE 7. MAINTENANCE PRACTICES	Nr of questions		
	A1 A2 A3 A4	B1.1 B1.2 B1.3 B1.4 B3	B2 B2L
Maintenance inspection / quality control / quality assurance;			
Additional maintenance procedures;			
Control of life-limited components.			
7.21 *Documentation and Communication*			
Documentation; elements and criteria for writing of work reports, troubleshooting reports, and shift handover instructions;	4	4	4
Communication: clear, comprehensive, and concise.			

8. MODULE 8 — BASIC AERODYNAMICS

MODULE 8. BASIC AERODYNAMICS	Nr of questions	
	A1 A2 A3 A4 B3	B1.1 B1.2 B1.3 B1.4 B2 B2L
Total number for the module:	24	24
8.1 *Physics of the Atmosphere*	2	2
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 associated to aerodynamics: 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;	9	9
Thrust, weight, aerodynamic resultant;		
Generation of lift and drag: angle of attack, lift coefficient, drag coefficient, polar curve, stall;		
Aerofoil contamination including ice, snow, frost.		
8.3 Theory of Flight		
Relationship between lift, weight, thrust and drag;		
Glide ratio;		
Steady state flights, performance;	7	7
Theory of the turn;		
Influence of load factor: stall, flight envelope and structural limitations;		
Lift augmentation.		
8.4 *High-Speed Airflow*	4	4
Speed of sound, subsonic flight, transonic flight, supersonic flight;		

MODULE 8. BASIC AERODYNAMICS	Nr of questions	
	A1 A2 A3 A4 B3	B1.1 B1.2 B1.3 B1.4 B2 B2L
Mach number, critical Mach number, compressibility buffet, shock wave, aerodynamic heating, area rule;		
Factors that affect airflow in engine intakes of high-speed aircraft;		
Effects of sweepback on critical Mach number.		
8.5 *Flight Stability and Dynamics*	2	2
Longitudinal, lateral and directional stability (active and passive).		

9. MODULE 9 — HUMAN FACTORS

MODULE 9. HUMAN FACTORS	Nr of questions
	ALL
Total number for the module:	28
9.1 *General*	3
The need to take human factors into account in aircraft maintenance;	
Incidents attributable to human factors / human error;	
Murphy's law.	
9.2 *Human Performance and Limitations*	3
Vision;	
Hearing;	
Information processing;	
Attention and perception;	
Memory;	
Claustrophobia and physical access.	
9.3 *Social Psychology*	2
Accountability and responsibility: individual and group;	
Motivation and demotivation;	
Peer pressure;	
Culture issues;	
Teamwork;	
Management, supervision, and leadership.	

MODULE 9. HUMAN FACTORS	Nr of questions
	ALL
9.4 *Factors that Affect Performance*	3
Fitness/health;	
Stress: domestic and work related;	
Time pressure and deadlines;	
Workload: overload and underload;	
Sleep and fatigue, shift work;	
Alcohol, medication, drug abuse.	
9.5 *Physical Environment*	2
Noise and fumes;	
Illumination;	
Climate and temperature;	
Motion and vibration;	
Working environment.	
9.6 *Tasks*	2
Physical work;	
Repetitive tasks;	
Visual inspection;	
Complex systems.	
9.7 *Communication*	2
Within and between teams;	
Work logging and recording;	
Keeping up to date, currency;	
Dissemination of information.	
9.8 *Human Error*	3
Error models and theories;	
Types of errors in maintenance tasks;	
Implications of errors (i.e. accidents);	
Organisational errors;	
Avoiding and managing errors.	
9.9 *Safety Management*	2
Risk management;	
Occurrence reporting;	
Safety culture;	
Just culture;	
Identifying, avoiding, and reporting hazards;	
Dealing with emergencies.	

MODULE 9. HUMAN FACTORS	Nr of questions
	ALL
9.10 *The 'Dirty Dozen' and Risk Mitigation*	
The 'Dirty Dozen' — the twelve most common human-factor errors in maintenance: Lack of communication, Lack of teamwork, Lack of assertiveness, Complacency, Fatigue, Stress, Lack of knowledge, Lack of resources, Lack of awareness, Distraction, Pressure, Norms; Risk-mitigation methods.	4

10. MODULE 10 — AVIATION LEGISLATION

MODULE 10. AVIATION LEGISLATION	Nr of questions	
	A1 A2 A3 A4	B3 B1.1 B1.2 B1.3 B1.4 B2 B2L
Total number for the module:	32	44
10.1 *Regulatory Framework*		
Role of the International Civil Aviation Organization (ICAO);		
Role of the European Commission (EC);		
Role of the European Union Aviation Safety Agency (EASA);		
Role of the EU Member States and national aviation authorities;	5	5
Bilateral agreements concluded by the European Commission;		
Regulation (EU) 2018/1139 (the Basic Regulation) and its implementing acts: Regulations (EU) No 748/2012 (Initial Airworthiness) and (EU) No 1321/2014 (Continuing Airworthiness);		
Relationship between regulations (hard law) and AMC, GM and CSs (soft law);		

MODULE 10. AVIATION LEGISLATION	Nr of questions	
	A1 A2 A3 A4	B3 B1.1 B1.2 B1.3 B1.4 B2 B2L
Occurrence reporting according to Regulation (EU) No 376/2014; Relationship between the various Annexes (Parts) relating to Initial and Continuing Airworthiness (such as Part 21, Part-M, Part-145, Part-66, Part-147, Part-T, Part-ML, Part-CAMO, and Part-CAO) and Regulations (EU) No 965/2012 (the Air Operations Regulation) and (EU) No 1178/2011 (the Air Crew Regulation).		
10.2 *Certifying Staff — Maintenance* Deep understanding of Part-66 maintenance licences with the associated privileges and authorisations, and how to exercise them properly for the different aircraft categories.	7	7
10.3 *Approved Maintenance Organisations and Independent Certifying Staff* General understanding of Part-145, Part-CAO, Part-CAMO, and independent certifying staff.	6	6
10.4 *Independent Certifying Staff* Privileges, responsibilities, record-keeping, limitations, and oversight according to Part-M, Part-ML and Part-66.	—	3
10.5 *Air Operations*		
General understanding of Regulation (EU) No 965/2012 (the Air Operations Regulation); Differences between commercial air operations and non-commercial air operations, and their influence on aircraft maintenance; Air Operator Certificates (AOCs) and self-declaration authorisations; Air operator responsibilities, in particular regarding continuing airworthiness and maintenance; Special authorised operations / specific approvals: ETOPS; CAT I/II/III; BRNAV, etc.;	4	4
Aircraft Maintenance Programme; Minimum Equipment List (MEL) and Configuration Deviation List (CDL); Aircraft placarding and markings; Documents to be carried on board: — Certificate of Airworthiness / Restricted Certificate of Airworthiness; — Airworthiness Review Certificate; — Permit to Fly; — Certificate of Registration; — Noise Certificate; — Weight and Balance Report; — Radio Station Licence.	—	3
10.6 *Certification of Aircraft, Parts and Appliances*		
Basic understanding of Part 21 and the EASA certification specifications CS-22, CS-23, CS-25, CS-27, CS-29 and CS-STAN.	—	3
10.7 *Continuing Airworthiness*	7	7

MODULE 10. AVIATION LEGISLATION	Nr of questions	
	A1 A2 A3 A4	B3 B1.1 B1.2 B1.3 B1.4 B2 B2L
General understanding of Part 21 provisions related to continuing airworthiness.		
General understanding of Part-M, Part-ML and Part-CAMO.		
10.8 *Oversight Principles and Safety Management Systems in Continuing Airworthiness*	3	3
10.9 *Maintenance and Certification beyond the current EU regulations (if not superseded by EU requirements)*		
Maintenance of European aircraft not subject to Regulation (EU) 2018/1139;	—	3
Applicable national and international requirements for component maintenance, welding, painting, NDT, etc. (if not superseded by EU requirements).		
10.10 *Cybersecurity*	—	—

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

MODULE 11. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEM	Nr of questions				
	A1	A2	B1.1	B1.2	B3
Total number for the module:	108	72	140	100	60
11.1 *Theory of Flight*					
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;	4	4	4	6	4
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.					
11.2 Airframe Structures — General Concepts					
(a) Airworthiness requirements for structural strength;					
Structural classification: primary, secondary and tertiary;	4	4	6	8	4
Fail-safe, safe-life, damage-tolerance concepts;					

MODULE 11. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEM	Nr of questions				
	A1	A2	B1.1	B1.2	B3
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 provisions;					
Aircraft bonding.					
(b) Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, skinning, anti-corrosive protection, wing, empennage and engine attachments;					
Structure assembly techniques: riveting, bolting, bonding;	4	4	4	5	4
Methods of surface protection, such as chromating, anodising, painting;					
Surface cleaning;					
Airframe symmetry: methods of alignment and symmetry checks.					
11.3 *Airframe Structures — Aeroplanes*					
11.3.1 *Fuselage (ATA 52/53/56)*					
(a)					
Construction and pressurisation sealing;					
Wing, horizontal stabiliser, vertical stabiliser, pylon, and undercarriage attachments;					
Seat installation;					
Doors and emergency exits: construction, mechanisms and operation;	2	2	4	5	4
Windows and windscreen construction and mechanisms.					
(b)					
Towing devices (glider, banner, target).					
(c)					
Doors and emergency exits: safety devices;					
Cargo-loading system.					
11.3.2 *Wings (ATA 57)*					
Construction;	2	2	3	3	2
Fuel storage;					
Landing gear, pylon, control surface and high lift/drag attachments.					
11.3.3 *Stabilisers (ATA 55)*					
Construction;	1	1	2	1	1
Control surface attachment.					
11.3.4 *Flight Control Surfaces (ATA 55/57)*					
Construction and attachment;	1	1	2	1	1
Balancing — mass and aerodynamics.					
11.3.5 *Nacelles/Pylons (ATA 54)*					
Nacelles/Pylons:	2	1	2	1	1
Construction;					

MODULE 11. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEM	Nr of questions				
	A1	A2	B1.1	B1.2	B3
Firewalls; Engine mounts.					
11.4 *Air Conditioning and Cabin Pressurisation (ATA 21)*					
11.4.1 *Heating systems and ventilation systems*	—	1	—	1	1
11.4.2 *Air-conditioning and pressurisation systems* Air-conditioning systems; Pressurisation systems; Cabin pressure controllers.	4		5	1	—
11.4.3 *Air supply and air conditioning* Sources of air supply including engine bleed, APU and ground cart; Air cycle and vapour cycle machines; Distribution systems; Flow, temperature, and humidity control system; Control and indication, including control and safety valves.	2		4	—	—
11.4.4 *Safety and warning devices* Protection and warning devices.	2	1	3	1	—
11.5 *Instruments/Avionics Systems*					
11.5.1 *Instrument systems (ATA 31)* Pitot static: altimeter, airspeed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Angle-of-attack indication, stall warning-systems; Glass cockpit; Indication of other aircraft systems	5	5	8	5	5
11.5.2 *Avionics systems* Fundamentals of system layouts and operation of: Autoflight (ATA 22); Communications (ATA 23); Very High Frequency (VHF) communications; High Frequency (HF) communications; Satellite communications (SATCOM); Controller–pilot data link communications (CPDLC); Audio systems; Emergency Locator Transmitters (ELTs); Cockpit Voice Recorder (CVR); Navigation Systems (ATA 34); Very High Frequency omnidirectional range (VOR); Automatic Direction Finding (ADF); Instrument Landing System (ILS); Microwave Landing System (MLS);	6	3	7	4	4

MODULE 11. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEM	Nr of questions				
	A1	A2	B1.1	B1.2	B3
Flight Director systems, Distance-Measuring Equipment (DME);					
Area navigation (RNAV) systems;					
Flight Management Systems;					
Satellite Navigation Systems;					
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;					
Types and use of avionics general test equipment.					
11.6 *Electrical Power (ATA 24)*					
Installation and operation of batteries;					
DC power generation;					
AC power generation;					
Emergency power generation;	6	4	9	5	5
Voltage regulation;					
Power distribution;					
Inverters, transformers;					
Circuit protection;					
External/ground power.					
11.7 *Equipment and Furnishings (ATA 25)*					
(a) Emergency equipment requirements;	2	1	3	2	2
Seats, harnesses, and belts.					
(b) Cabin layout;					
Equipment layout;					
Cabin furnishing installation;					
Cabin entertainment equipment;	3	4	3	6	—
Galley installation;					
Cargo handling and retention equipment;					
Airstairs.					
11.8 *Fire Protection (ATA 26)*					
(a) Fire and smoke detection and warning systems;					
Fire-extinguishing systems;	3	2	4	3	-
System tests.					
(b) Portable fire extinguisher.	1	1	1	1	1
11.9 *Flight Controls (ATA 27)*					
(a)					
Primary controls: aileron, elevator, rudder, spoiler;					
Trim control, trim tabs;	-	4	6	6	5
High-lift devices;					
System operation: manual;					

MODULE 11. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEM	Nr of questions				
	A1	A2	B1.1	B1.2	B3
Gust locks and gust lock systems; Artificial feel, yaw damper, Mach trim, rudder limiter; Balancing and rigging; Stall-warning system.					
(b) Active load control; Lift dump, speed brakes; Hydraulic, pneumatic, electrical, fly-by-wire systems; Stall protection.	6	-	4	-	-
11.10 *Fuel Systems (ATA 28 & 47)*					
(a) System layout; Fuel tanks; Supply systems; Indications and warnings; Refuelling and defuelling; Cross-feed and transfer.	4	4	5	6	2
(b) Dumping, venting and draining; Longitudinal balance fuel systems; Inert gas systems.	2	-	3	-	-
11.11 *Hydraulic Power (ATA 29)*					
(a) System layout; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical; Filters; Pressure control; Power distribution; Indication and warning systems; Servicing.	5	4	6	6	2
(b) Pneumatic pressure generation; Emergency pressure generation; Interface with other systems.	2	-	3	-	-
11.12 *Ice and Rain Protection (ATA 30)*					
(a) Ice formation, classification, and detection; De-icing systems: electrical, hot-air; Probe and drain heating; Wiper systems.	2	3	2	4	2

MODULE 11. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEM	Nr of questions				
	A1	A2	B1.1	B1.2	B3
(b) Rain repellent; De-icing systems: pneumatic and chemical; Anti-icing systems: electrical, hot-air and chemical.	2	-	3	-	-
11.13 *Landing Gear (ATA 32)*					
(a) Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering.	5	5	8	4	2
(b) Air–ground sensing.	1	-	1	-	-
11.14 *Lights (ATA 33)* External: navigation, anticollision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	4	2	4	3	2
11.15 *Oxygen (ATA 35)* System layout: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	3	3	4	4	2
11.16 *Pneumatic/Vacuum (ATA 36)* System layout; Sources: engine/APU (Auxiliary Power Unit), compressors, reservoirs, ground supply; Pressure and vacuum pumps; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	4	4	5	5	4
11.17 *Water/Waste (ATA 38)* Water system layout, supply, distribution, servicing and draining; Toilet system layout, flushing and servicing; Corrosion aspects.	3	2	3	3	—
11.18 *Onboard Maintenance Systems (ATA 45)* Central maintenance computers; Data-loading system; Electronic library system; Printing; Structure monitoring (damage-tolerance monitoring).	2	—	3	—	—

MODULE 11. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEM	Nr of questions				
	A1	A2	B1.1	B1.2	B3
11.19 *Integrated Modular Avionics (ATA 42)* Functions that may be typically integrated in the Integrated Modular Avionics (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System Built-In Test Equipment (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.	2	—	2	—	—
11.20 *Cabin Systems (ATA 44)* The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System (CIDS)) and between the aircraft cabin and ground stations (Cabin Network Service (CNS)). They include voice, data, music and video transmissions. The CIDS provides an interface between cockpit/cabin crew and cabin systems. These systems support data exchange between the different related Line Replaceable Units (LRUs) and they are typically operated via Flight Attendant Panels (FAPs). The CNS typically consists of a server which interfaces, among others, with the following systems: Data/Radio Communication; Cabin Core System (CCS); In-Flight Entertainment System (IFES); External Communication System (ECS); Cabin Mass Memory System (CMMS); Cabin Monitoring System (CMS); Miscellaneous Cabin Systems (MCSs). The CNS may host functions such as: — access to predeparture/departure reports; — email/intranet/internet access, and passenger database. Cabin Core System (CCS); In-Flight Entertainment System (IFES); External Communication System (ECS); Cabin Mass Memory System (CMMS); Cabin Monitoring System (CMS); Miscellaneous Cabin System (MCS).	2	—	2	—	—
11.21 *Information Systems (ATA 46)* The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. They include units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and	2	—	2	—	—

MODULE 11. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEM	Nr of questions				
	A1	A2	B1.1	B1.2	B3
controller. They do not include units or components installed for other uses and shared with other systems, such as flight deck printer or general-use display.					
Typical examples include Air Traffic and Information Management Systems and Network Server Systems;					
Aircraft General Information System;					
Flight Deck Information System;					
Maintenance Information System;					
Passenger Cabin Information System;					
Miscellaneous Information System.					

12. MODULE 12 — ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS

MODULE 12. ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions	
	A3 A4	B1.3 B1.4
Total number for the module:	100	128
12.1 *Theory of Flight — Rotary Wing Aerodynamics*	6	9
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 setting, overpitching;		
Auto-rotation;		
Ground effect.		
12.2 *Flight Control Systems*	9	9
Cyclic control;		
Collective control;		
Swashplate;		
Yaw control: anti-torque control, tail rotor, bleed air;		
Main-rotor head: design and operation features;		
Blade dampers: function and construction;		
Rotor blades: main- and tail-rotor blade construction and attachment;		
Trim control, fixed and adjustable stabilisers;		
System operation: manual, hydraulic, electrical and fly-by-wire;		
Artificial feel;		
Balancing and rigging.		
12.3 *Blade Tracking and Vibration Analysis*	7	9
Rotor alignment;		
Main- and tail-rotor tracking;		

MODULE 12. ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions	
	A3 A4	B1.3 B1.4
Static and dynamic balancing;		
Vibration types, vibration-reduction methods;		
Ground resonance.		
12.4 *Transmission*		
Gear boxes, main and tail rotors;	3	6
Clutches, free wheel units and rotor brake;		
Tail-rotor drive shafts, flexible couplings, bearings, vibration dampers and bearing hangers.		
12.5 *Airframe Structures*		
(a) Airworthiness requirements for structural strength;		
Structural classification: primary, secondary and tertiary;		
Fail-safe, safe-life, and damage-tolerance concepts;		
Zonal and station identification systems;	5	6
Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue;		
Drains and ventilation provisions;		
System installation provisions;		
Lightning strike protection provisions.		
(b) Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, 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;	5	7
Firewalls;		
Engine mounts;		
Structure assembly techniques: riveting, bolting, bonding;		
Methods of surface protection, such as chromating, anodising, painting;		
Surface cleaning;		
Airframe symmetry: methods of alignment and symmetry checks.		
12.6 *Air Conditioning (ATA 21)*	2	—
12.6.1 *Air supply*	1	2
Sources of air supply including engine bleed and ground cart.		
12.6.2 *Air conditioning*		
Air-conditioning systems;		
Distribution systems;	3	5
Flow and temperature control systems;		
Protection and warning devices.		
12.7 *Instruments / Avionics Systems*		
12.7.1 *Instrument Systems (ATA 31)*	6	9
Pitot static: altimeter, airspeed indicator, vertical speed indicator;		

MODULE 12. ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions	
	A3 A4	B1.3 B1.4
Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator;		
Compasses: direct reading, remote reading;		
Vibration indicating systems / health and usage monitoring systems (HUMS);		
Glass cockpit;		
Indications of other aircraft systems.		
12.7.2 *Avionics Systems*		
Fundamentals of system layouts and operation of:		
Autoflight (ATA 22);		
Communications (ATA 23);		
Very High Frequency (VHF) communications;		
High Frequency (HF) communications;		
Satellite communications (SATCOM);		
Controller–pilot data link communications (CPDLC);		
Audio systems;		
Emergency Locator Transmitters (ELTs);		
Cockpit Voice Recorder (CVR);		
Navigation Systems (ATA 34).		
Very High Frequency omnidirectional range (VOR);		
Automatic Direction Finding (ADF);	5	7
Instrument Landing System (ILS);		
Microwave Landing System (MLS);		
Flight Director systems; Distance-Measuring Equipment (DME);		
Area navigation (RNAV) systems;		
Flight Management Systems;		
Satellite Navigation Systems;		
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;		
Types and use of avionics general test equipment.		
12.8 *Electrical Power (ATA 24)*		
Installation and operation of batteries;		
DC power generation, AC power generation;		
Emergency power generation;	7	10
Voltage regulation, circuit protection;		
Power distribution;		
Inverters, transformers, rectifiers;		

MODULE 12. ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions	
	A3 A4	B1.3 B1.4
External/ground power.		
12.9 *Equipment and Furnishings (ATA 25)*		
(a) Emergency equipment requirements;	2	3
Seats, harnesses and belts;		
Lifting systems.		
(b) Emergency flotation systems;	3	3
Cabin layout, cargo retention;		
Equipment layout;		
Cabin furnishing installation.		
12.10 *Fire Protection (ATA 26)*		
(a) Fire and smoke detection and warning systems;	2	4
Fire-extinguishing systems;		
System tests.		
(b) Portable fire extinguishers.	1	1
12.11 *Fuel Systems (ATA 28)*	7	8
System layout;		
Fuel tanks;		
Supply systems;		
Dumping, venting and draining;		
Cross-feed and transfer;		
Indications and warnings;		
Refuelling and defuelling.		
12.12 *Hydraulic Power (ATA 29)*	8	8
System layout;		
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;		
Servicing.		
12.13 *Ice and Rain Protection (ATA 30)*	4	4
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.		

MODULE 12. ROTORCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions	
	A3 A4	B1.3 B1.4
12.14 *Landing Gear (ATA 32)*	6	7
Construction, shock absorbing;		
Extension and retraction systems: normal and emergency;		
Indications and warnings;		
Wheels, tyres, brakes;		
Steering;		
Air–ground sensing;		
Skids, floats.		
12.15 *Lights (ATA 33)*	3	4
External: navigation, landing, taxiing;		
Internal: cabin, cockpit, cargo;		
Emergency.		
12.16 *(Reserved)*		
12.17 *Integrated Modular Avionics (ATA 42)*	1	2
Functions that may be typically integrated in the Integrated Modular Avionics (IMA) modules are, among others:		
Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System Built-In Test Equipment (BITE), Fuel Management, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc.;		
Core system;		
Network components.		
12.18 *Onboard Maintenance Systems (ATA 45)*	2	3
Central maintenance computers;		
Data-loading system;		
Electronic library system.		
12.19 *Information Systems (ATA 46)*	2	2
The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. They include units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. They do not include units or components installed for other uses and shared with other systems, such as flight deck printer or general-use display.		
Typical examples include Air Traffic and Information Management Systems and Network Server Systems;		
Aircraft General Information System;		
Flight Deck Information System;		
Maintenance Information System;		
Miscellaneous Information System.		

13. MODULE 13 — AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS

C/N: COM & NAV; In.: Instruments; A/F: Autoflight; Sur.: Surveillance; A/S: Airframe & Systems

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions						
	B2	Basic B2L	B2L C/N	B2L In.	B2L A/F	B2L Sur.	B2L A/S
Total number for the module:	188	32	24	20	28	8	52
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; and — yaw control: rudder limiters; Control using elevons, ruddervators; High-lift devices: slots, slats, flaps; Drag-inducing devices: spoilers, lift dumpers, speed brakes; and Operation and effect of trim tabs, servo tabs and control surface bias.	3	3	-	-	-	-	-
(b) Rotary Wing Aerodynamics Terminology; Operation and effect of cyclic, collective and anti-torque controls.	3	3	-	-	-	-	-
13.2 *Structures — General Concepts*							
(a) Fundamentals of structural systems;	2	2	-	-	-	-	-
(b) Zonal and station identification systems;	2	2	-	-	-	-	-
(c) Electrical bonding;	2	2	-	-	-	-	-
(d) Lightning strike protection provisions.	2	2	-	-	-	-	-
13.3 *Autoflight (ATA 22)*							
(a) 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 rotorcraft Automatic trim control; Autopilot navigation aids interface.	16	-	-	-	16	-	-
(b) Autothrottle systems; Automatic landing systems: principles and categories, modes of operation, approach, glideslope, land, go-around, system monitors and failure conditions.	8	-	-	-	-	-	-
13.4 *Communication/Navigation (ATA 23/34)*							

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions						
	B2	Basic B2L	B2L C/N	B2L In.	B2L A/F	B2L Sur.	B2L A/S
(a)	24	-	24	-	-	-	-
Fundamentals of radio-wave propagation, antennas, transmission lines, communication, receiver and transmitter;							
Working principles of the following systems:							
Very High Frequency (VHF) communications;							
High Frequency (HF) communications;							
Satellite communications (SATCOM);							
Controller–pilot data link communications (CPDLC);							
Audio systems;							
Emergency Locator Transmitters (ELTs);							
Cockpit Voice Recorder (CVR);							
Very High Frequency Omnidirectional Range (VOR);							
Automatic Direction Finding (ADF);							
Instrument Landing System (ILS);							
Flight Director Systems (FDSs), Distance-Measuring Equipment (DME);							
Area navigation (RNAV) systems;							
Flight Management Systems (FMSs);							
Global Positioning System (GPS), Global Navigation Satellite Systems (GNSSs), Galileo, Ground-based Augmentation System (GBAS), Satellite-based Augmentation System (SBAS) such as the European Geostationary Navigation Overlay Service (EGNOS) and the Wide Area Augmentation System (WAAS);							
Data Link and Two-Way Data Link.							
(b)	3	-	-	-	-	8	-
Air Traffic Control transponder, secondary surveillance radar;							
Traffic Alert and Collision Avoidance System (TCAS);							
Weather avoidance radar;							
Radio altimeter;							
Automatic Dependent Surveillance Broadcast (ADS-B) and its other associated services such as FIS-B, TIS-B and multilink;							
Inertial Navigation System (INS);							
ARINC (Aeronautical Radio Incorporated) communication and reporting.							
13.5 *Electrical Power (ATA 24)*	13	13	-	-	-	-	-
Installation and operation of batteries;							
DC power generation;							
AC power generation;							
Emergency power generation;							

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions						
	B2	Basic B2L	B2L C/N	B2L In.	B2L A/F	B2L Sur.	B2L A/S
Voltage regulation;							
Power distribution;							
Inverters, transformers, rectifiers;							
Circuit protection;							
External/ground power.							
13.6 *Equipment and Furnishings (ATA 25)*	5	-	-	-	-	-	-
Electronic emergency equipment requirements.							
13.7 *Flight Controls (ATA 27)*							
(a)							
Primary controls: aileron, elevator, rudder, spoiler;							
Trim control;							
Active load control;							
High-lift devices;	4	-	-	-	4	-	-
Lift dump, speed brakes;							
System operation: manual, hydraulic, pneumatic;							
Artificial feel, yaw damper, Mach trim, rudder limiter, gust locks;							
Stall protection systems.							
(b)							
Rotorcraft controls: cyclic control, collective control, swashplate, yaw control (anti-torque control, tail rotor, bleed air).	4	-	-	-	4	-	-
(c)							
System operation: electrical, fly-by-wire.	4	-	-	-	4	-	-
13.8 *Instruments (ATA 31)*							
Classification;							
Atmosphere;							
Terminology;							
Pressure-measuring devices and systems;							
Pitot-static systems;							
Altimeters;							
Vertical-speed indicators;							
Airspeed indicators;	20	-	-	20	-	-	-
Machmeters;							
Altitude-reporting/alerting systems;							
Air-data computers;							
Instrument pneumatic systems;							
Direct-reading pressure and temperature gauges;							
Temperature indication systems;							
Gyroscopic principles;							
Artificial horizons;							

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions						
	B2	Basic B2L	B2L C/N	B2L In.	B2L A/F	B2L Sur.	B2L A/S
Slip indicators;							
Directional gyros;							
Ground Proximity Warning Systems (GPWSs);							
Compass systems;							
Flight Data Recording Systems (FDRSs);							
Electronic Flight Instrument Systems (EFISs) — typical system arrangements and cockpit layout;							
Instrument warning systems including master warning systems and centralised warning panels;							
Stall-warning systems and angle-of-attack-indication systems;							
Vibration measurement and indication;							
Glass cockpit;							
Types and use of avionics general test equipment.							
13.9 *Lights (ATA 33)*	5	5	—	—	—	—	—
External: navigation, landing, taxiing, ice;							
Internal: cabin, cockpit, cargo;							
Emergency.							
13.10 *Onboard Maintenance Systems (ATA 45)*	5	—	—	—	—	—	—
Central maintenance computers;							
Data-loading system;							
Electronic library system;							
Printing system;							
Structure-monitoring system (damage-tolerance monitoring).							
13.11 *Air Conditioning and Cabin Pressurisation (ATA 21)*							
13.11.1 *Air supply*	1	—	—	—	—	—	1
Sources of air supply including engine bleed, APU and ground cart.							
13.11.2 *Air conditioning*							
(a) Air-conditioning systems;	1	—	—	—	—	—	1
(b) Air cycle and vapour cycle machines;	1	—	—	—	—	—	1
(c) Distribution systems;	1	—	—	—	—	—	1
(d) Flow, temperature, and humidity control system.	1	—	—	—	—	—	1
13.11.3 *Pressurisation*	1	—	—	—	—	—	1
Pressurisation systems;							
Control and indication including control and safety valves;							
Cabin pressure controllers.							
13.11.4 *Safety and warning devices*	2	—	—	—	—	—	2
Protection and warning devices.							
13.12 *Fire Protection (ATA 26)*							
(a)	2	—	—	—	—	—	2
Fire and smoke detection and warning systems;							

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions						
	B2	Basic B2L	B2L C/N	B2L In.	B2L A/F	B2L Sur.	B2L A/S
Fire-extinguishing systems; System tests.							
(b) Portable fire extinguisher.	1	—	—	—	—	—	1
13.13 *Fuel Systems (ATA 28/47)*							
(a) Fundamentals of structural systems	1	—	—	—	—	—	1
(b) Fuel tanks;	1	—	—	—	—	—	1
(c) Supply systems;	1	—	—	—	—	—	1
(d) Dumping, venting and draining;	1	—	—	—	—	—	1
(e) Cross-feed and transfer;	1	—	—	—	—	—	1
(f) Indications and warnings;	1	—	—	—	—	—	1
(g) Refuelling and defuelling;	1	—	—	—	—	—	1
(h) Longitudinal balance fuel systems;	1	—	—	—	—	—	1
(i) Inert gas systems.	1	—	—	—	—	—	1
13.14 *Hydraulic Power (ATA 29)*		-	-	-	-	-	
(a) System layout;	1	-	-	-	-	-	1
(b) Hydraulic fluids;	1	-	-	-	-	-	1
(c) Hydraulic reservoirs and accumulators;	1	-	-	-	-	-	1
(d) Pressure generation: electrical, mechanical, pneumatic;	1	-	-	-	-	-	1
(e) Emergency pressure generation;	1	-	-	-	-	-	1
(f) Filters;	1	-	-	-	-	-	1
(g) Pressure control;	1	-	-	-	-	-	1
(h) Power distribution;	1	-	-	-	-	-	1
(i) Indication and warning systems;	1	-	-	-	-	-	1
(j) Interface with other systems;	1	-	-	-	-	-	1
(k) Servicing.	1	-	-	-	-	-	1
13.15 *Ice and Rain Protection (ATA 30)*							
(a) Ice formation, classification, and detection;	1	-	-	-	-	-	1
(b) Anti-icing systems: electrical, hot-air, and chemical;	1	-	-	-	-	-	1
(c) De-icing systems: electrical, hot-air, pneumatic, chemical;	1	-	-	-	-	-	1
(d) Rain repellent;	1	-	-	-	-	-	1
(e) Probe and drain heating;	1	-	-	-	-	-	1
(f) Wiper systems.	1	-	-	-	-	-	1
13.16 *Landing Gear (ATA 32)*		-	-	-	-	-	
(a) Construction, shock absorbing;	1	-	-	-	-	-	1
(b) Extension and retraction systems: normal and emergency;	1	-	-	-	-	-	1
(c) Indications and warnings;	1	-	-	-	-	-	1
(d) Wheels, brakes, antiskid and automatic braking systems;	1	-	-	-	-	-	1
(e) Tyres;	1	-	-	-	-	-	1
(f) Steering;	1	-	-	-	-	-	1

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions						
	B2	Basic B2L	B2L C/N	B2L In.	B2L A/F	B2L Sur.	B2L A/S
(g) Air–ground sensing.	1	-	-	-	-	-	1
13.17 *Oxygen (ATA 35)* System layout: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	2	-	-	-	-	-	2
13.18 *Pneumatic/Vacuum (ATA 36)*						-	
(a) System layout;	1	-	-	-	-	-	1
(b) Sources: engine/APU, compressors, reservoirs, ground supply;	1	-	-	-	-	-	1
(c) Pressure control;	1	-	-	-	-	-	1
(d) Distribution;	1	-	-	-	-	-	1
(e) Indications and warnings;	1	-	-	-	-	-	1
(f) Interfaces with other systems.	1	-	-	-	-	-	1
13.19 *Water/Waste (ATA 38)* Water system layout, supply, distribution, servicing and draining; Toilet system layout, flushing and servicing.	2	-	-	-	-	-	-
13.20 *Integrated Modular Avionics (IMA) (ATA 42)* Core system; Network components. Note: Functions that may be typically integrated into the IMA modules are among others: — bleed management; — air pressure control; — air ventilation and control; — avionics and cockpit ventilation control, temperature control; — air traffic control communication; — avionics communication router; — electrical load management; — circuit breaker monitoring; — electrical system built-in test equipment (BITE); — fuel management; — braking control; — steering control; — landing gear extension and retraction; — tyre pressure indication; — oleo pressure indication; — brake temperature monitoring.	3	-	-	-	-	-	-
13.21 *Cabin Systems (ATA 44)*	3	-	-	-	-	-	-

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS	Nr of questions						
	B2	Basic B2L	B2L C/N	B2L In.	B2L A/F	B2L Sur.	B2L A/S
The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System (CIDS)) and between the aircraft cabin and ground stations (Cabin Network Service (CNS)). They include voice, data, music and video transmissions.							
The CIDS provides an interface between cockpit/cabin crew and cabin systems. These systems support data exchange between the different related Line Replaceable Units (LRUs) and they are typically operated via Flight Attendant Panels (FAPs).							
The CNS typically consists of a server which interfaces, among others, with the following systems:							
— Data/Radio Communication;							
— Cabin Core System (CCS);							
— In-Flight Entertainment System (IFES);							
— External Communication System (ECS);							
— Cabin Mass Memory System (CMMS);							
— Cabin Monitoring System (CMS);							
— Miscellaneous Cabin Systems (MCSs).							
The CNS may host functions such as:							
— access to predeparture/departure reports;							
— email/intranet/internet access;							
— passenger database.							
13.22 *Information Systems (ATA 46)*							
The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. They include units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller, but they do not include units or components installed for other uses and shared with other systems, such as flight deck printer or general-use display.	3	-	-	-	-	-	-
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 systems.							

14. MODULE 14 — PROPULSION

MODULE 14. PROPULSION	Nr of questions B2 B2L Instruments B2L Airframe Systems
Total number for the module:	**32**
14.1 *Engines*	
(a) Constructional arrangement and operation of turbojet, turbofan, turboshaft, and turboprop engines;	3
(b) Constructional arrangement and operation of auxiliary power units (APUs);	4
(c) Constructional arrangement and operation of piston engines;	2
(d) Constructional arrangement and operation of electric and hybrid engines, and their electric energy storage and control systems.	4
(e) Electronic engine control and fuel-metering systems (full authority digital engine control (FADEC)).	3
14.2 *Electric/Electronic Engine Indication Systems*	10
Exhaust gas temperature / Interstage turbine temperature systems;	
Cylinder head temperature;	
Engine coolant temperature;	
Engine speed;	
Engine thrust indication: engine pressure ratio, engine turbine discharge pressure or jet pipe pressure systems;	
Vibration measurement systems;	
Oil pressure and temperature;	
Fuel pressure, temperature, and flow;	
Manifold pressure;	
Engine torque.	
14.3 *Propeller Systems*	2
Propeller speed indication;	
Speed control and pitch change methods, electrical/electronic;	
Synchronising and synchrophasing equipment;	
Electrical anti-icing/de-icing equipment.	
14.4 *Starting and Ignition Systems*	4
Operation of engine start systems and components;	
Ignition systems and components;	
Maintenance safety requirements.	

15. MODULE 15 — GAS TURBINE ENGINE

MODULE 15. GAS TURBINE ENGINE	Nr of questions	
	A1 A3	B1.1 B1.3
Total number for the module:	60	92
15.1 *Fundamentals*	4	4
Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle;		
The relationship between force, work, power, energy, velocity, and acceleration;		
Constructional arrangement and operation of turbojet, turbofan, turboshaft, turboprop, and geared turbofan.		

MODULE 15. GAS TURBINE ENGINE	Nr of questions	
	A1 A3	B1.1 B1.3
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;	-	6
By-pass ratio and engine pressure ratio;		
Pressure, temperature, and velocity of the gas flow;		
Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations.		
15.3 *Inlet*		
Compressor inlet ducts;	3	4
Effects of various inlet configurations;		
Ice protection.		
15.4 *Compressors*		
Axial and centrifugal types;		
Constructional features, operating principles, and applications;		
Fan balancing;		
Operation;	5	7
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.		
15.5 *Combustion Section*	3	3
Constructional features and principles of operation.		
15.6 *Turbine Section*		
Operation and characteristics of different turbine blade types;		
Blade-to-disk attachment;	5	5
Nozzle guide vanes;		
Causes and effects of turbine blade stress and creep.		
15.7 *Exhaust*		
Constructional features and principles of operation;		
Convergent, divergent, and variable area nozzles;	4	4
Engine noise reduction;		
Thrust reversers.		
15.8 *Bearings and Seals*	-	3
Constructional features and principles of operation.		
15.9 *Lubricants and Fuels*		
Properties and specifications of standard, alternate and drop-in fuels;		
Properties and specifications of lubricants;	3	4
Fuel additives;		
Safety precautions.		
15.10 *Lubrication Systems*	3	4

MODULE 15. GAS TURBINE ENGINE	Nr of questions	
	A1 A3	B1.1 B1.3
System operation/layout and components.		
15.11 *Fuel Systems*	4	5
Operation of engine control and fuel-metering systems including electronic engine control (full authority digital engine control (FADEC)) and electronic power augmentation;		
Systems layout and components.		
15.12 *Air Systems*	3	3
Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.		
15.13 *Starting and Ignition Systems*	3	4
Operation of engine start systems and components;		
Ignition systems and components;		
Maintenance safety requirements.		
15.14 *Engine Indication Systems*	5	7
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.		
15.15 *Alternate Turbine Constructions — Power Augmentation Systems*	-	2
Geared turbofan (GTF);		
Variable fan blades;		
Open rotors / Propfan;		
Hybrid turbine-electric concepts and electric power augmentation;		
Future trends and developments.		
15.16 Turboprop Engines	3	5
Gas-coupled/-free turbine and gear-coupled turbines;		
Reduction gears;		
Integrated engine and propeller controls;		
Overspeed safety devices.		
15.17 *Turboshaft Engines*	2	3
Arrangements drive systems, reduction gearing, couplings, control systems.		
15.18 *Auxiliary Power Units (APUs)*	2	3
Purpose, operation, protective systems.		
15.19 *Power Plant Installation*	2	3
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.		
15.20 *Fire Protection Systems*	2	3

MODULE 15. GAS TURBINE ENGINE	Nr of questions	
	A1 A3	B1.1 B1.3
Operation of fire-detection and fire-extinguishing systems.		
15.21 *Engine Monitoring and Ground Operation*	4	7
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 the engine manufacturer;		
Compressor washing/cleaning;		
Foreign object damage (FOD).		
15.22 *Engine Storage and Preservation*		3
Preservation and depreservation for the engine and accessories/systems.		

16. MODULE 16 — PISTON ENGINE

MODULE 16. PISTON ENGINE	Nr of questions		
	A2 A4	B1.2 B1.4	B3
Total number for the module:	52	76	72
16.1 *Fundamentals*	5	5	6
Mechanical, thermal, and volumetric efficiencies;			
Operating principles: 2-stroke, 4-stroke, Otto, Diesel, and Rotary (Wankel);			
Piston displacement and compression ratio;			
Engine configuration and firing order.			
16.2 *Engine Performance*	3	5	4
Power calculation and measurement;			
Factors that affect engine power;			
Mixtures/leaning, pre-ignition.			
16.3 *Engine Construction*	7	8	9
Crank case, crank shaft, cam shafts, sumps;			
Accessory gearbox;			
Cylinder and piston assemblies;			
Connecting rods, inlet, and exhaust manifolds;			
Valve mechanisms;			
Propeller reduction gearboxes.			
16.4 *Engine Fuel Systems*			
16.4.1 *Carburettors*	3	4	3
Types, construction, and principles of operation;			
Icing and heating.			
16.4.2 *Fuel injection systems*	2	4	2
Types, construction, and principles of operation.			
16.4.3 *Electronic engine control*	2	4	3

MODULE 16. PISTON ENGINE	Nr of questions		
	A2 A4	B1.2 B1.4	B3
Operation of engine control and fuel-metering systems including electronic engine control (full authority digital engine control (FADEC));			
System layout and components.			
16.5 *Starting and Ignition Systems*			
Starting systems, preheat systems;			
Magneto types, construction, and principles of operation;	5	5	6
Ignition harnesses, spark plugs;			
Low- and high-tension systems.			
16.6 *Induction, Exhaust and Cooling Systems*			
Construction and operation of induction systems including alternate air systems;	3	4	3
Exhaust systems, engine cooling systems — air and liquid.			
16.7 *Supercharging/Turbocharging*			
Principles and purpose of supercharging and its effects on engine parameters;			
Construction and operation of supercharging/turbocharging systems;	5	6	8
System-related terminology;			
Control systems;			
System protection.			
16.8 *Lubricants and Fuels*			
Properties and specifications of standard, alternate and drop-in fuels;			
Properties and specifications of lubricants;	2	5	4
Fuel additives;			
Safety precautions.			
16.9 *Lubrication Systems*	3	4	2
System operation/layout and components.			
16.10 *Engine Indication Systems*			
Engine speed;			
Cylinder head temperature;			
Coolant temperature;	6	7	10
Oil pressure and temperature;			
Exhaust gas temperature;			
Fuel pressure and flow;			
Manifold pressure.			
16.11 *Power Plant 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.	3	3	2
16.12 *Engine Monitoring and Ground Operation*			
Procedures for starting and ground run-up;			
Interpretation of engine power output and parameters;	3	5	5
Inspection of engine and components: criteria, tolerances, and data specified by the engine manufacturer.			
16.13 *Engine Storage and Preservation*		3	1
Preservation and depreservation for the engine and accessories/systems.			

MODULE 16. PISTON ENGINE	Nr of questions		
	A2 A4	B1.2 B1.4	B3
16.14 *Alternate Piston Engine Constructions*	-	4	4
Hybrid piston-electric concepts and electric power augmentation.			

17. MODULE 17 — PROPELLER

MODULE 17. PROPELLER	Nr of questions	
	A1 A2	B1.1 B1.2 B3
Total number for the module:	20	32
17.1 *Fundamentals*	5	8
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.		
17.2 *Propeller Construction*	4	5
Construction methods and materials used in wooden, composite and metal propellers;		
Blade station, blade face, blade shank, blade back/thrust face and hub assembly;		
Fixed pitch, controllable pitch, constant speeding propeller;		
Propeller/spinner installation.		
17.3 *Propeller Pitch Control*	4	6
Speed control and pitch change methods, mechanical and electrical/electronic;		
Feathering and reverse pitch;		
Overspeed protection.		
17.4 *Propeller Synchronising*	-	2
Synchronising and synchrophasing equipment.		
17.5 *Propeller Ice Protection*	2	3
Fluid and electrical de-icing equipment.		
17.6 *Propeller Maintenance*	3	6
Static and dynamic balancing;		
Blade tracking;		
Assessment of blade damage, erosion, corrosion, impact damage, delamination;		
Propeller treatment/repair schemes;		
Propeller engine running.		
17.7 *Propeller Storage and Preservation*	2	2
Propeller preservation and depreservation.		

18. MODULE 18 — PRACTICAL ASSESSMENT

A. Assessment of 'A' licence categories

At least 5 maintenance tasks shall be selected in Table (a) and the assessment shall be based on the observation of the candidate's performance while carrying out the tasks.

Duration of the assessment: 2 days.

B. Assessment of 'B1', 'B2' and 'B3' licence categories

The training organisation or the competent authority shall decide on the group of tasks and the assessment shall be based on the observation of the candidate's performance while carrying out the tasks.

Duration of the assessment:

B1.1 and B1.3:	5 assessment days on selected maintenance tasks for the applicable subjects in Table (b)
B1.2, B1.4, B2L and B3:	3 assessment days on selected maintenance tasks for the applicable subjects in Table (b)
B2:	4 assessment days on selected maintenance tasks for the applicable subjects in Table (b) plus 1 assessment day on at least 2 maintenance tasks selected from Table (a)

'1 Assessment Day' means at least 6 hours, calculated without breaks. '1 hour' means 60 minutes.

Appendix III — Aircraft type training and examination standard — On-the-job training (OJT)

1. General

[…]

(a) The ~~T~~theoretical training and the examination shall comply with the following requirements:

[…]

(ii) Shall comply, except as permitted by the differences training provided for in point (c), with the standard set out in point 3.1 of this Appendix and, if available, the ~~relevant~~ elements defined in the ~~mandatory part of the~~ operational suitability data established in accordance with Regulation (EU) No 748/2012.

[…]

(b) The ~~P~~practical training and assessment shall comply with the following requirements:

[…]

(ii) Shall comply, except as permitted by the differences training described in point (c), with the standard set out in point 3.2 of this Appendix and, if available, the ~~relevant~~ elements defined in ~~the mandatory part of~~ the operational suitability data established in accordance with Regulation (EU) No 748/2012.

[…]

(iv) Shall include demonstrations using equipment, components, maintenance simulation training devices (MSTDs), maintenance training devices (MTDs), or real aircraft.
~~Shall include demonstrations using equipment, components, simulators, other training devices or aircraft.~~

[…]

(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 by the Agency.~~
Differences training is the training required in order to cover the differences between:

(a) two different aircraft type ratings of the same manufacturer as determined by the Agency; or

(b) two different licence categories in the same type rating.

[…]

(iv) the limit of 3 years (as per points 1(a), (b) and 6 of Appendix III) does not apply to those elements of the theoretical and practical type training and the OJT that were passed and demonstrated to the same level as part of the endorsement of the type in another licence (sub)category, as it is for the basic knowledge modules (ref. point 1.12 of Appendix II).

[…]

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.

An appropriate training method, or combination of training methods, shall be determined for the entire course or for each of its parts with regard to the scope and objectives of each training phase and in consideration of the benefits and limitations of the available training methods.

Multimedia-based training (MBT) methods may be used in order to achieve the training objectives either in a physically or in a virtually controlled environment.

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.

~~(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 subject to the acceptance of the competent authority approving the training course.~~

[…]

(d) Justification of course duration:

[…]

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

— The minimum physical and/or virtual classroom attendance required ~~to~~by the trainee~~,~~ in order to meet the objectives of the course.

— The maximum number of hours of physical and/or virtual classroom training per day, taking into account pedagogical and human factors principles.

[…]

(e) Content:

As a minimum, the elements in the Syllabus below that are specific to the aircraft type shall be covered.

If available, the minimum syllabus of the operational suitability data (OSD), established in accordance with Regulation (EU) No 748/2012, shall be implemented.

Additional elements introduced due to type variations, technological changes, etc. shall also be included.

[…]

Level Chapters	Aeroplanes turbine		Aeroplanes piston		Helicopters turbine		Helicopters piston		Avionics
Licence category	B1	C	B1	C	B1	C	B1	C	B2
[…]									
Airframe systems:									

Level Chapters	Aeroplanes turbine		Aeroplanes piston		Helicopters turbine		Helicopters piston		Avionics
[…]									
47 Nitrogen Generation System	3	1	3	1	—	—	—	—	2
[…]									

[…]

3.2. Practical elements

[…]

(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 in terms of 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.

If available, the minimum list of practical tasks of the OSD, established in accordance with Regulation (EU) No 748/2012, shall be part of the practical elements.

[…]

Chapters	B1/B2	B1					B2				
	LOC	FOT	SGH	R/I	MEL	TS	FOT	SGH	R/I	MEL	TS
[…]											
47 Nitrogen Generation System	X/X	X	X	X	X	X	X	—	X	—	X
[…]											

[…]

4.1. Theoretical element examination standard

[…]

(f) The number of questions shall be at least one question per hour of training. The number of questions for each chapter and level shall be proportionate to:

— the effective training hours spent on teaching at that chapter and level; or

— in case of student-centred methods, the anticipated average time to complete the training; and

— the learning objectives as given by the training needs analysis.

The competent authority shall assess the number and the level of the questions when approving the course.

~~(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.~~

~~The competent authority of the Member State will assess the number and the level of the questions when approving the course.~~

[…]

(j) Whilst it is accepted that the subject matter of the questions may be the same, the questions used as part of the MBT learning programme shall not be used in course or phase examinations.

[…]

5. Type examination standard for Group 2 and Group 3 aircraft

Type examination shall be conducted by training organisations appropriately approved under Part-147 or by the competent authority.

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~~a) The ~~P~~practical assessment shall determine a person's competence to perform a task.

(~~d~~b) Examinations shall be on a sample of chapters ([1]) drawn from point 3 type training/examination syllabus, at the indicated level.

~~(c) 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~~c) 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~~d) The following conditions apply to the examination:

1. The maximum number of consecutive attempts is three. A ~~F~~further set~~s~~ of three attempts ~~are~~is allowed with a 1-year waiting period between sets. A waiting period of 30 days is required after the first failed attempt within one set, and a waiting period of 60 days is required after the second failed attempt.

[…]

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

~~6. On the Job Training~~

~~On the Job Training (OJT) shall be approved by the competent authority who has issued the licence.~~

~~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 competent authority. 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 competent authority, 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.~~

6. On-the-job training (OJT)

6.1. Introduction

The OJT represents the third step in the first aircraft type training. While the theoretical training provides the licence holder with all relevant knowledge on a specific aircraft type in a given category and the practical training provides the licence holder with aircraft-specific skills, the OJT refines both the theoretical and the practical training under the guidance of a mentor in a maintenance environment, while offering the licence holder the possibility to learn maintenance best practices and correct release-to-service procedures.

The OJT is only required to endorse the first aircraft rating in the licence (sub)category.

The aim of the OJT is for the licence holder to gain experience in a particular aircraft type in a real workplace. The licence holder is mentored by qualified and experienced personnel in the procedures and in the release to service of complex maintenance on their first type rating.

After having passed the OJT, the license holder shall be considered to have acquired all the skills required for certifying staff on the level of category B1, B2 or L5.

The applicant that seeks the OJT approval shall meet the requirements established in this paragraph.

6.2. OJT approval

The competent authority shall approve the OJT.

The competent authority for an individual licence holder (or individual licence holders) is the authority that is responsible for issuing the Part-66 licence.

The competent authority for the OJT procedure in maintenance organisations is the authority that is responsible for the maintenance organisation approval.

6.3. OJT requirements

6.3.1. General requirements

The OJT shall involve actual task performance on aircraft and components, covering line and base maintenance activities. The OJT may cover more than one licence category.

The OJT shall be conducted at and under the control of a maintenance organisation that is appropriately approved for the maintenance of a particular aircraft type.

The applicant shall start and complete the OJT within 3 years preceding the application for the first type rating endorsement. Up to 50 % of the required OJT may be undertaken before the aircraft theoretical type training starts.

The applicant shall undergo the OJT under the mentorship of appropriately qualified mentors, on a one-to-one supervision basis. The mentor shall verify and release the tasks performed during the OJT. This means that the mentor shall sign off the tasks and assume responsibility for the tasks at support staff or certifying staff level, as applicable, depending on the release-to-service procedure. Designated assessors shall finally assess the entire OJT programme.

6.3.2 Personnel requirements

The applicant shall undergo the OJT in order to gain the required knowledge as well as the technical and soft skills required in a maintenance environment. The applicant shall be advised and guided from their mentor(s) on maintenance best practices.

The applicant shall have a category A, B or L5 licence before undergoing their OJT or have finished the theoretical type training and cumulated at least 50 % of the basic experience requirement (point 66.A.30) as regards the category of aircraft they are trained for.

The mentor(s) shall transmit their knowledge and experience to the applicant, providing them with advice, support and guidance during the OJT. The mentor(s) shall sign off the work performed in the OJT after they have assured that the work performed is satisfactory and the applicant has the required skills to perform and release maintenance tasks on their own in the future. The mentor(s) shall

countersign the tasks in the OJT task list and issue a recommendation for the final assessment of the applicant.

The competent authority shall accept as mentors the maintenance staff that have the following qualifications:

— They hold of a valid Part-66 AML or a valid ICAO AML in accordance with Appendix IV to Annex II (Part-145), which is acceptable to the competent authority.

— They hold the relevant type rating and category, and exercise the privileges for at least 1 year.

— They have experience in training other people (such as being apprenticeship trainers, Part-147 trainers, have delivered train-the-trainer courses, or have any other comparable national qualification).

— They have the relevant release privileges in the maintenance organisation where the OJT is performed.

The assessor shall assess the applicant at the end of the OJT after having received the recommendation from the mentor(s). The competent authority shall accept as assessors the maintenance staff that have the following qualifications:

— They hold a valid Part-66 AML or a valid ICAO AML in accordance with Appendix IV to Annex II (Part-145), which is acceptable to the competent authority.

— They hold the relevant type rating and category, and exercise the privileges for at least 3 years.

— They have experience and/or have received training in examining others (such as being apprenticeship trainers, Part-147 examiners, have delivered train-the-trainer courses, or have any other comparable national qualification).

— The assessor shall not have been involved as a mentor with the candidate in the OJT. If such a condition is unavoidable, an independent observer shall be present during the OJT assessment.

6.3.3 OJT content

The OJT programme shall include a series of activities and tasks, during which the mentor(s) verifies (verify) the skills, attitudes and responsibilities of a typical certifying staff.

The OJT shall cover a cross section of tasks, acceptable to the competent authority, which are representative of the aircraft type rating, systems, and category applied for.

6.4 Performance of the OJT

The OJT shall be performed in an approved maintenance organisation according to this Regulation. The OJT may be split in line maintenance and base maintenance activities that are necessary in order to completely cover all systems and tasks.

The performance of the OJT shall be documented in an OJT logbook, which shall at least state the following:

1. Name of the candidate;
2. Date of birth of the candidate;
3. Approved Maintenance Organisation;
4. Location where the task has been performed;
5. Name of mentor(s) and assessor(s) (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 and category applied for.

The listed tasks shall refer to an actual job card / work sheet, etc. Before performing the tasks, the candidate shall prepare the necessary documentation and the tools required during the performance of the tasks.

The performance of each task of the OJT shall be signed off by the candidate and countersigned by the designated mentor(s).

The performance of each task shall be supervised by a designated mentor.

6.5 OJT assessment

The assessment may only be performed once the relevant OJT logbook has been finished and the mentor(s) has (have) recommended an assessment. The final assessment shall comply with the following:

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

(b) The objective of the assessment is to verify that the candidates have sufficient technical knowledge as well as the appropriate skills and attitude and that they are, in all aspects, competent to work independently as type-rated certifying staff on a particular aircraft type.

In particular:

(1) general technical knowledge required for the particular licence category;

(2) aircraft-type-specific knowledge and skills for the particular licence category;

(3) knowledge of the regulatory framework and documentation relevant to the aircraft and the licence category;

(4) appropriate behaviour and safety attitude of the candidate in relation to the maintenance environment.

(c) The assessment shall be documented on an approved assessment protocol. The protocol shall contain the following:

— Identification data of the candidate;

— Identification data of the assessor;

— Date and time frame of the OJT assessment;

— Content of the assessment (theoretical and practical);

— Assessment result (pass/fail);

— Signature of the assessor, the candidate and, if applicable, the independent observer;

— A failed assessment may be retaken after 3 months or, if additional training has been received and a new recommendation by the mentor(s) has been made, earlier than 3 months if agreed upon by the assessor(s). After 3 failed attempts, the complete OJT shall be retaken.

6.6 Compliance report and OJT certificate

The performance of the OJT should be documented in a proper and dedicated OJT logbook, reporting the tasks carried out.

The satisfactory accomplishment of the OJT shall be documented with a compliance report and attested to the trainee. The compliance report shall indicate the category and airframe/engine combination for which the OJT has been passed. The compliance report shall be approved by the competent authority.

6.7 Records

The OJT records with all associated data shall be subject to the conditions laid out in point 147.A.125.

[…]

AMC to Section 1 of Appendix III to Part-66 'Aircraft Type Training and Examination Standard. — On-the-Jjob Ttraining'

Aircraft Type Training

[…]

6. The theoretical and practical training should be complementary and may be:

— Iintegrated or split;

— Ssupported by the use of training aids, such as trainers, virtual aircraft, aircraft components, maintenance simulation training devices (MSTDs) and maintenance training devices (MTDs).synthetic training devices (STD), computer based training devices (CBT), etc.

7. The integration and usage of MSTDs and MTDs in maintenance type training (theoretical and/or practical) should consider the following:

— The use of actual aircraft components should be allowed for any MSTD or MTD (even if the components are in a non-airworthy condition, provided that this condition has no impact on the related geometrical, operational or functional characteristics for which they are used in the maintenance training, examination or assessment).

— An MSTD is a training device that is intended to be used in maintenance training, examination and/or assessment for a component, system or an entire aircraft. The MSTD may consist of hardware and software elements. The complexity and degree of simulation may vary and should support type training elements that address a component, a system or the entire aircraft. Based on its characteristics and capabilities, the MSTD may be:

  — a training device capable of providing for the respective component or system the representation of aircraft location, access and layout and servicing with an acceptable level of accuracy and limited simulation; or

  — a training device capable of providing for the respective component or system the representation of aircraft location, access, layout with sufficient accuracy and with interactive simulation for servicing, and the applicable maintenance data for operational (O) and functional (F) test elements including built-in test (BIT) initiation and monitoring from outside the cockpit; such representation should have the capability to accommodate some troubleshooting scenarios; or

  — a training device capable of providing for the respective component or system the representation of on board (flight deck/cockpit or cabin) indication and controls with an acceptable level of accuracy and limited interactive simulation; or

  — a training device capable of providing for the respective component or system the representation of on board (flight deck/cockpit or cabin) indication and controls with sufficient accuracy and with interactive simulation for servicing, and the applicable maintenance data for operational (O) and functional (F) test elements including built-in test (BIT) initiation and monitoring; such representation should have the capability to accommodate some troubleshooting scenarios; or

  — any combination of the above.

— Flight simulation training devices (FSTDs) may be used as MSTDs whenever their characteristics and capabilities are considered appropriate for, and supportive of, the delivery of the respective maintenance training element(s).

— An MTD is any training device other than an MSTD used for maintenance training and/or examination and/or assessment. A mock-up MTD may be considered as an example of an MTD.

GM to point 1(c) of Appendix III to Part-66 'Aircraft Type Training and Examination Standard — On-the-job training'

(c) (iv) Differences training

If the holder of a B1 and B2 licence, without any type rating, successfully completes a combined type training course (B1 + B2) followed by an OJT tailored to B1 tasks, they can obtain, upon request, only the type-rating endorsement that is applicable to the B1 subcategory.

After 3 years, they can apply for the endorsement of the B2 category provided they pass a differences type training course (from B1 to B2) and carry out an OJT programme limited to the avionics tasks that are missing in the previous OJT. All common theoretical and practical elements and OJT tasks, already demonstrated as B1, shall be considered fulfilled.

AMC to Section 3 of Appendix III to Part-66 'Aircraft Type Training and Examination Standard — On-the-job training'

Aircraft type training standard

Training methods are categorised as 'instructor-centred', 'student-centred' and 'blended training'.

The actual training method and the training tools should be adapted to suit the training subject and be chosen considering their intrinsic characteristics such as but not limited to their efficiency and the pedagogical benefits of the method/tool.

A complex or critical subject should not normally be taught solely through a student-centred method unless provisions are in place to verify the actual and progressive acquisition of knowledge of the student.

Complex and critical areas should be identified by the training needs analysis (TNA). The complexity and criticality of the areas could differ on a case-by-case basis (that is, areas proven to be critical by organisations' 'in-service events', occurrence reporting, human factors, safety, etc.), but should in any case cover the maintenance areas with special emphasis (MASE) identified by the type-certificate holder (TCH) in its operational suitability data (OSD).

AMC to point 3.1(d) of Appendix III to Part-66 'Aircraft Type Training and Examination Standard. — On-the-Job Training'

Training Needs Analysis (TNA) for the Theoretical Element of the Aircraft Type Training

[...]

4. ~~In order to approve a reduction of such minimum duration, the evaluation done by the competent authority should be performed on a case-by-case basis appropriate to the aircraft type. For example, while it would be exceptional for a theoretical course for a transport category complex motor-powered aircraft such as an A330 or B757 to be below the minimum duration shown, it would not necessarily be exceptional in the case of a General Aviation (GA) business aircraft such as a Learjet 45 or similar. Typically the TNA for a GA aircraft course would demonstrate that a course of a shorter duration satisfies the requirement.~~

In order to approve the reduction of such minimum duration, the competent authority should perform an assessment on a case-by-case basis and the assessment should be appropriate to the aircraft type and to the training methods and tools proposed.

For example:

(a) While it would be exceptional for a theoretical course for a large transport category aircraft, such as an A330 or a B777, to be below the minimum duration shown, it would not necessarily be exceptional in the case of a general aviation (GA) business aircraft, such as a Learjet 45 or similar. The TNA for a GA aircraft course could demonstrate that a course of a shorter duration satisfies the requirements.

(b) The use of an MSTD (i.e. flat panel trainer) comprising aircraft-type-specific software may result in the duration of the training being reduced due to a more effective transfer of knowledge.

(c) The use of multimedia-based training (MBT), or blending the training methods, may improve the efficiency of the training and, consequently, contribute to the reduction of the overall time needed to achieve the learning objectives.

5. When developing the TNA, the following should be considered:

[…]

(g) The TNA should:

[…]

- Describe the following:
  - The instructional methods and ~~equipment~~ training tools as well as their blended application, ~~teaching methods and blending of the teaching methods~~ in order to ensure the effectiveness of the training;
  - The maintenance training documentation/material to be delivered to the student;
  - Facilitated discussions, questioning session, additional practice~~d~~-oriented training, etc.;
  - The homework, if developed, i.e. to support the achievement of the learning objectives while using asynchronous distance-learning or self-learning methods;
  - The training provider's resources available to the learner.

(h) It is acceptable to differentiate between subjects ~~issues~~ which have to be led by an instructor and subjects ~~issues~~ which may be delivered through interactive simulation training devices and/or covered by ~~web based~~ self-paced elements. The ~~O~~overall time of the course will be allocated accordingly.

(i) […]

(j) The minimum participation time for the trainee in order to meet the objectives of the course should not be less than 90 % of the tuition hours, or 95 % completion of the content in case of student-centred methods in a ~~of the~~ theoretical training course. Additional training may

be provided by the training organisation in order to meet the minimum participation time. If the minimum participation defined for the course is not met, a certificate of recognition should not be issued.

(k) […]

[…]

AMC to point 4.1 of Appendix III to Part-66 'Aircraft Type Training and Examination Standard — On-the-job training'

Type training examination and assessment standard

4.1 Theoretical element examination standard

Examinations may be computer or hard-copy based, or a combination of both. Refer to point 147.A.135.

[…]

AMC to Section 6~~.~~ of Appendix III to Part-66 'Aircraft Type Training and Examination Standard~~.~~ — On-the-~~J~~job ~~T~~training'

~~**On-the-Job Training (OJT)**~~

~~1. 'A maintenance organisation appropriately approved for the maintenance of the particular aircraft type' means a Part-145 or M.A. Subpart F approved maintenance organisation holding an A rating for such aircraft.~~

~~2. The OJT should include one to one supervision and should involve actual work task performance on aircraft/components, covering line and/or base maintenance tasks.~~

~~3. The use of simulators for OJT should not be allowed.~~

~~4. The OJT should cover at least 50% of the tasks contained in Appendix II to AMC to Part-66. Some tasks should be selected from each paragraph of the Appendix II list. Tasks should be selected among those applicable to the type of aircraft and licence (sub)category applied for. Other tasks than those in the Appendix II may be considered as a replacement when they are relevant. Typically, in addition to the variety and the complexity, the OJT tasks should be selected because of their frequency, safety, novelty, etc.~~

~~5. Up to 50% of the required OJT may be undertaken before the aircraft theoretical type training starts.~~

~~6. The organisation providing the on-the-job training should provide trainees a schedule or plan indicating the list of tasks to be performed under supervision. A record of the tasks completed should be entered into a logbook which should be designed such that each task or group of tasks is countersigned by the corresponding supervisor. The logbook format and its use should be clearly defined.~~

~~7. Regarding the day-to-day supervision of the OJT programme in the approved maintenance organisation and the role of the supervisor(s), the following should be considered:~~

~~— It is sufficient that the completion of individual OJT tasks is confirmed by the direct supervisor(s), without being necessary the direct evaluation of the assessor.~~

~~— During the day-to-day OJT performance, the supervision aims at overseeing the complete process, including task completion, use of manuals and procedures, observance of safety measures, warnings and recommendations and adequate behaviour in the maintenance environment.~~

- ~~The supervisor(s) should personally observe the work being performed to ensure the safe completeness and should be readily available for consultation, if needed during the OJT performance.~~
- ~~The supervisor(s) should countersign the tasks and release the maintenance tasks as the trainee is still not qualified to do so.~~
- ~~The supervisor(s) should therefore:~~
  - ~~have certifying staff or support staff privileges relevant to the OJT tasks;~~
  - ~~be competent for the selected tasks;~~
  - ~~be safety-orientated;~~
  - ~~be capable to coach (setting objectives, giving training, performing supervision, evaluating, handling trainee's reactions and cultural issues, managing objectively and positively debriefing sessions, determining the need for extra training or reorientate the training, reporting, etc.);~~
  - ~~be designated by the approved maintenance organisation to carry out the supervision.~~

8. ~~Regarding the assessor, the following should be considered:~~
   - ~~The function of the assessor, as described in Section 6 of Appendix III to Part-66, is to conduct the final assessment of the completed OJT. This assessment should include confirmation of the completion of the required diversity and quantity of OJT and should be based on the supervisor(s) reports and feedback.~~
   - ~~In Section 6 of Appendix III to Part-66, the term 'designated assessor appropriately qualified' means that the assessor should demonstrate training and experience on the assessment process being undertaken and should be authorised to do so by the organisation. Further guidance about the assessment and the designated assessors is provided in Appendix III to AMC to Part-66.~~

9. ~~The procedures for OJT should be included into the Exposition Manual of the approved maintenance organisation (chapter 3.15, as indicated in AMC 145.A.70(a)).~~

~~However, since these procedures in the Exposition Manual are approved by the competent authority of the maintenance organisation, and providing training is not one of the privileges of a maintenance organisation, they can only be used when the licensing authority is the same as the competent authority of the maintenance organisation. In other cases, it is up to the licensing authority to decide whether it accepts such procedures for the purpose of approving the OJT (refer to AMC 66.B.115).~~

On-the-job training (OJT)

6.4.1 and 6.4.2 General and Personnel requirements

'A maintenance organisation appropriately approved for the maintenance of the particular aircraft type' means a Part-145 or Part-CAO approved maintenance organisation that holds an 'A' rating for such aircraft.

The procedures for the OJT should be included in the Exposition Manual of the approved maintenance organisation (Section 3.15, as indicated in AMC 145.A.70(a) or in Part-CAO).

The term 'designated assessor appropriately qualified' means that the assessor should demonstrate they have received training and have experience in the assessment process being undertaken and should be designated by the organisation to perform the assessment. Further guidance about the assessment and the designated assessors is provided in the AMC to Appendix III to Part-66.

The function of the assessor is to conduct the final assessment of the completed OJT. This assessment should include confirmation about the completion of the required diversity and quantity of the OJT and should be based on the mentors' reports and feedback.

6.4.3 OJT content

Typical certifying staff activities are the following (non-exhaustive list):

— review and acceptance of work orders;

— shift-handover procedures and team coordination;

— communication and interaction with flight crew;

— dispatch with unserviceable items;

— clear aircraft logbook entries and reporting notes;

— checks before the release to service.

In case the manufacturer has defined the OJT tasks during the approval of a particular aircraft type (e.g. an OSD-MCS has been approved for a particular aircraft type), those tasks shall be selected. In particular, the analysis performed for the maintenance areas of specific emphasis (MASE) shall help the organisation identify the more appropriate tasks.

Where no such data exists, the task list in Appendix II to the AMC to Annex III (Part-66) shall serve as the basis to develop an OJT programme including the applicable tasks for a particular aircraft type, based on the currently valid maintenance manuals (typically the AMM). The tasks could be selected from the table in Appendix II in order to cover a broader representative sample of both simple and complex tasks on the particular aircraft (ideally 50 % of the tasks in line maintenance and 50 % of the tasks in base maintenance). The tasks should be selected among those that are applicable to the type of aircraft and licence (sub)category applied for, e.g. excluding location tasks and tasks that can be considered under the category A licence privileges (seat covers, boilers, wheels, etc.). If there are tasks which are not applicable to the particular aircraft, they should be replaced with equivalent tasks on related systems (e.g. if an aircraft has a float instead of a traditional landing gear, those tasks should be replaced with tasks that are appropriate for an aircraft with floats).

A minimum number of tasks, expressed in percentage (%) of each category of: INS/inspections, FOT/functional or operational, SGH/servicing, R/I removal and installation, MEL and T/S troubleshooting, should be performed. The competent authority may accept that a limited number of tasks have not been performed as long as the relevant cross section of tasks as regards quality, quantity and complexity is still assured.

Other tasks than those in Appendix II may be considered as a replacement when they are relevant. Typically, in addition to the variety and the complexity, the OJT tasks should be selected because of their frequency, safety, novelty, uniqueness, etc.

A task may be performed on the analogous system installed on a different aircraft type when the systems are similar in terms of design architecture, technology, and functionality. This can be the case, for example, of tasks carried out on engines or landing gears of the same manufacturer.

The experience should be gained on functional aircraft. Tasks circumscribed to system components may be executed at the workshop. This can be the case for avionics functional tests, for example.

Where an existing licence is changed to include an additional category with a type rating, a difference OJT from the category held to the new one may be permissible. In those cases, only the differences category has to be performed.

The use of training aircraft maintained in a full maintenance organisation environment may be acceptable given that such an aircraft is held fully functional. The acceptance of training aircraft is up

to the competent authority. Such an aircraft should be able to be registered and operated with limited effort.

The use of MSTDs and MTDs for OJT should not be allowed.

The OJT may be partly performed on aircraft whose maintenance is not subject to Regulation (EU) 2018/1139 (for example, aircraft subject to the FAA regulatory framework or training helicopters used by the military) given that the maintenance is subject to the same procedures and manuals. A minimum of maintenance activity on aircraft that are subject to Regulation (EU) 2018/1139 is, however, required in order to gain sufficient insight into the European civil aviation regulatory framework and into release-to-service procedures. The acceptance of the OJT is up to the competent authority.

6.5 Performance of the OJT

The organisation that provides the OJT should provide candidates with a schedule or plan which indicates the list of tasks to be performed under supervision. A record of the completed tasks should be entered into a logbook whose design and format should be such that each task or group of tasks is countersigned by the corresponding mentor(s). The logbook format and its use should be clearly defined.

Regarding the day-to-day supervision of the OJT programme in the approved maintenance organisation and the role of the mentor(s), the following should be considered:

— It is sufficient for the completion of the individual OJT tasks to be confirmed by the direct mentor(s), without the direct evaluation of the assessor being necessary.

— During the day-to-day OJT performance, the aim of the supervision is for mentors to oversee the complete process, including task completion, use of manuals, adherence to procedures, observance of safety measures, warnings, cautions and recommendations, and demonstration of the appropriate behaviour in the maintenance environment.

— The mentor(s) should personally observe the work being performed to ensure its safe completion, and should be readily available for consultation if needed during the OJT performance.

— The mentor(s) should countersign the tasks and release the maintenance tasks as the candidate is still not qualified to do so.

— The mentor(s) should be designated by the approved maintenance organisation to carry out the supervision.

After the performance of a task, the mentor(s) shall review the performance of the task together with the candidate and let the candidate prepare a simulated release to service which has to be marked as ‘for training purposes only’. If both the task and the simulated release have been performed to the satisfaction of the mentor(s), the task may be countersigned in the OJT task list by the mentor(s). A physical or electronic copy of the simulated release should be added to the syllabus.

Tasks which are usually performed with more than one person may be performed by more than one candidate under the supervision of one mentor. During the performance of the tasks, the mentor is limited to oversee three candidates at the same time, given that the candidates can be properly overseen ‘at a glance’ from the mentor’s position. Those tasks should be marked as ‘group tasks’ when applying for the approval. All other tasks should be a one-to-one mentorship. In such cases, all the candidates involved should be noted on the work order.

At the end of the performance of the OJT, a compliance report shall be made which verifies and documents the correct and complete performance and the recommendation of the mentor(s) for the following assessment. The mentor(s) may deny a recommendation if the candidate has not demonstrated the knowledge, skills, behaviour and/or ethics required from a certifying staff.

6.6 OJT assessment

The OJT assessment shall consist of a theoretical and a practical part. The theoretical part shall regard the regulatory framework, safety procedures, knowledge of aircraft and its systems, maintenance procedures, and release to service. The practical part should include maintenance tasks on the aircraft, e.g. rem./inst., TS, R/I, FOT, MEL dispatch and so on. The assessor may decide to simulate some aspects of the maintenance tasks.

The aircraft type on which the OJT is performed needs to be available for the assessment together with access to the required maintenance data, equipment, and tools. A training aircraft may be acceptable. It is good practice to assess the practical skills on the aircraft in question while the assessment of knowledge may be performed either on the aircraft or in theory.

[…]

Appendix IV — Experience and basic knowledge modules requirements for extending a Part-66 aircraft maintenance licence

A. Experience requirements

Table A below shows the experience requirements, in months, for obtaining a licence category or adding a new category or subcategory to an existing Part-66 licence.

The experience shall be in practical maintenance on operating aircraft in the subcategory relevant to the application.

The experience requirement will be reduced by 50 % if the applicant has completed an approved Part-147 course relevant to the subcategory.

Recent experience should be in the subcategory applied for and be 50 % of the duration indicated in the table with a minimum of 3 months and a maximum of 1 year. The remaining experience may be accumulated in any subcategory (66.A.30(d)).

Nevertheless, for an initial application, the required experience cannot be less than that established in point 66.A.30.

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

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

* Experience may be reduced by 50 % but allowing a licence with limitations, i.e. a licence endorsed with the exclusion of 'complex maintenance tasks provided for in Appendix VII to Annex I (Part-M), standard changes provided for in point 21.A.90B of Annex I (Part 21) to Regulation (EU) No 748/2012, and standard repairs provided for in point 21.A.431B of Annex I (Part 21) to Regulation (EU) No 748/2012'.

B. Basic knowledge modules (or submodules analysis) required

Table B below shows the basic knowledge modules (Appendix I or Appendix VII) required for adding a new category or subcategory to an existing Part-66 licence.

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	—	16	12	12, 16	All except 9	All except 9	All except 9	All except 9	All except 9	All except 9	All except 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	—	12, 15	12	All except 9	All except 9	All except 9	All except 9	All except 9	All except 9	All except 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	—	16	All except 9	All except 9	All except 9	All except 9	All except 9	All except 9	All except 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	—	All except 9	All except 9	All except 9	All except 9	All except 9	All except 9	All except 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
B1.1	—	16	12	12, 16	—	16	12	12, 16	4, 5, 13, 14	4, 5, SQ	16	—	—	8L	8L	9L	10L	9L, 11L	10L, 11L	8L,10L, 11L
B1.2	15	—	12, 15	12	11, 15	—	12, 15	12	4, 5, 13, 14	4, 5, SQ	—	—	—	8L.10	8L.10	9L	10L	9L, 11L	10L, 11L	10L, 11L
B1.3	11, 17	11, 16, 17	—	16	11, 17	11, 16, 17	—	16	4, 5, 13, 14	4, 5, SQ	11, 16, 17	7L	7L	7L, 8L	7L, 8L	9L	10L	8L, 9L, 11L	8L, 10L, 11L	8L,10L, 11L
B1.4	11, 15, 17	11, 17	15	—	11, 15, 17	11, 17	15	—	4, 5, 13, 14	4, 5, SQ	11, 17	7L	7L	7L, 8L.10	7L, 8L.10	9L	10L	9L, 11L	10L, 11L	10L, 11L
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	—	—	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, 16 (or 8L), 17
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	*13, 14*	—	6, 7, 11, 16, 17	5L, 7L, (12L depending on SQ)	4L, 5L, 6L, 7L, (12L depending on SQ)	5L, 7L, 8L, (12L depending on SQ)	4L, 5L, 6L, 7L, 8L, (12L depending on SQ)	9L	10L	9L, 11L, (12L depending on SQ)	10L, 11L, (12L depending on SQ)	6, 7, 11, 16 (or 8L), 17, (12L depending on SQ)
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, SQ	—	—	—	8L.10	8L.10	9L	10L	9L, 11L	10L, 11L	3, 5, 11L
L1C	All	All	All	All	All	All	All	All	All	All	All	—	4L, 6L	8L	4L, 6L, 8L	9L	10L	8L, 9L, 11L	8L, 10L, 11L	All except 12L

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
L1	All	All	All	All	All	All	All	All	All	All	All	—	—	8L	8L	9L	10L	8L,9L, 11L	8L,10L, 11L	All except 12L
L2C	All	All	All	All	All	All	All	All	All	All	All	—	4L,6L	—	4L , 6L	9L	10L	9L,11L	10L, 11L	All except 8L, 12L
L2	All	All	All	All	All	All	All	All	All	All	All	—	—	—	—	9L	10L	9L,11L	10L, 11L	All except 8L, 12L
L3H	All	All	All	All	All	All	All	All	All	All	All	5L,7L	4L,5L, 6L,7L	5L,7L, 8L	4L,5L, 6L,7L, 8L	—	10L	8L,11L	8L,10L, 11L	All
L3G	All	All	All	All	All	All	All	All	All	All	All	5L,7L	4L,5L, 6L,7L	5L,7L, 8L	4L,5L, 6L,7L, 8L	9L	—	8L,9L, 11L	8L,11L	All except 10L
L4H	All	All	All	All	All	All	All	All	All	All	All	5L,7L	4L,5L, 6L,7L	5L,7L	4L,5L, 6L,7L	—	10L	—	10L	All except 8L, 11L, 12L
L4G	All	All	All	All	All	All	All	All	All	All	All	5L,7L	4L,5L, 6L,7L	5L,7L	4L,5L, 6L,7L	9L	—	9L	—	All except 8l, 10L, 11L, 12L
L5	11, 15, 17	11, 16, 17	12, 15	12, 16	11, 15, 17	11, 16, 17	12, 15	12, 16	4,5,6, 13, 14	4, 5, 6, SQ	11, 16, 17	5L,7L	7L	5L,7L	7L	9L	—	9L	—	—

SQ = system qualification

[…]

Appendix VII — Basic knowledge and practical assessment 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 Annex III (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:

Module 13L is required only for applicants that do not attend a Part-147 basic training course.

MODULE 1L — BASIC KNOWLEDGE

MODULE 1L — BASIC KNOWLEDGE	Level
1L.1 Mathematics Arithmetic Algebra Geometry	1
1L.2 Physics Matter Mechanics Temperature	1
1L.3 Electrics AC and DC Circuits	1
1L.4 Aerodynamics/aerostatics	1
1L.5 Workplace safety and environmental protection	2

MODULE 2L — HUMAN FACTORS

MODULE 2L — HUMAN FACTORS	Level
2L.1 General	1
2L.2 Human performance and limitations	1
2L.3 Social psychology	1
2L.4 Factors that affect~~ing~~ performance	1
2L.5 Physical environment	1
2L.6 The 'Dirty Dozen' and risk mitigation	2

MODULE 3L — AVIATION LEGISLATION

MODULE 3L — AVIATION LEGISLATION	Level
3L.1 Regulatory framework	1
3L.2 Continuing airworthiness regulations	1
3L.3 Repairs and modifications (Part-ML)	2
3L.4 Maintenance data (Part-ML)	2
3L.5 Licence privileges and how to exercise them properly (Part-66, Part-ML)	2

MODULE 4L — WOODEN AND/OR METAL-TUBE STRUCTURE COVERED WITH FABRIC ~~AIRFRAME WOODEN/METAL TUBE AND FABRIC~~

MODULE 4L — WOODEN AND/OR METAL-TUBE STRUCTURE COVERED WITH FABRIC ~~AIRFRAME WOODEN/METAL TUBE AND FABRIC~~	Level
4L.1 Airframe wooden/combination of metal tube and fabric	2
4L.2 Material	2
4L.3 Identifying damage	3
4L.4 Standard repair and maintenance procedures	3

MODULE 5L — COMPOSITE STRUCTURE ~~AIRFRAME COMPOSITE~~

MODULE 5L — COMPOSITE STRUCTURE ~~AIRFRAME COMPOSITE~~	Level
5L.1 Airframe fibre-reinforced plastic (FRP)	2
5L.2 Material	2
5L.3 Identifying damages and defects	3

MODULE 5L — COMPOSITE STRUCTURE ~~AIRFRAME COMPOSITE~~		Level
5L.4	Standard repair and maintenance procedures	3

MODULE 6L — METALLIC STRUCTURE ~~AIRFRAME METAL~~

MODULE 6L — METALLIC STRUCTURE ~~AIRFRAME METAL~~		Level
6L.1	Metallic ~~A~~airframe ~~metal~~	2
6L.2	Material	2
6L.3	Identifying damage	3
6L.4	Standard repair and maintenance procedures	3

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS ~~AIRFRAME — GENERAL~~

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS ~~AIRFRAME — GENERAL~~	Level
7L.1 Theory of Flight — Gliders and Aeroplanes	1
7L.3 Airframe Structure — Aeroplanes and Gliders	1
7L.4 Air Conditioning (ATA 21)	1
7L.5 Electrical Power, Cables and Connectors (ATA 24)	2
7L.6 Equipment and Furnishing (ATA 25)	2
7L.7 Fire Protection and Other Safety Systems (ATA 26)	2
7L.8 Flight Controls (ATA 27)	3
7L.9 Fuel System (ATA 28)	2
7L.10 Hydraulic Power (ATA 29)	2
7L.11 Ice and Rain Protection (ATA 30)	1
7L.12 Landing Gear (ATA 32)	2
7L.13 Lights (ATA 33)	2
7L.14 Oxygen (ATA 35)	2
7L.15 Pneumatic/Vacuum (ATA 36)	2
7L.16 Water Ballast (ATA 41)	2
7L.17 Fasteners	2
7L.18 Pipes, Hoses and Connectors	2
7L.19 Springs	2
7L.20 Bearings	2
7L.21 Transmissions	2
7L.22 Control Cables	2
7L.23 Fits and Clearances	2
7.L24 Aircraft Weight and Balance	2
7L.25 Workshop Practices and Tools	2
7L.26 Disassembly, Inspection, Repair and Assembly Techniques	2
7L.27 Abnormal Events	2
7L.28 Maintenance Procedures	2

MODULE 8L — POWER PLANT

MODULE 8L — POWER PLANT	Level
8L.1 General Engine Fundamentals	2
8L.2 Piston Engine Fundamentals and Performance	2
8L.3 Piston Engine Construction	2
8L.4 Piston Engine Fuel System (non-electronic)	2
8L.5 Starting and Ignition System	2
8L.6 Air Intake, Exhaust and Cooling System	2
8L.7 Supercharging/Turbocharging	2
8L.8 Lubrication Systems of Piston Engines	2
8L.9 Engine Indication Systems	2
8L.10 Electric and Hybrid Aircraft Engines	2
8L.11 Turbine Engine Fundamentals and Performance	2
8L.12 Inlet and Compressor	2
8L.13 Combustion Chamber, Starting and Ignition System	2
8L.14 Turbine Section and Exhaust	2
8L.15 Other Turbine Engine Components and Systems	2
8L.16 Turbine Engine Inspections and Ground Operation	2
8L.17 Propeller	2
8L.18 Full Authority Digital Engine Control (FADEC)	2
8L.19 Lubricants and Fuels	2
8L.20 Engine and Propeller Installation	2
8L.21 Engine Monitoring and Ground Operation	2
8L.22 Engine/Propeller Storage and Preservation	2

MODULE 9L — BALLOONS — HOT-AIR BALLOONS ~~'BALLOON/AIRSHIP HOT AIR'~~

MODULE 9L — BALLOONS — HOT-AIR BALLOONS ~~'BALLOON/AIRSHIP HOT AIR'~~	Level
9L.1 Theory of Flight — Hot-air Balloons	1
9L.2 General Airframe of Hot-air Balloons	2
9L.3 Envelope	3
9L.4 Heater System/Burner	3
9L.5 Basket and Basket Suspension (including alternative devices)	3
9L.6 Instruments	2
9L.7 Equipment	2
9L.8 Hot-air Balloon Handling and Storage	2
9L.9 Disassembly, Inspection, Repair and Assembly Techniques	3

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

MODULES 10L — BALLOONS — GAS (FREE/TETHERED) ~~BALLOON/AIRSHIP GAS (FREE/TETHERED)~~	Level
10L.1 Theory of Flight — Gas Balloons	1
10L.2 General Airframe of Gas Balloons	2
10L.3 Envelope	3
10L.4 Netting	3
10L.5 Valves, Parachutes and Other Related Systems	3
10L.6 Load Ring	3
10L.7 Basket (including alternative devices)	3
10L.8 Ropes and Lines	3
10L.9 Instruments	2
10L.10 Tethered Gas Balloon (TGB) systems	3
10L.11 Equipment	2
10L.12 Gas Balloon Handling and Storage	2
10L.13 Disassembly, Inspection, Repair and Assembly Techniques	3

MODULES 11L — AIRSHIPS — HOT-AIR / GAS AIRSHIPS

MODULES 11L — AIRSHIPS — HOT-AIR / GAS AIRSHIPS	Level
11L.1 Theory of Flight and Control of Airships	2
11L.2 Airship Airframe Structure — General Concepts	2
11L.3 Airship Envelope	2
11L.4 Gondola Landing gear (construction, shock absorbing, tyres, weight-on-wheels)	2 3
11L.5 Airship Flight Control (ATA 27/55)	3
11L.6 Electrical Power (ATA 24)	3
11L.7 Lights (ATA 33)	2
11L.8 Ice and Rain Protection	3
11L.9 Fuel Systems (ATA 28)	2
11L.10 Engine and Propellers in Airships	2
11L.11 Airship Handling and Storage	2
11L.12 Disassembly, Inspection, Repair and Assembly Techniques	2

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

MODULE 12L — RADIO COM/ELT/TRANSPONDER/INSTRUMENTS		Level
12L.1	Radio Com/ELT	2
12L.2	Transponder and FLARM	2
12L.3	Instruments	2
12L.4	Avionics General Test Equipment	1

MODULE 13L. PRACTICAL ASSESSMENT

The candidate shall demonstrate the required competencies while performing a number of maintenance tasks selected by the training organisation or by the competent authority. The assessment shall evaluate two types of competencies:

I. General competence applicable to every licence category and related to the following aspects:

A. Safety precautions — aircraft and workshop;

B. Workshop practices;

C. Use of tools;

D. Use of maintenance data (AMM, SRM, IPC, etc.), engineering drawings, diagrams and standards;

E. Documentation and communication.

II. Competence relevant to the licence category the candidate has applied for.

AMC to Appendix VII — Table of contents

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 AC and DC circuits — Ohm's law, Kirchhoff'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 in parallel.	1
1L.4 Aerodynamics/aerostatics International Standard Atmosphere (ISA), application to aerodynamics and aerostatics.	1
1L.5 Workplace safety and environmental protection — Safe working practices and precautions when working with electricity, gases (especially oxygen), oils and chemicals;	2

MODULE 1L — BASIC KNOWLEDGE	Level
— Labelling, storage and disposal of hazardous (to workplace safety and environment) materials; — Remedial action in the event of a fire or another accident with one or more hazards, including knowledge of fire-extinguishing agents.	

MODULE 2L — HUMAN FACTORS

MODULE 2L — HUMAN FACTORS	Level
2L.1 General — The need to take human factors into account in the maintenance domain. — 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 that affect performance Fitness, physical and mental health, stress, sleep, fatigue, alcohol, medication, drug abuse.	1
2L.5 Physical environment Working environment (climate, noise, illumination).	1
2L.6 The 'Dirty Dozen' and risk mitigation The 'Dirty Dozen': lack of communication, lack of teamwork, lack of assertiveness, complacency, fatigue, stress, lack of knowledge, lack of resources, lack of awareness, distraction, pressure, norms; Risk-mitigation methods.	2

MODULE 3L — AVIATION LEGISLATION

MODULE 3L — AVIATION LEGISLATION	Level
3L.1 Regulatory framework — Role of the European Commission (EC), the European Union Aviation Safety Agency (EASA) and ~~N~~national ~~A~~aviation ~~A~~authorities (NAAs); — Scope and limits of the regulatory framework.	1
3L.2 Continuing airworthiness regulations — General understanding of the applicable parts of Part-66; — General understanding of the applicable parts of Part-ML; — General understanding of the applicable parts of Part-CAO; — General understanding of Part-M, Part-CAMO and Part-145.	1
3L.3 Repairs and modifications (Part-ML) — Approval of changes (repairs and modifications); — Standard changes and standard repairs.	2
3L.4 Maintenance data (Part-ML) — Airworthiness directives (ADs), safety information bulletins (SIBs); — Service bulletins (SBs), Instructions for Continuing Airworthiness (ICAs) (AMM, IPC, etc.), aircraft flight manual (AFM), maintenance records, maintenance programmes.	2
3L.5 Licence privileges and how to exercise them properly (Part-66, Part-ML) Conditions for release to service: — in a maintenance organisation;	2

MODULE 3L — AVIATION LEGISLATION	Level
— as independent certifying staff; — release-to-service procedures.	

MODULE 4L — WOODEN AND/OR METAL-TUBE STRUCTURE COVERED WITH FABRIC

MODULE 4L — WOODEN AND/OR METAL-TUBE STRUCTURE COVERED WITH FABRIC	Level
4L.1 Airframe wooden/combination of metal tube and fabric — General construction principles for wooden structures covered with fabric, metal-tube structures covered with fabric, and combination of wooden and metal-tube structures; — Wood as a technical material (heartwood, sapwood, grain, etc.); — Wood defects (types, acceptable/not acceptable); — Different woodcuts and their properties (tangential cuts, radial cuts, etc.); — Metal-tubing (mechanical and stress properties of metal tubes); — Types of welding and welding joints; — General characteristics of aircraft coverings; — General characteristics of paint; — Transmission of loads in and between structures.	2
4L.2 Material — Types of wood (solid wood, laminated wood, plywood, wood composites), suitable wood materials and their properties (spruce, firs, etc.), wood defects (acceptable and not acceptable), stability, deterioration (temperature, humidity, ageing, etc.); — Types of covering and technologies (natural and synthetic polymers), deterioration; — Types of glues, adhesives, paints and other associated materials; — Types of metal-tubing material (steel, light alloy tubes, etc.); — Welding seams, fittings, screws and bolts (material and properties); — Proper storage of those materials; — Plastics (overview, understanding of their properties).	2
4L.3 Identifying damage — Inspection procedures; — Damage identification in wooden structures (heavy landing, rot, glue failure, fungi, shrinkage, stress damage, cracks, fatigue, etc.); — Damage identification in metal-tubing structures (hard landing, stress, corrosion, fatigue, dents, cracks, fatigue, etc.); — Damage identification in welded seams; — Damage identification in fabric coverings (tears, strains, UV-damage, hard landing, etc.).	3
4L.4 Standard repair and maintenance procedures — Repair and conservation of wooden aircraft structures: wing rib, wing spar, bolt and brushing holes, patches (fabric, splayed, surface, plug, scarf); — Repair and reapplication of fabric on aircraft (fabric, tape, lacing, threads, seams, fabric protection, stitching, knots, fasteners, finishing tape, rings and grommets, dope); — Repair and corrosion protection/prevention methods for metal-tubing aircraft structures (welding, patch plates, reinforcement tubes, sleeves, etc.); — Repair, removal and application of paint and dope on airframes in wooden / combination of metal tube and fabric (surface preparation, application, and finish).	3

MODULE 5L — COMPOSITE STRUCTURE

MODULE 5L — COMPOSITE STRUCTURE	Level
5L.1 Airframe fibre-reinforced plastic (FRP) — General construction principles of airframes in FRP and its properties; — Characteristics of laminated structures (matrix and fibres); — Fibre (fibre orientation, strength characteristics, isotropic, anisotropic, filament, strands, tows, yarns, rovings, impreg and prepreg); — Fabric weave styles (plain weave, twill weave, atlas weave, unidirectional) and non-woven material (stitched and knotted) and their characteristics; — Matrix (thermosetting, thermoplastic, curing stages); — Characteristics of sandwich structures and their supporting cores (honeycombs, foams, wooden cores, pseudo cores); — General characteristics of accelerators and additives/modifiers; — Transmission of loads in and between structures.	2
5L.2 Material — Types of fibres (fiberglass, E-glass, aramid, carbon/graphite, boron, ceramic, lightning protection fibre); — Types of matrices (different types, properties and application); — Types of resin filler materials (fumed silica, glass powder, hollow glass, phenolic and plastic microballoons, cotton, flox, colour pigments, fire retardants); — Types of sandwich structure core materials (honeycombs: aramid paper, kraft paper, thermoplastic, aluminium, fiberglass, carbon; foams: polystyrene, phenolic, polyurethane, polypropylene, PVC, polymethacylimide; balsa wood); — Behaviour, interaction and technological aspects of composites made of those materials; — Storage and handling of those materials.	2
5L.3 Identifying damages and defects — Inspection procedures (visual inspection, tapping, NDT testing, etc.); — Types of manufacturing defects and damages and their causes (fibre breakage, matrix imperfections, delamination, debonding, improper drilling, environmental degradation, impact damage, fatigue, erosion, corrosion, UV-damage, hard landing, stress etc.).	3
5L.4 Standard repair and maintenance procedures — Repairs of aircraft structures: wing, rib, wing spar, aerofoil, bolt and brushing holes, patches, sandwich core and faceplate repairs, bolted and bonded repairs; — Proper construction and repair fittings and load-bearing points to composites and composite sandwich structures; — Creation and use of repair moulds from the airframe or intact parts (types, procedures, coatings, etc.); — Proper procedure for the mixing of resins, fibre layering and curing of composites; — Bonding metals and other materials; — Composite painting and finish.	3

MODULE 6L — METALLIC STRUCTURE

MODULE 6L — METALLIC STRUCTURE	Level
6L.1 Metallic airframe — General construction principles of metal-structure airframes;	2

MODULE 6L — METALLIC STRUCTURE	Level
— General knowledge of the properties of metal as a technical material (classification, physical, mechanical and electrical properties, manufacturing properties, chemical properties); — General knowledge of the properties of pure metals and alloys; — Metal grain structure of pure metals and alloys and its impact on behaviour (grain boundaries, corrosion, hardening, annealing, differences between forged, machined and cast metals); — Stresses in structural members (tension, compression, torsion, shearing, bearing, bending); — Types of corrosion and corrosion protection (electrochemical oxidation, galvanic corrosion, stress-corrosion cracking, corrosion in passivated materials, high-temperature corrosion); — Types of rivets and fasteners (solid shank rivet, blind rivets, self-plugging rivets (mechanical and friction lock), pull-thru rivets, pin rivets, head styles, taper-lok, rivet nut, lockbolt, high shear fastener, identification, measuring); — Types of welding and welding joints; — Transmission of loads in and between structures.	
6L.2 Material — Types of iron, steel and their alloys in aviation (cast, forged, tempering, corrosion, strength properties); — Types of aluminium and aluminium alloys in aviation in airframes, rivets and fasteners (strength properties, corrosion); — Common alloying elements for steel and aluminium (influence on mechanical and physical properties of the alloy); — Common paint and surface protection materials; — Common adhesives for use with metals.	2
6L.3 Identifying damage — Inspection procedures (sheet metal, structure, bonded joints, soldered joints, welded and brazed joints, riveted joints, corrosion); — Identification and classification of cracks, fatigue and corrosion in metallic structures.	3
6L.4 Standard repair and maintenance procedures — Metal and sheet metal (marking out and calculation of bend allowance, cutting, drilling, bending and forming, inspection of metal work); — Welding, brazing, soldering and bonding (soldering methods, welding and brazing methods, bonding methods); — Riveting (riveted joints, rivet spacing and pitch; tools used for riveting and dimpling, inspection of riveted joints); — Repairing by patching, insertion, and replacement of parts; — Corrosion treatment; — Problems in multiple-material systems.	3

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS	Level
7L.1 Theory of Flight — Gliders and Aeroplanes Aerodynamics and flight controls — Airflow around a body; — Boundary layer, laminar and turbulent flow; — Thrust, weight, aerodynamic resultant;	1

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS	Level
— Generation of lift and drag: angle of attack, polar curve, stall. Operation and effect of roll control, pitch control, yaw control and rudder limiters — Control using dual-purpose controls; — High-lift devices, slots, slats, flaps, flaperons; — Drag-inducing devices, lift dumpers, speed brakes, dive 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.	
7L.3 Airframe Structure — Gliders and Aeroplanes — Fuselage: construction (truss type, monocoque, semimonocoque), attach points (wing, tail plane, undercarriage); — Wings: construction (monospar, multispar, box beam), configurations (cantilever, semicantilever, strut/wire braced), fairing; — Stabilisers: construction, control surface attachments; — Flight control surfaces: construction and attachment, balancing (mass and aerodynamics); — Tow hooks (schweizer and tost hook); — Aircraft assembly, storage, jacking, chocking, securing and associated safety precautions; — Effects of environmental conditions on aircraft handling and operation.	1
7L.4 Air Conditioning (ATA 21) Heating and ventilation of small aircraft.	1
7L.5 Electrical Power, Cables and Connectors (ATA 24) — Installation and operation of batteries; — Power generation / power sources on small aircraft (AC/DC), voltage regulation, power distribution and circuit protection; — Cable types, construction and characteristics, high-tension and coaxial cables, testing and installation precautions; — Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes, pin insertion and removal; — Crimping (crimping, tools, testing of crimp joints); — Continuity, insulation and bonding techniques and testing; — Wiring protection techniques (cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding).	2
7L.6 Equipment and Furnishing (ATA 25) — Emergency equipment requirements; — Seats, harnesses, and belts.	2
7L.7 Fire Protection and Other Safety Systems (ATA 26) — Portable fire extinguisher; — Rescue systems (safety parachute, recovery parachute, launching systems including safety measures for pyrotechnics).	2
7L.8 Flight Controls (ATA 27) — Primary controls: aileron, elevator/stabilator, rudder, dual-purpose controls (stabilator, ruddervator, flaperons); — Secondary controls: elevator trim systems, wing flaps, slats and spoilers/dive breaks; — System operation: manual; — Gust locks, balancing and rigging of flight controls; — Simple stall-warning systems.	3

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS	Level
7L.9 Fuel System (ATA 28) — System layout; — Fuel tanks; — Supply systems; — Indications and warnings; — Refuelling and defuelling.	2
7L.10 Hydraulic Power (ATA 29) — System layout; — Hydraulic fluids; — Hydraulic reservoirs and accumulators, pressure generation (electric, mechanical), filters, pressure control, power distribution, indication and warning systems.	2
7L.11 Ice and Rain Protection (ATA 30) — Hydrophobic coatings; — Pitot probe heat.	1
7L.12 Landing Gear (ATA 32) — Construction (tricycle, tailwheel, outrigger wheels, skids), shock absorbing; — Extension and retraction systems: normal and emergency operation; — Indication and warning; — Wheels, brakes, tyres, and steering; — Standard repair and maintenance procedures for the landing gear.	2
7L.13 Lights (ATA 33) — External lights: navigation, anticollision, landing, taxiing; — Internal lights: cockpit.	2
7L.14 Oxygen (ATA 35) — System layout: storage system (containers), delivery system (continuous flow, diluter demand and pressure demand) and masks/nasal cannula; — System operation including charging and discharging; — The 'PRICE' check.	2
7L.15 Pneumatic/Vacuum (ATA 36) — System layout; — Sources, pumps, control, and distribution; — Indication and warnings.	2
7L.16 Water Ballast (ATA 41) Water tanks (main tank, fin tank), drain valves, vents.	2
7L.17 Fasteners — Screw threads: nomenclature, forms, dimensions and tolerances, and measuring; — Bolts, studs and screws: types (specifications, identification, markings, international standards), nuts (self-locking, anchor, standard types), machine screws (aircraft specifications), studs (types and uses, insertion and removal), self-tapping screws, dowels; — Locking devices: tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick-release fasteners, keys, circlips, cotter pins; — Aircraft rivets: types of solid and blind rivets: specifications and identification, heat treatment.	2
— 7L.18 Pipes, Hoses and Connectors — Types and connectors of pipes and hoses for hydraulics, fuel, oil, pneumatic and air; — Bending, belling/flaring, inspection, testing and installation of pipes and hoses.	2
7L.19 Springs	2

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS	Level
Types of springs, materials, characteristics, applications, inspection, and testing.	
7L.20 Bearings — Purpose of bearings, loads, material, construction; — Types of bearings, their application, testing, cleaning, inspection, lubrication requirements, and common defects in bearings and their causes.	2
7L.21 Transmissions — Gear types, their application, gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns, inspection of gears, backlash/play; — Types, application and inspection of belts and pulleys, chains and sprockets; — Inspection of screw jacks, lever devices, push–pull rod systems.	2
7L.22 Control Cables — Types of cables, end fittings, turnbuckles, compensation devices, pulleys, cable system components, Bowden cables and aircraft flexible control systems; — Swaging of end fittings; — Inspection and testing of control cables, Bowden cables and aircraft flexible control systems.	2
7L.23 Fits and Clearances Common system of fits, clearances and tolerances, drill sizes for bolt holes, classes of fits, 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.L24 Aircraft Weight and Balance Calculation of centre-of-gravity / balance limits: use of relevant documents, preparation of aircraft for weighing, aircraft weighing.	2
7L.25 Workshop Practices and Tools — Common hand-tool types, power-tool types, precision tool types and equipment, their operation, care, control, calibration and standards; — Operation, function and use of electrical general test equipment; — Proper handling of engineering drawings, diagrams and standards and comprehension of the presented information thereupon (symbols, schematics and diagrams); — Use of workshop materials; — Dimensions, allowances and tolerances, standards of workmanship; — Lubrication equipment and methods.	2
7L.26 Disassembly, Inspection, Repair and Assembly Techniques — Types of defects and visual inspection techniques; corrosion removal, assessment and reprotection; — General repair methods, structural repair manual; ageing, fatigue and corrosion control programmes; — Non-destructive inspection techniques including penetrant, radiographic, eddy current, ultrasonic and boroscope methods; — Disassembly and reassembly techniques; — Troubleshooting techniques.	2
7.27 Abnormal Events Inspection following lightning strike, HIRF penetration, heavy landing, and flight through turbulence.	2
7.28 Maintenance Procedures	2

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS	Level
Maintenance planning, modification procedures, stores procedures, maintenance inspection / quality control / quality assurance, additional maintenance procedures, control of life-limited components.	

MODULE 8L — POWER PLANT

MODULE 8L — POWER PLANT	Level
8L.1 Engine Fundamentals — General — Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; — The relationship between force, work, power, energy, velocity, and acceleration; — Mechanical, thermal, and volumetric efficiencies.	2
8L.2 Piston Engine Fundamentals and Piston Engine Performance — Operating principles: 2-stroke, 4-stroke, Otto, Diesel, and Rotary (Wankel); — Piston displacement and compression ratio; — Engine configuration and firing order; — Power calculation and measurement; — Factors that affect engine power; — Mixtures/leaning, pre-ignition.	2
8L.3 Piston 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.	2
8L.4 Piston Engine Fuel System (non-electronic) — Carburettors (types, construction and principles of operation, icing and heating); — Fuel injection systems (types, construction, and principles of operation).	2
8L.5 Starting and Ignition Systems — Starting systems, preheat systems; — Magneto types, construction and principles of operation; — Ignition harnesses, spark plugs; — Low- and high-tension systems.	2
8L.6 Air Intake, Exhaust and Cooling Systems — Construction and operation of induction systems, including alternate air systems; — Exhaust systems, engine cooling systems — air and liquid.	2
8L.7 Supercharging/Turbocharging — Principles and purpose of supercharging and its effects on engine parameters; — Construction and operation of supercharging/turbocharging systems; — System-associated terminology; — Control systems; — System protection.	2
8L.8 Lubrication Systems of Piston Engines System operation/layout and components.	2

MODULE 8L — POWER PLANT	Level
8L.9 Engine Indication Systems — Indication systems specific to general combustion engines (coolant temperature, oil pressure and temperature, exhaust gas temperature, fuel pressure and flow); — Indication systems specific to piston engines (cylinder head temperature, manifold pressure, engine speed); — Indication systems specific to turbine engines (exhaust gas temperature, engine thrust indication, engine speed); — Indication systems specific to electric engines (voltage).	2
8L.10 Electric and Hybrid Aircraft Engines — Types and construction of electric motors (AC and DC motors, rotor, stator, bearings, windings, commutator, self-commutated, externally commutated, outrunner and inrunner, motor cooling, etc.); — Power electronics; — Transformer, transducer and inverter; — Engine control systems; — Power storage systems (common high-density batteries, chemistry batteries, load cycles, degradation, effects of charging and overcharging, thermal runaway); — Battery management systems (general functions, battery balancing, monitoring); — Wiring of electric power storage, power electronics and electric motor; — High-energy safety procedures.	2
8L.11 Turbine Engine Fundamentals and Performance — Constructional arrangement and operation of turbojet and turboprop engines; — Thrust: thrust horsepower, shaft horsepower, specific fuel consumption; — Engine pressure ratio; — Pressure, temperature and velocity of the gas flow; — Engine ratings, static thrust, limitations.	2
8L.12 Inlet and Compressor — Compressor inlet; — Axial and centrifugal compressor types, constructional features, operating principles, and applications; — Compressor (stator, rotor, blisk, disk, blades, compressor stall and surge); — Compressor ratio.	2
8L.13 Combustion Chamber, Starting and Ignition System — Constructional features and principles of operation; — Operation of engine start systems and components; — Ignition systems and components (exciter, ignition plugs and glow plugs).	2
8L.14 Turbine Section and Exhaust — Operation and characteristics of different turbine blade types, nozzle guide vanes; — Gas producer turbine and power turbine, blade-to-disk attachment; — Causes and effects of turbine blade stress and creep; — Engine exhaust nozzle and noise reduction.	2

MODULE 8L — POWER PLANT	Level
8L.15 Other Turbine Engine Components and Systems — General knowledge of the type features and principles of bearings and seals in turbine engines; — System operation, layout and components of lubrication systems in small turbine engines (separate lubrication, as part of the fuel system); — System operation, layout and components of air and fuel systems in small turbine engines; — Turboprop reduction gears.	2
8L.16 Turbine Engine Inspections and Ground Operation — Standard procedures for starting and ground run-up, and interpretation of engine power output and parameters; — Inspection of engine and components to criteria, tolerances and data specified by the engine manufacturer; — Foreign object damage (FOD).	2
8L.17 Propeller — Propeller fundamentals (blade element theory, blade angles, angle of attack, rotational speed, propeller slip, aerodynamic/centrifugal/thrust forces, torque, relative airflow, vibration and resonance); — Propeller construction (methods of construction and materials in wooden/composite/metal propellers, blade station, blade face, blade shank, blade back/thrust face and hub assembly, fixed pitch, controllable pitch, constant speed propeller, propeller/spinner installation); — Propeller pitch control (speed control and mechanical/electrical pitch change methods, feathering, propeller accumulators, overspeed protection); — Environmental protection (de-icing and metal tipping); — Propeller balancing (static and dynamic) and blade tracking; — Damage assessment, erosion, corrosion, impact damage, delamination, and decay; — Standard treatment and repair methods for propellers.	2
8L.18 Full Authority Digital Engine Control (FADEC) — Operation of engine control and fuel-metering systems in piston and turbine engines including electronic engine control (FADEC); — System layout and components.	2
8L.19 Lubricants and Fuels — Properties and specifications of standard, alternate and drop-in fuels, fuel additives, and lubricants.	2
8L.20 Engine and Propeller Installation — Construction of nacelles; — 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; — Extension and retraction systems, including propeller position control; — Propeller installation.	2
8L.21 Engine Monitoring and Ground Operation — Procedures for starting and ground run-up; — Interpretation of engine power output and parameters; — Inspection of engine and components to criteria, tolerances and data specified by the engine manufacturer; — Foreign object damage (FOD).	2

MODULE 8L — POWER PLANT	Level
8L.22 Engine/Propeller Storage and Preservation — Preservation and depreservation of the engine, propeller and accessories/systems.	2

MODULE 9L — BALLOONS — HOT-AIR BALLOONS

MODULE 9L — BALLOONS — HOT-AIR BALLOONS	Level
9L.1 Theory of Flight — Hot-Air Balloons — Aerostatics and controls; — Principles; — Effect on envelopes, wind effect, altitude and temperature effects.	1
9L.2 Airframe of Hot-Air Balloons Components and assembly of a hot-air balloon: — Identification plate; — Envelope; — Heater system/burner; — Suspension cables; — Basket; — Lines and ropes (crown line, actuation line).	2
9L.3 Envelope — Shape and assembly of envelope (poles, equator, panels, gores, special shapes); — Fabrics, seams and materials; — Crown ring; — Deflation port / parachute and ripping panel; — Load tapes (horizontal and vertical) and rip stoppers; — Turning vent; — Mouth; — Skirt/scoop; — Diaphragms/catenaries (special shapes).	3
9L.4 Heater System / Burner — System layout (burner, fuel tanks, fuel lines); — Types of burners (whisper-/cow-burner, main/take-off burner); — Functionality, materials, use, inspection, and care of: — fuel tanks (propane cylinders, material, valves, fittings, fuel quantity gauge); — fuel lines / gas hoses; — burner (piezo igniter, pilot light and valve, blast valve, heat exchanger/burner coils, nozzle, etc.).	3
9L.5 Basket and Basket Suspension (including alternative devices) — Common assembly of and materials for hot-air balloon baskets; — Rigging points, burner frame, burner support rods, metal frame, basket padding and leather trim; — Basket weave, grab handles, cylinder attachment, take-off aid and rope; — Basket wire and basket wire routing; — Basket floor, basket frame / load-bearing frame, sliders, raw hide protective covering.	3
9L.6 Instruments Basic operation, maintenance, and testing of:	2

MODULE 9L — BALLOONS — HOT-AIR BALLOONS	Level
— altimeter (mechanical and electronic); — variometer (mechanical and electronic); — pyrometer/temperature sensors; — Mode S transponder; — VHF radio; — emergency locator transmitter (ELT) and personal locator beacon (PLB).	
9L.7 Equipment — Required equipment for free-ballooning operations and its care.	2
9L.8 Hot-Air Balloon Handling and Storage — Ground procedures for hot-air balloons, rigging and launch preparation; — Safe handling of propane; — Effects of environmental conditions on hot-air balloon handling.	2
9L.9 Disassembly, Inspection, Repair and Assembly Techniques — Types of defects and visual inspection techniques; — Allowable damage and tolerances in envelope, basket, lines, ropes, etc.; — Common test procedures (Grab test); — General repair methods for envelopes, load ring, ropes and lines, basket; — Inspection methods for envelopes, ropes and lines, basket; — Ageing, fatigue; — Disassembly and reassembly techniques; — Troubleshooting techniques.	3

MODULES 10L — BALLOONS — GAS (FREE/TETHERED) BALLOONS

MODULES 10L — BALLOONS — GAS (FREE/TETHERED) BALLOONS	Level
10L.1 Theory of Flight — Gas Balloons Aerostatics and controls: — Principles; — Effect on envelopes, wind effect, altitude and temperature effects.	1
10L.2 Airframe of Gas Balloons Components and assembly of a gas balloon: — Identification plate; — Envelope; — Valve; — Netting; — Load ring (hoop); — Basket; — Lines and ropes (drag rope, mooring line, valve line, emergency opening rope, ripping line, neck line).	2
10L.3 Envelope — Shape and assembly of envelope (poles, equator, panels); — Fabrics, seams and materials; — Deflation opening and parachute; — Load belt;	3

MODULES 10L — BALLOONS — GAS (FREE/TETHERED) BALLOONS	Level
— Ripping panel; — Appendix; — Emergency opening; — Holding down patches; — Ballonets; — Electrostatic properties.	
10L.4 Netting — Netting assembly (net ring, net, mesh); — Mesh dimensions (knots, sizes, angles); — Materials for netting and accessories; — Electrostatic properties.	3
10L.5 Valves, Parachutes and Other Related Systems — Construction, operation, maintenance and testing of manoeuvring/helium valves, pressure relief valves, gas-tight parachutes and ballonet fans; — Construction, operation, maintenance and testing of parachute-centring belt and pull-down belts.	3
10L.6 Load Ring — Function, material, and common problems (steel pipe, strops, toggles).	3
10L.7 Basket (including alternative devices) Common assembly of and materials for hot-air / gas balloon baskets: — Metal frame, basket padding and leather trim; — Basket weave, grab handles, basket strops and toggles, ballast system (bags, support and sand dumpers); — Basket wire and basket wire routing; — Basket floor, basket frame / load-bearing frame, sliders, raw hide protective covering.	3
10L.8 Ropes and lines Functionality, materials, use, inspection, and care of: — shroud lines / envelope ropes / bridles; — trail rope / drag rope and trail-rope bag; — holding ropes; — valve line / valve cord and parachute rope; — emergency opening rope; — appendix pull-close rope; — appendix anchor line; — inflation aid.	3
10L.9 Instruments Basic operation, maintenance, and testing of: — altimeter (mechanical and electronic); — variometer (mechanical and electronic); — Mode-S transponder; — VHF radio; — emergency locator transmitter (ELT) and personal locator beacon (PLB).	2
10L.10 Tethered Gas Balloon (TGB) Systems Functionality, operation, materials, use, inspection, and care of:	3

MODULES 10L — BALLOONS — GAS (FREE/TETHERED) BALLOONS	Level
— launch platform; — winch system: winch (electric, hydraulic, emergency operation), tether cable (cable, sheaves, swivel, clamps) and control panel; — gondola (metal-tubing construction); — night lighting.	
10L.11 Equipment — Required equipment for free ballooning and for tethered operations, and its care.	2
10L.12 Gas-Balloon Handling and Storage — Ground procedures and mooring for gas balloons and tethered gas balloons, ballasting, rigging and launch preparation; — Safe handling of hydrogen, helium, illuminating gas and other lifting gases; — Lifting gas (charging, purifying and leak testing, pressure monitoring); — Effects of environmental conditions on gas-balloon handling.	2
10L.13 Disassembly, Inspection, Repair and Assembly Techniques — Types of defects and visual inspection techniques; — Allowable damage to and tolerances of envelope, basket, lines, ropes, etc.; — Common test procedures (Grab test, tensile strength, tear growth, porosity, electric resistivity, etc.); — General repair methods for envelopes, load ring, ropes and lines, basket/gondola; — Inspection methods for envelopes, load ring, ropes and lines, basket/gondola (especially for steel frames and welds on TGB gondolas); — Ageing, fatigue and corrosion control programmes; — Disassembly and reassembly techniques; — Troubleshooting techniques.	3

MODULES 11L — AIRSHIPS — HOT-AIR / GAS AIRSHIPS

MODULES 11L — AIRSHIPS — HOT-AIR / GAS AIRSHIPS	Level
11L.1 Theory of Flight and Control of Airships — Control using fins, rudders and elevators; — Aerodynamic lift and aerodynamic balance; — Stability and control; — Free ballooning; — Operation of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels; — Vectored thrust; — Fire and lightning protection.	2
11L.2 Airship Airframe Structure — General Concepts — Classification of airships (rigid airship, semi-rigid airship, non-rigid airship); — Construction of semi-rigid airships (envelope, ballonet, membranes, nose cone, internal structures, keel, trusses, longerons, suspension lines); — Construction of non-rigid airships (envelope, ballonet, catenary curtains, suspension lines, air scoops); — Attachment of stabilisers and control surfaces to the airframe.	2
11L.3 Airship Envelope	2

MODULES 11L — AIRSHIPS — HOT-AIR / GAS AIRSHIPS	Level
— Nose cone battens/bow strips; — Catenary systems (catenary curtain, support/suspension cables); — Ballonets and their positioning (forward, aft); — Air systems (air scoops, ballonet fans, empennage air system, dampers, and transfer fans).	
11L.4 Gondola — General knowledge of gondola construction (metal-tubing gondolas, metal-structure gondolas, composite gondolas); — Doors, windows and hatches; — Attachment of the gondola to the airframe/envelope; — Gondola layout, equipment and furnishing (emergency equipment requirements, seats, harnesses and belts); — Simple water/waste systems in airships; — Gondola heating and ventilation (ventilations and heating systems, heat exchanger, blower); — Landing gear (construction, shock absorbing, tyres, weight-on-wheels).	2 2 2 2 2 2 3
11L.5 Airship Flight Controls (ATA 27/55) — Primary controls (rudder, elevator, asymmetric thrust, thrust vectoring); — Trim control; — System operation: manual, hydraulic, pneumatic, electrical, fly-by-wire; — Balancing and rigging.	3
11L.6 Electrical Power (ATA 24) — Installation and operation of batteries; — DC power generation; — AC power generation; — Voltage regulation; — Power distribution; — Wiring, electrical connections; — Inverters, transformers, rectifiers; — Circuit protection; — External/ground power.	3
11L.7 Lights (ATA 33) — External: navigation, anticollision, landing, taxiing, ground approach light, aft landing light; — Internal: flight compartment (cockpit) and passenger compartment (cabin); — Emergency.	2
11L.8 Ice and Rain Protection — Windscreen wipers and windscreen demisting systems; — Surface de-icing systems.	3
11L.9 Fuel Systems (ATA 28) — System layout; — Fuel tanks: venting, draining; — Supply systems; — Cross-feed and transfer; — Indications and warnings; — Refuelling and defueling.	2
11L.10 Engine and Propellers in Airships	2

MODULES 11L — AIRSHIPS — HOT-AIR / GAS AIRSHIPS	Level
— General understanding of engine layout, thrust vectoring, swivel systems, ducted propellers, and control system.	
11L.11 Airship Handling and Storage — Ground procedures and mooring with and without mooring mast, ballasting, hangaring, rigging and launch preparation; — Lifting gas (charging, purifying and leak testing, pressure monitoring); — Effects of environmental conditions on airship handling.	2
11L.12 Disassembly, Inspection, Repair and Assembly Techniques — Types of defects and visual inspection techniques; — Corrosion removal, assessment and reprotection; — General repair methods, structural repair manual; — Ageing, fatigue and corrosion control programmes; — Non-destructive inspection techniques; — Disassembly and reassembly techniques; — Troubleshooting techniques.	2

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

MODULE 12L — RADIO COM / ELT / TRANSPONDER / INSTRUMENTS	Level
12L.1 Radio Communications / Emergency Locator Transmitters (ELTs) Fundamentals of radio-wave propagation, antennas, transmission lines, communication, receiver and transmitter. Working principle of: — emergency locator transmitters (ELTs); — very high frequency (VHF) communications; — installation and testing of ELTs and VHF radio and antennas.	2
12L.2 Transponder and FLARM — Air traffic control transponder, secondary surveillance radar (basic operation, configuration, modes); — FLARM; — Installation and testing.	2
12L.3 Instruments — Pitot static: altimeter, airspeed indicator, vertical speed indicator, total energy probes; — 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 and analogue cockpit; — Indications of other aircraft systems; — Installation and testing of instruments.	2
12L.4 Avionics General Test Equipment — Operation, function and use of avionics general test equipment.	1

MODULE 13L — PRACTICAL ASSESSMENT

I. General competencies

A. Safety precautions — aircraft and workshop

Working practices with:

— electricity;

— gases, especially oxygen;

— oils and chemicals;

— aircraft jacking, chocking, mooring and securing;

— ground supplies of electrical, hydraulic and pneumatic energy.

B. Workshop practices:

— Care and control of tools;

— Use of workshop equipment and materials;

— Use and handling of calibrated tools and equipment.

C. Use of tools:

— Handling of hand-tool types;

— Handling of power-tool types;

— Operation and use of precision-measuring tools;

— Lubrication equipment.

D. Use of maintenance data (AMM, SRM, IPC, etc.), engineering drawings, diagrams and standards:

— Understanding and application of maintenance instructions;

— Use of symbols, tolerances and projections;

— Identification of title block information;

— Use of the Air Transport Association (ATA) Specification 100 (including ISO, AN, MS, NAS and MIL);

— Use of wiring and schematic diagrams;

— Conversion units for size, volume, weight, and momentum.

E. Documentation and communication:

— Use of the applicable documentation;

— Writing of work reports, aircraft technical logs and troubleshooting reports;

— Demonstration of good oral and written communication during shift handover;

— Demonstration of clear and comprehensive communication with colleagues.

II. Competencies related to the licence category the candidate applies for

Tasks applicable to L1C, L1, L2C and L2:

Practical task	Submodule Reference
Identification of damage and defects in wooden, metal, and composite structures. Limited to composite structures for L1C and L2C.	4L.3, 5L.3 and 6L.3
Standard repairs of wooden, metal and composite structures. Limited to composite structures for L1C and L2C.	4L.4, 5L.4 and 6L.4
Inspection and testing of control cables, Bowden cables and aircraft flexible control systems.	7L.22
Balancing and rigging of flight controls.	7L.8
Standard repairs and maintenance procedures for the landing gear.	7L.12
Bending, belling/flaring, inspection, testing and installation of pipes and hoses.	7L.18
Inspection and testing of springs.	7L.19
Testing, cleaning, inspection, and lubrication of bearings.	7L.20
Drilling required sizes for bolt holes, check appropriate classes of fits; application of limits for bow, twist and wear; standard methods for checking shafts, bearings.	7L.23
Preparation of aircraft for weighing and balance.	7.L24
General disassembly, inspection, repair and assembly techniques: — Corrosion removal, assessment and reprotection; — General repair methods, structural repair manual; ageing, fatigue and corrosion control programmes; — Non-destructive inspection techniques, including penetrant, radiographic, eddy current, ultrasonic and boroscope methods; — Disassembly and reassembly techniques; — Troubleshooting techniques; — Inspections following lightning strikes, HIRF penetration, heavy landings, and flight through turbulence.	7L.26 and 7.27

Tasks applicable to L3, L4 and L5:

Practical task	L3H	L3G	L4H	L4G	L5	Submodule Reference
Heater system/burner — inspection and care of: — fuel tanks (propane cylinders, material, valves, fittings, fuel quantity gauge); — fuel lines / gas hoses; — burner (piezo igniter, pilot light and valve, blast valve, heat exchanger / burner coils, nozzle, etc.).	X		X			9L.4
Basic maintenance and testing of: — altimeter (mechanical and electronic); — variometer (mechanical and electronic); — pyrometer/temperature sensors (only hot-air balloons); — Mode S transponder; — VHF radio; — emergency locator transmitter (ELT) and personal locator beacon (PLB).	X	X	X	X		9L.6 and 10L.9

Practical task	L3H	L3G	L4H	L4G	L5	Submodule Reference
Disassembly, Inspection, Repair and Assembly Techniques — Types of defects and visual inspection techniques; — Allowable damage and tolerances for envelope, basket, lines, ropes, etc.; — Common test procedures (Grab test); — General repair methods for envelopes, load ring, ropes and lines, basket; — Inspection methods for envelopes, ropes and lines, basket; — Disassembly and reassembly techniques; — Troubleshooting techniques.	X	X				9L.9, 10L.13
Disassembly, Inspection, Repair and Assembly Techniques — Types of defects and visual inspection techniques; — Corrosion removal, assessment and reprotection; — General repair methods, structural repair manual; — Non-destructive inspection techniques;			X	X	X	11L.12
Valves, Parachutes and Other Related Systems — Maintenance and testing of manoeuvring valves / helium valves, pressure relief valves, gas-tight parachutes, and ballonet fans; — Maintenance and testing of parachute centring belt and pull-down belts.		X		X	X	10L.5
Ropes and lines — inspection and care of: — shroud lines / envelope ropes/bridles; — trail rope / drag rope and trail-rope bag; — holding ropes; — valve line / valve cord and parachute rope; — emergency opening rope; — appendix pull-close rope; — appendix anchor line; — inflation aid.		X		X	X	10L.8
Inspection and Care of Tethered Gas Balloon (TGB) Systems: — Launch platform; — Winch system: winch (electric, hydraulic, emergency operation), tether cable (cable, sheaves, swivel, clamps) and control panel; — Gondola (metal-tubing construction); — Night lighting.		X		X	X	10L.10
Balancing and rigging of airship flight controls.			X	X	X	11L.5

[…]

Appendix VIII — Basic examination and assessment standard for category L aircraft maintenance licence

(a)

[…]

(vi) a failed module may not be retaken for at least 90 days from the date of the failed module examination;

(vii) 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 and the licence has already been issued;

(viii) the maximum number of consecutive attempts for each module is three. A further set of three attempts is allowed with a 1-year waiting period between the sets.

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

(i) module 1L '~~Basic knowledge~~ BASIC KNOWLEDGE': ~~12~~ 20 questions. Time allowed: ~~15~~ 25 minutes;

(ii) module 2L '~~Human factors~~ HUMAN FACTORS': ~~8~~ 20 questions. Time allowed: ~~10~~ 25 minutes;

(iii) module 3L '~~Aviation legislation~~ AVIATION LEGISLATION': ~~24~~ 28 questions. Time allowed: ~~30~~ 35 minutes;

(iv) module 4L '~~Airframe wooden/metal tube and fabric~~ WOODEN AND/OR METAL-TUBE STRUCTURE COVERED WITH FABRIC': ~~32~~ 40 questions. Time allowed: ~~40~~ 50 minutes;

(v) module 5L '~~Airframe composite~~ COMPOSITE STRUCTURE': 32 questions. Time allowed: 40 minutes;

(vi) module 6L '~~Airframe metal~~ METALLIC STRUCTURE': 32 questions. Time allowed: 40 minutes;

(vii) module 7L '~~Airframe general~~ AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS': ~~64~~ 60 questions. Time allowed: ~~80~~ 75 minutes;

(viii) module 8L '~~Power plant~~ POWER PLANT': ~~48~~ 64 questions. Time allowed: ~~60~~ 80 minutes;

(ix) module 9L '~~Balloon/Airship hot air~~ BALLOONS — HOT-AIR BALLOONS': 36 questions. Time allowed: 45 minutes;

(x) module 10L '~~Balloon/Airship gas (free/tethered)~~ BALLOONS — GAS (FREE/TETHERED) BALLOONS': ~~40~~ 44 questions. Time allowed: ~~50~~ 55 minutes;

(xi) module 11L '~~Airships hot air/gas~~ AIRSHIPS — HOT-AIR / GAS AIRSHIPS': ~~36~~ 40 questions. Time allowed: ~~45~~ 50 minutes;

(xii) Module 12L '~~Radio Com/ELT/transponder/instruments~~ RADIO COM / ELT / TRANSPONDER / INSTRUMENTS': ~~16~~ 20 questions. Time allowed: ~~20~~ 25 minutes.

(c) Module 13 — PRACTICAL ASSESSMENT

The practical assessment shall include an introductory phase where the training organisation, which conducts the assessment, instructs the candidate on the facilities, access to the documents, materials, and tooling.

The training organisation or the competent authority shall decide on the group of practical maintenance tasks to be performed by the candidate, and the assessment shall be based on the observation of the candidate's performance while carrying out the tasks.

The practical assessment is considered passed when the candidate has demonstrated adequate proficiency in the practical skills that are required for the assigned elements to the standard that, if performed during actual aircraft maintenance, the aircraft is considered airworthy.

Three consecutive attempts are allowed. After the third failure to pass, an approved skills training is necessary addressing all the criteria of Module 13L.

For the purpose of the practical assessment, the competencies to be assessed are the following:

Mental skills

— The candidate can apply existing knowledge in practice.

— The candidate can apply existing knowledge to other subjects.

— The candidate can understand complex systems.

— The candidate can demonstrate good decision-making.

— The candidate can demonstrate good communication skills (both orally and in writing).

Technical skills

— The candidate demonstrates good craftsmanship (reliable handling of tools, measuring equipment, technics, AMM procedures, safety precautions, applying maintenance-required skills).

— The candidate handles reliably IT systems.

[…]

AMC to Appendix VIII — Number of questions per submodule

The tables below show the number of questions recommended for each submodule. Justified deviations from these values are also acceptable, provided the sum of the questions for the submodules equals the total number for the module.

MODULE 1L — BASIC KNOWLEDGE

MODULE 1L — BASIC KNOWLEDGE	Nr of questions
	20
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.	4
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.	5
1L.3 Electrics AC and 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 in parallel.	4

MODULE 1L — BASIC KNOWLEDGE	Nr of questions
	20
1L.4 Aerodynamics/Aerostatics International Standard Atmosphere (ISA), and its application to aerodynamics and aerostatics;	2
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 workplace safety and environment) materials; — Remedial action in the event of a fire or another accident with one or more hazards, including knowledge of fire-extinguishing agents.	5

MODULE 2L — HUMAN FACTORS

MODULE 2L — HUMAN FACTORS	Nr of questions
	20
2L.1 General — The need to take human factors into account in the maintenance domain; — Incidents attributable to human factors / human error; — Murphy's law.	3
2L.2 Human Performance and Limitations — Vision, hearing, information processing, attention and perception, memory.	2
2L.3 Social Psychology — Responsibility, motivation, peer pressure, teamwork.	2
2L.4 Factors that Affect Performance — Fitness, physical and mental health, stress, sleep, fatigue, alcohol, medication, drug abuse.	4
2L.5 Physical Environment — Working environment (climate, noise, illumination).	4
2L.6 The 'Dirty Dozen' and Risk Mitigation — The 'Dirty Dozen': lack of communication, lack of teamwork, lack of assertiveness, complacency, fatigue, stress, lack of knowledge, lack of resources, lack of awareness, distraction, pressure, norms; — Risk-mitigation methods.	5

MODULE 3L — AVIATION LEGISLATION

MODULE 3L — AVIATION LEGISLATION	Nr of questions
	28
3L.1 Regulatory Framework — Role of the European Commission (EC), the European Union Aviation Safety Agency (EASA) and national aviation authorities (NAAs); — Scope and limits of the regulatory framework.	4

MODULE 3L — AVIATION LEGISLATION	Nr of questions
	28
3L.2 Continuing Airworthiness Regulations — General understanding of the applicable parts of Part-66; — General understanding of the applicable parts of Part-ML; — General understanding of the applicable parts of Part-CAO; — General understanding of Part-M, Part-CAMO and Part-145.	6
3L.3 Repairs and Modifications (Part-ML) — Approval of changes (repairs and modifications); — Standard changes and standard repairs.	5
3L.4 Maintenance Data (Part-ML) — Airworthiness directives (ADs), safety information bulletins (SIBs); — Service bulletins (SBs), Instructions for Continuing Airworthiness (ICAs) (AMM, IPC, etc.), aircraft flight manual (AFM), maintenance records, maintenance programmes.	5
3L.5 Licence privileges and how to exercise them properly (Part-66, Part-ML) Conditions for release to service: — in a maintenance organisation; — as independent certifying staff; — release-to-service procedures.	8

MODULE 4L — WOODEN AND/OR METAL-TUBE STRUCTURE COVERED WITH FABRIC

MODULE 4L — WOODEN AND/OR METAL-TUBE STRUCTURE COVERED WITH FABRIC	Nr of questions
	40
4L.1 Combined structures made of wood, metal tube and fabric — General construction principles for wooden structures covered with fabric, metal-tube structures covered with fabric, and combination of wooden/metal-tube structures; — Wood as a technical material (heartwood, sapwood, grain, etc.); — Wood defects (types, acceptable/not acceptable); — Different woodcuts and their properties (tangential cuts, radial cuts, etc.); — Metal tubing (mechanical and stress properties of metal tubes); — Types of welding and welding joints; — General characteristics of aircraft coverings; — General characteristics of paint; — Transmission of loads in and between structures.	8
4L.2 Material — Types of wood (solid wood, laminated wood, plywood, wood composites), suitable wood materials and their properties (spruce, firs, etc.), wood defects (acceptable and not acceptable), stability, deterioration (temperature, humidity, ageing, etc.); — Types of covering and technologies (natural and synthetic polymers), deterioration; — Types of glues, adhesives, paints and other associated materials; — Types of metal-tubing materials (steel, light alloy tubes, etc.); — Welding seams, fittings, screws and bolts (material and properties); — Proper storage of those materials; — Plastics (overview, understanding of their properties)	8

MODULE 4L — WOODEN AND/OR METAL-TUBE STRUCTURE COVERED WITH FABRIC	Nr of questions
	40
4L.3 Identifying Damage — Inspection procedures; — Damage identification in wooden structures (hard landing, rot, glue failure, fungi, shrinkage, stress damage, cracks, fatigue, etc.); — Damage identification in metal-tubing structures (hard landing, stress, corrosion, fatigue, dents, cracks, fatigue, etc.); — Damage identification in welded seams; — Damage identification in fabric coverings (tears, strains, UV damage, hard landing, etc.).	12
4L.4 Standard Repair and Maintenance Procedures — Repair and conservation of aircraft wooden structures: wing rib, wing spar, bolt and brushing holes, patches (fabric, splayed, surface, plug, scarf); — Repair and reapplication of fabric on aircraft (fabric, tape, lacing, threads, seams, fabric protection, stitching, knots, fasteners, finishing tape, rings and grommets, dope); — Repair and corrosion protection/prevention methods for aircraft metal-tubing structures (welding, patch plates, reinforcement tubes, sleeves, etc.); — Repair, removal from and application of paint and dope on airframes made by a combination of wood, metal tube and fabric (surface preparation, application, and finish).	12

MODULE 5L — COMPOSITE STRUCTURE

MODULE 5L — COMPOSITE STRUCTURE	Nr of questions
	32
5L.1 Fibre-Reinforced Plastic (FRP) Airframe — General construction principles for airframes with FRP and its properties; — Characteristics of laminated structures (matrix and fibre); — Fibre (fibre orientation, strength characteristics, isotropic, anisotropic, filament, strands, tows, yarns, rovings, impreg and prepreg); — Fabric weave styles (plain weave, twill weave, atlas weave, unidirectional) and non-woven material (stitched and knotted) and their characteristics; — Matrix (thermosetting, thermoplastic, curing stages); — Characteristics of sandwich structures and their supporting cores (honeycombs, foams, wooden cores, pseudo cores); — General characteristics of accelerators and additives/modifiers; — Transmission of loads in and between structures.	6
5L.2 Material — Types of fibres (fiberglass, E-glass, aramid, carbon/graphite, boron, ceramic, lightning protection fibre); — Types of matrices (different types, properties and application); — Types of resin filler materials (fumed silica, glass powder, hollow glass, phenolic and plastic microballoons, cotton, flox, colour pigments, fire retardants); — Types of sandwich structure core materials (honeycombs: aramid paper, kraft paper, thermoplastic, aluminium, fiberglass, carbon; foams: polystyrene, phenolic, polyurethane, polypropylene, PVC, polymethacrylimide; balsa wood); — Behaviour, interaction and technological aspects of composites made of those materials; — Storage and handling of those materials.	6

MODULE 5L — COMPOSITE STRUCTURE	Nr of questions
	32
5L.3 Identifying Damages and Defects — Inspection procedures (visual inspection, tapping, NDT testing, etc.); — Types of manufacturing defects and damages and their causes (fibre breakage, matrix imperfections, delamination, debonding, improper drilling, environmental degradation, impact damage, fatigue, erosion, corrosion, UV damage, hard landing, stress, etc.).	10
5L.4 Standard Repair and Maintenance Procedures — Repairs of aircraft structures: wing, rib, wing spar, aerofoil, bolt and brushing holes, patches, sandwich core and faceplate repairs, bolted and bonded repairs; — Proper construction and repair fittings and load-bearing points to composites and composite sandwich structures; — Creation and use of repair moulds from the airframe or intact parts (types, procedures, coatings, etc.); — Proper procedure for the mixing of resins, fibre layering and curing of composites; — Bonding metals and other materials; — Composite painting and finish.	10

MODULE 6L — METALLIC STRUCTURE

MODULE 6L — METALLIC STRUCTURE	Nr of questions
	32
6L.1 Metallic Airframe — General construction principles for metallic airframe structures; — General knowledge of the properties of metal as a technical material (classification; physical, mechanical and electrical properties; manufacturing properties; chemical properties); — General knowledge of the properties of pure metals and alloys; — Metal grain structure of pure metals and alloys and its impact on behaviour (grain boundaries, corrosion, hardening, annealing, differences between forged, machined and cast metals); — Stresses in structural members (tension, compression, torsion, shearing, bearing, bending); — Types of corrosion and corrosion protection (electrochemical oxidation, galvanic corrosion, stress-corrosion cracking, corrosion in passivated materials, high-temperature corrosion); — Types of rivets and fasteners (solid shank rivet, blind rivets, self-plugging rivets (mechanical and friction lock), pull-thru rivets, pin rivets, head styles, taper-lok, rivet nut, lockbolt, high shear fastener, identification, measuring); — Types of welding and welding joints; — Transmission of loads in and between structures.	6
6L.2 Material — Types of iron, steel and their alloys in aviation (cast, forged, tempering, corrosion, strength properties); — Types of aluminium and aluminium alloys in aviation in airframe, rivets and fasteners (strength properties, corrosion); — Common alloying elements for steel and aluminium (influence on mechanical and physical properties of the alloy); — Common paint and surface protection materials; — Common adhesives for use with metals.	6

MODULE 6L — METALLIC STRUCTURE	Nr of questions
	32
6L.3 Identifying Damage — Inspection procedures (sheet metal, structure, bonded joints, soldered joints, welded and brazed joints, riveted joints, corrosion); — Identification and classification of cracks, fatigue, and corrosion in metallic structures.	10
6L.4 Standard Repair and Maintenance Procedures — Metal and sheet metal (marking out and calculation of bend allowance, cutting, drilling, bending and forming, inspection of metal work); — Welding, brazing, soldering and bonding (soldering methods, welding and brazing methods, bonding methods); — Riveting (riveted joints, rivet spacing and pitch; tools used for riveting and dimpling, inspection of riveted joints); — Repairing by patching, insertion, and replacement of parts; — Corrosion treatment; — Problems in multiple-material systems.	10

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS	Nr of questions
	60
7L.1 Theory of Flight — Gliders and Aeroplanes Aerodynamics and flight controls: — Airflow around a body; — Boundary layer, laminar and turbulent flow; — Thrust, weight, aerodynamic resultant; — Generation of lift and drag: angle of attack, polar curve, stall. Operation and effect of roll control, pitch control, yaw control and rudder limiters: — Control using dual-purpose controls; — High-lift devices, slots, slats, flaps, flaperons; — Drag-inducing devices, lift dumpers, speed brakes, dive 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.	3
7L.2 Airframe Structure — General Concepts — Airworthiness requirements for structural strength for gliders, powered gliders and ELA1 aircraft; — Major structural stresses in an airframe (tension, compression, torsion, shear, bending); — Categorisation of airframe structure (primary, secondary, tertiary); — Safety design concepts (fail safe, safe life, damage tolerance); — Transmission of loads in and between structures; — Construction methods for: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, skinning, anti-corrosive protection, wing, empennage and engine attachments; — Structure assembly techniques: riveting, bolting, bonding;	4

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS	Nr of questions
	60
— Protective measures (drains, ventilation, bonding, lightning protection, surface protection and cleaning); — Airframe symmetry alignment and checks.	
7L.3 Airframe Structure — Aeroplanes and Gliders — Fuselage: construction (truss type, monocoque, semimonocoque), attach points (wing, tail plane, undercarriage); — Wings: construction (monospar, multispar, box beam), configurations (cantilever, semicantilever, strut/wire braced), fairing; — Stabilisers: construction, control surface attachments; — Flight control surfaces: construction and attachment, balancing (mass and aerodynamics); — Tow hooks (schweizer and tost hook); — Aircraft assembly, storage, jacking, chocking, securing and associated safety precautions; — Effects of environmental conditions on aircraft handling and operation.	3
7L.4 Air Conditioning (ATA 21) — Heating and ventilation of small aircraft.	1
7L.5 Electrical Power, Cables and Connectors (ATA 24) — Installation and operation of batteries; — Power generation / power sources on small aircraft (AC/DC), voltage regulation, power distribution and circuit protection; — Cable types, construction and characteristics, high-tension and coaxial cables, testing and installation precautions; — Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes, pin insertion and removal; — Crimping (crimping, tools, testing of crimp joints); — Continuity, insulation and bonding techniques and testing; — Wiring protection techniques (cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding).	3
7L.6 Equipment and Furnishing (ATA 25) — Emergency equipment requirements; — Seats, harnesses, and belts.	2
7L.7 Fire Protection and other Safety Systems (ATA 26) — Portable fire extinguisher; — Rescue systems (safety parachute, recovery parachute, launching systems including safety measures for pyrotechnics).	2
7L.8 Flight Controls (ATA 27) — Primary controls: aileron, elevator/stabilator, rudder, dual-purpose controls (stabilator, ruddervator, flaperons); — Secondary controls: elevator trim systems, wing flaps, slats and spoilers/dive breaks; — System operation: manual; — Gust locks, balancing and rigging of flight controls; — Simple stall-warning systems.	3
7L.9 Fuel System (ATA 28) — System layout; — Fuel tanks; — Supply systems;	2

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS	Nr of questions
	60
— Indications and warnings; — Refuelling and defuelling.	
7L.10 Hydraulic Power (ATA 29) — System layout; — Hydraulic fluids; — Hydraulic reservoirs and accumulators, pressure generation (electric, mechanical), filters, pressure control, power distribution, indication and warning systems.	2
7L.11 Ice and Rain Protection (ATA 30) — Hydrophobic coatings; — Pitot probe heat.	1
7L.12 Landing Gear (ATA 32) — Construction (tricycle, tailwheel, outrigger wheels, skids), shock absorbing; — Extension and retraction systems: normal and emergency operation; — Indications and warnings; — Wheels, brakes, tyres, and steering; — Standard repair and maintenance procedures for the landing gear.	3
7L.13 Lights (ATA 33) — External lights: navigation, anticollision, landing, taxiing; — Internal lights: cockpit.	1
7L.14 Oxygen (ATA 35) — System layout: storage system (containers), delivery system (continuous flow, diluter demand and pressure demand), and masks/nasal cannula; — System operation including charging and discharging; — The 'PRICE' check.	1
7L.15 Pneumatic/Vacuum (ATA 36) — System layout; — Sources, pumps, control and distribution; — Indications and warnings.	1
7L.16 Water Ballast (ATA 41) — Water tanks (main tank, fin tank), drain valves, vents.	1
7L.17 Fasteners — Screw threads: nomenclature, forms, dimensions and tolerances, and measuring; — Bolts, studs and screws: types (specifications, identification, markings, international standards), nuts (self-locking, anchor, standard types), machine screws (aircraft specifications), studs (types and uses, insertion and removal), self-tapping screws, dowels; — Locking devices: tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick-release fasteners, keys, circlips, cotter pins; — Aircraft rivets: types of solid and blind rivets: specifications and identification, heat treatment.	2
7L.18 Pipes, Hoses and Connectors — Types and connectors of pipes and hoses for hydraulics, fuel, oil, pneumatic and air; — Bending, belling/flaring, inspection, testing and installation of pipes and hoses.	2
7L.19 Springs — Types of springs, materials, characteristics, applications, inspection, and testing.	1

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS	Nr of questions
	60
7L.20 Bearings — Purpose of bearings, loads, material, construction; — Types of bearings, their application, testing, cleaning, inspection, lubrication requirements, and common defects in bearings and their causes.	1
7L.21 Transmissions — Gear types, their application, gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns, inspection of gears, backlash/play; — Types, application and inspection of belts and pulleys, chains and sprockets; — Inspection of screw jacks, lever devices, push-pull rod systems.	2
7L.22 Control Cables — Types of cables, end fittings, turnbuckles, compensation devices, pulleys, cable system components, Bowden cables and aircraft flexible control systems; — Swaging of end fittings; — Inspection and testing of control cables, Bowden cables and aircraft flexible control systems.	3
— 7L.23 Fits and Clearances — Common system of fits, clearances and tolerances, drill sizes for bolt holes, classes of fits, 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
7.L24 Aircraft Weight and Balance — Calculation of centre-of-gravity / balance limits: use of relevant documents, preparation of aircraft for weighing, aircraft weighing.	2
7L.25 Workshop Practices and Tools — Common hand-tool types, power-tool types, precision-tool types and equipment, their operation, care, control, calibration and standards; — Operation, function and use of electrical general test equipment; — Proper handling of engineering drawings, diagrams and standards, and comprehension of the presented information thereupon (symbols, schematics and diagrams); — Use of workshop materials; — Dimensions, allowances and tolerances, standards of workmanship; — Lubrication equipment and methods.	3
7L.26 Disassembly, Inspection, Repair and Assembly Techniques – Types of defects and visual inspection techniques; corrosion removal, assessment and reprotection; – General repair methods, structural repair manual; ageing, fatigue and corrosion control programmes; – Non-destructive inspection techniques, including penetrant, radiographic, eddy current, ultrasonic and boroscope methods; – Disassembly and reassembly techniques; – Troubleshooting techniques.	4
7.27 Abnormal Events — Inspections following lightning strikes, HIRF penetration, hard landings and flight through turbulence.	3
7.28 Maintenance Procedures	3

MODULE 7L — AIRFRAME — GENERAL, MECHANICAL AND ELECTRICAL SYSTEMS	Nr of questions
	60
— Maintenance planning, modification procedures, stores procedures, maintenance inspection / quality control / quality assurance, additional maintenance procedures, control of life-limited components.	

MODULE 8L — POWER PLANT

MODULE 8L — POWER PLANT	Nr of questions
	64
8L.1 Engine Fundamentals — General — Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; — The relationship between force, work, power, energy, velocity, and acceleration; — Mechanical, thermal, and volumetric efficiencies.	2
8L.2 Piston Engine Fundamentals and Performance — Operating principles: 2-stroke, 4-stroke, Otto, Diesel, and Rotary (Wankel); — Piston displacement and compression ratio; — Engine configuration and firing order; — Power calculation and measurement; — Factors that affect engine power; — Mixtures/leaning, pre-ignition.	2
8L.3 Piston 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.	3
8L.4 Piston Engine Fuel System (non-electronic) — Carburettors (types, construction and principles of operation, icing and heating); — Fuel injection systems (types, construction, and principles of operation).	2
8L.5 Starting and Ignition Systems — Starting systems, preheat systems; — Magneto types, construction and principles of operation; — Ignition harnesses, spark plugs; — Low- and high-tension systems.	3
8L.6 Air Intake, Exhaust and Cooling Systems — Construction and operation of induction systems, including alternate air systems; — Exhaust systems, engine cooling systems — air and liquid.	2
8L.7 Supercharging/Turbocharging — Principles and purpose of supercharging and its effects on engine parameters; — Construction and operation of supercharging/turbocharging systems; — System-associated terminology; — Control systems; — System protection.	2

MODULE 8L — POWER PLANT	Nr of questions
	64
8L.8 Lubrication Systems of Piston Engines — System operation/layout and components.	2
8L.9 Engine Indication Systems — General indication systems specific to combustion engines (coolant temperature, oil pressure and temperature, exhaust gas temperature, fuel pressure and flow); — Indication systems specific to piston engines (cylinder head temperature, manifold pressure, engine speed); — Indication systems specific to turbine engines (exhaust gas temperature, engine thrust indication, engine speed); — Indication systems specific to electric engines (voltage).	3
8L.10 Electric and Hybrid Aircraft Engines — Types and construction of electric motors (AC/DC motors, rotor, stator, bearings, windings, commutator, self-commutated, externally commutated, outrunner and inrunner, motor cooling); — Power electronics; — Transformer, transducer and inverter; — Engine control systems; — Power storage systems (common high-density battery, chemistry batteries, load cycles, degradation, effects of charging and overcharging, thermal runaway); — Battery management systems (general functions, battery balancing, monitoring); — Wiring of electric power storage, power electronics and electric motor; — High-energy safety procedures.	9
8L.11 Turbine Engine Fundamentals and Performance — Constructional arrangement and operation of turbojet and turboprop engines; — Thrust: thrust horsepower, shaft horsepower, specific fuel consumption; — Engine pressure ratio; — Pressure, temperature and velocity of the gas flow; — Engine ratings, static thrust, limitations.	2
8L.12 Inlet and Compressor — Compressor inlet; — Axial and centrifugal compressor types, constructional features, operating principles, and applications; — Compressor (stator, rotor, blisk, disk, blades, compressor stall and surge); — Compressor ratio.	2
8L.13 Combustion Chamber, Starting and Ignition System — Constructional features and principles of operation; — Operation of engine start systems and components; — Ignition systems and components (exciter, ignition plugs and glow plugs).	2
8L.14 Turbine Section and Exhaust — Operation and characteristics of different turbine blade types, nozzle guide vanes; — Gas producer turbine and power turbine, blade-to-disk attachment; — Causes and effects of turbine blade stress and creep. — Engine exhaust nozzle and noise reduction.	2

MODULE 8L — POWER PLANT	Nr of questions
	64
8L.15 Other Turbine Engine Components and Systems — General knowledge of the types, features and principles of bearings and seals in turbine engines; — System operation, layout and components of lubrication systems in small turbine engines (separate lubrication as part of the fuel system); — System operation, layout and components of air and fuel systems in small turbine engines; — Turboprop reduction gears.	2
8L.16 Turbine Engine Inspections and Ground Operation — Standard procedures for starting and ground run-up, and interpretation of engine power output and parameters; — Inspection of engine and components to criteria, tolerances and data specified by the engine manufacturer; — Foreign object damage (FOD).	3
8L.17 Propeller — Propeller fundamentals (blade element theory, blade angles, angle of attack, rotational speed, propeller slip, aerodynamic/centrifugal/thrust forces, torque, relative airflow, vibration and resonance); — Propeller construction (methods and materials for wooden/composite/metallic propellers, blade station, blade face, blade shank, blade back/thrust face and hub assembly, fixed pitch controllable pitch, constant speed propeller, propeller/spinner installation); — Propeller pitch control (speed control and mechanical, electrical pitch change methods, feathering, propeller accumulators, overspeed protection); — Environmental protection (de-icing and metal tipping); — Propeller balancing (static and dynamic) and blade tracking; — Damage assessment, erosion, corrosion, impact damage, delamination and decay; — Standard treatment and repair methods for propellers.	7
8L.18 Full Authority Digital Engine Control (FADEC) — Operation of engine control and fuel-metering systems in piston and turbine engines, including electronic engine control (FADEC); — System layout and components.	2
8L.19 Lubricants and Fuels — Properties and specifications of standard, alternate and drop-in fuels, fuel additives and lubricants.	3
8L.20 Engine and Propeller Installation — Construction of nacelles; — 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; — Extension and retraction systems, including propeller position control; — Propeller installation.	4

MODULE 8L — POWER PLANT	Nr of questions
	64
8L.21 Engine Monitoring and Ground Operation — Procedures for starting and ground run-up; — Interpretation of engine power output and parameters; — Inspection of engine and components to criteria, tolerances and data specified by the engine manufacturer; — Foreign object damage (FOD).	3
8L.22 Engine/Propeller Storage and Preservation — Preservation and depreservation of the engine, propeller and accessories/systems.	2

MODULE 9L — BALLOONS — HOT-AIR BALLOONS

MODULE 9L — BALLOONS — HOT-AIR BALLOONS	Nr of questions
	36
9L.1 Theory of Flight — Hot-Air Balloons Aerostatics and controls: — Principles; — Effect on envelopes, wind effect, altitude, and temperature effects.	2
9L.2 Airframe of Hot-Air Balloons Components and assembly of a hot-air balloon: — Identification plate; — Envelope; — Heater system / burner; — Suspension cables; — Basket; — Lines and ropes (crown line, actuation line).	3
9L.3 Envelope — Shape and assembly of envelope (poles, equator, panels, gores, special shapes); — Fabrics, seams and materials; — Crown ring; — Deflation port / parachute and ripping panel; — Load tapes (horizontal and vertical) and rip stoppers; — Turning vent; — Mouth; — Skirt/scoop; — Diaphragms/catenaries (special shapes).	4
9L.4 Heater System / Burner — System layout (burner, fuel tanks, fuel lines); — Types of burners (whisper-/cow-burner, main/take-off burner); — Functionality, materials, use, inspection, and care of: — fuel tanks (propane cylinders, material, valves, fittings, fuel quantity gauge), — fuel lines / gas hoses,	4

MODULE 9L — BALLOONS — HOT-AIR BALLOONS	Nr of questions
	36
— burner (piezo igniter, pilot light and valve, blast valve, heat exchanger/burner coils, nozzle, etc.).	
9L.5 Basket and Basket Suspension (including alternative devices) Common assembly and materials of hot-air balloon baskets: — Rigging points, burner frame, burner support rods, metal frame, basket padding and leather trim; — Basket weave, grab handles, cylinder attachment, take-off aid and rope; — Basket wire and basket wire routing; — Basket floor, basket frame / load-bearing frame, sliders, raw hide protective covering.	4
9L.6 Instruments Basic operation, maintenance, and testing of: — altimeter (mechanical and electronic); — variometer (mechanical and electronic); — pyrometer/temperature sensors; — Mode S transponder; — VHF radio; — emergency locator transmitter (ELT) and personal locator beacon (PLB).	5
9L.7 Equipment — Required equipment for free ballooning operations and its care.	2
9L.8 Hot-Air Balloon Handling and Storage — Ground procedures for hot-air balloons, rigging and launch preparation; — Safe handling of propane; — Effects of environmental conditions on balloon handling.	4
9L.9 Disassembly, Inspection, Repair and Assembly Techniques — Types of defects and visual inspection techniques; — Allowable damage and tolerances for envelope, basket, lines, ropes, etc.; — Common test procedures (Grab test); — General repair methods for envelopes, load ring, ropes and lines, basket; — Inspection methods for envelopes, ropes and lines, basket; — Ageing, fatigue; — Disassembly and reassembly techniques; — Troubleshooting techniques.	8

MODULES 10L — BALLOONS — GAS (FREE/TETHERED) BALLOONS

MODULES 10L — BALLOONS — GAS (FREE/TETHERED) BALLOONS	Nr of questions
	44
10L.1 Theory of Flight — Gas Balloons Aerostatics and controls: — Principles; — Effect on envelopes, wind effect, altitude, and temperature effects.	2
10L.2 Airframe of Gas Balloons	3

MODULES 10L — BALLOONS — GAS (FREE/TETHERED) BALLOONS	Nr of questions 44
Components and assembly of a gas balloon: — Identification plate; — Envelope; — Valve; — Netting; — Load ring (hoop); — Basket; — Lines and ropes (drag rope, mooring line, valve line, emergency opening rope ripping line, neck line).	
10L.3 Envelope — Shape and assembly of envelope (poles, equator, panels); — Fabrics, seams and materials; — Deflation opening and parachute; — Load belt; — Ripping panel; — Appendix; — Emergency opening; — Holding down patches; — Ballonets; — Electrostatic properties.	3
10L.4 Netting — Netting assembly (net ring, net, mesh); — Mesh dimensions (knots, sizes, angles); — Materials of netting and accessories; — Electrostatic properties.	1
10L.5 Valves, Parachutes and other Related Systems — Construction, operation, maintenance and testing of manoeuvring valves / helium valves, pressure relief valves, gas-tight parachutes and ballonet fans; — Construction, operation, maintenance and testing of parachute centring belt and pull-down belts.	1
10L.6 Load Ring — Function, material, and common problems (steel pipe, strops, toggles).	1
10L.7 Basket (including alternative devices) Common assembly and materials of hot-air / gas-balloon baskets: — Metal frame, basket padding and leather trim; — Basket weave, grab handles, basket strops and toggles, ballast system (bags, support and sand dumpers); — Basket wire and basket wire routing; — Basket floor, basket frame / load-bearing frame, sliders, raw hide protective covering.	4
10L.8 Ropes and Lines Functionality, materials, use, inspection, and care of: — shroud lines / envelope ropes / bridles; — trail rope / drag rope and trail-rope bag; — holding ropes;	2

MODULES 10L — BALLOONS — GAS (FREE/TETHERED) BALLOONS	Nr of questions
	44
— valve line / valve cord and parachute rope; — emergency opening rope; — appendix pull–close rope; — appendix anchor line; — inflation aid.	
10L.9 Instruments Basic operation, maintenance, and testing of: — altimeter (mechanical and electronic); — variometer (mechanical and electronic); — Mode S transponder; — VHF radio; — emergency locator transmitter (ELT) and personal locator beacon (PLB).	5
10L.10 Tethered Gas Balloon (TGB) Systems Functionality, operation, materials, use, inspection, and care of: — launch platform; — winch system: winch (electric, hydraulic, emergency operation), tether cable (cable, sheaves, swivel, clamps) and control panel; — gondola (metal-tubing construction); — night lighting.	8
10L.11 Equipment — Required equipment for free ballooning and for tethered operations, and its care.	2
10L.12 Gas-Balloon Handling and Storage — Ground procedures and mooring for gas balloons and tethered gas balloons, ballasting, rigging and launch preparation; — Safe handling of hydrogen, helium, illuminating gas and other lifting gases; — Lifting gas (charging, purifying and leak testing, pressure monitoring); — Effects of environmental conditions on gas-balloon handling.	4
10L.13 Disassembly, Inspection, Repair and Assembly Techniques — Types of defects and visual inspection techniques; — Allowable damage and tolerances for envelope, basket, lines, ropes, etc.; — Common test procedures (Grab test, tensile strength, tear growth, porosity, electric resistivity, etc.); — General repair methods for envelopes, load ring, ropes and lines, basket/gondola; — Inspection methods for envelopes, load ring, ropes and lines, basket/gondola (especially for steel frames and welds on TGB gondolas); — Ageing, fatigue and corrosion control programmes; — Disassembly and reassembly techniques; — Troubleshooting techniques.	8

MODULE 11L — AIRSHIPS — HOT-AIR / GAS AIRSHIPS

MODULE 11L — AIRSHIPS — HOT-AIR / GAS AIRSHIPS	Nr of questions

	40
11L.1 Theory of Flight and Control of Airships — Control using fins, rudders and elevators; — Aerodynamic lift and aerodynamic balance; — Stability and control; — Free ballooning; — Operation and effect of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels; — Vectored thrust; — Fire and lightning protection.	3
11L.2 Airship Airframe Structure — General Concepts — Classification of airships (rigid airship, semi-rigid airship, non-rigid airship); — Construction of semi-rigid airships (envelope, ballonet, membranes, nose cone, internal structures, keel, trusses, longerons, suspension lines); — Construction of non-rigid airships (envelope, ballonet, catenary curtains, suspension lines, air scoops); — Attachment of stabilisers and control surfaces to the airframe.	3
— 11L.3 Airship Envelope — Nose cone battens/bow strips; — Catenary systems (catenary curtain, support/suspension cables); — Ballonets and their positioning (forward, aft); — Air systems (air scoops, ballonet fans, empennage air system, dampers and transfer fans).	3
11L.4 Gondola — General knowledge of gondola construction (metal-tubing gondolas, metal-structure gondolas, composite gondolas); — Doors, windows and hatches; — Attachment of the gondola to the airframe/envelope; — Gondola layout, equipment and furnishing (emergency equipment requirements, seats, harnesses and belts); — Simple water/waste systems in airships; — Gondola heating and ventilation (ventilation and heating systems, heat exchanger, blower); — Landing gear (construction, shock absorbing, tyres, weight-on-wheels).	6
11L.5 Airship Flight Controls (ATA 27/55) — Primary controls (rudder, elevator, asymmetric thrust, thrust vectoring); — Trim control; — System operation: manual, hydraulic, pneumatic, electrical, fly-by-wire; — Balancing and rigging.	2
11L.6 Electrical Power (ATA 24) — Installation and operation of batteries; — DC power generation; — AC power generation; — Voltage regulation; — Power distribution; — Wiring, electrical connections; — Inverters, transformers, rectifiers; — Circuit protection; — External/ground power.	3

11L.7 Lights (ATA 33) — External: navigation, anticollision, landing, taxiing, ground approach light, aft landing light; — Internal: flight compartment (cockpit) and passenger compartment (cabin); — Emergency.	1
11L.8 Ice and Rain Protection — Windscreen wipers and windscreen demisting systems; — Surface de-icing systems.	2
11L.9 Fuel Systems (ATA 28) — System layout; — Fuel tanks: venting, draining; — Supply systems; — Cross-feed and transfer; — Indications and warnings; — Refuelling and defueling.	3
11L.10 Engines and Propellers in Airships — General understanding of engine layout, thrust vectoring, swivel systems, ducted propellers, and control system.	2
11L.11 Airship Handling and Storage — Ground procedures and mooring with and without mooring mast, ballasting, hangaring, rigging and launch preparation; — Lifting gas (charging, purifying and leak testing, pressure monitoring); — Effects of environmental conditions on airship handling.	4
11L.12 Disassembly, Inspection, Repair and Assembly Techniques — Types of defects and visual inspection techniques; — Corrosion removal, assessment and reprotection; — General repair methods, structural repair manual; — Ageing, fatigue and corrosion control programmes; — Non-destructive inspection techniques; — Disassembly and reassembly techniques; — Troubleshooting techniques.	8

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

MODULE 12L — RADIO COM / ELT / TRANSPONDER / INSTRUMENTS	Nr of questions
	20
12L.1 Radio Communication / Emergency Locator Transmitter (ELT) Fundamentals of radio-wave propagation, antennas, transmission lines, communication, receiver and transmitter. Working principle of: — emergency locator transmitters (ELTs); — very high frequency (VHF) communications; — installation and testing of ELTs and VHF radios and antennas.	6
12L.2 Transponder and FLARM — Air traffic control transponder, secondary surveillance radar (basic operation, configuration, modes; — FLARM; — Installation and testing.	5
12L.3 Instruments — Pitot static: altimeter, airspeed indicator, vertical speed indicator, total energy probes; — 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 and analogue cockpit; — Indications of other aircraft systems; — Installation and testing of instruments.	8
12L.4 Avionics General Test Equipment — Operation, function and use of avionics general test equipment.	1

MODULE 13L — PRACTICAL ASSESSMENT

The training organisation or the competent authority shall decide on the group of tasks and the assessment shall be based on the observation of the candidate's performance while carrying out the tasks.

Duration of the assessment: 2 assessment days on tasks selected from the applicable table of the AMC to Appendix VII.

'1 assessment day' means at least 6 hours, calculated without breaks. '1 hour' means 60 minutes.

Appendix IX — Evaluation method for the multimedia-based training (MBT)

The purpose of this Appendix is to establish the principles and criteria for the assessment of any course that includes MBT. It may be used for the assessment of other training courses, as appropriate. The assessment table is intended to serve as an objective tool to support the competent authority in the approval process of training courses that comprise MBT methods.

The assessment criteria shall comprise the evaluation, teaching, monitoring and students' support, as well as exercises and tests.

The general structure for the various sections shall be the following:

(a) Product identification

This section shall identify the educational resource. It shall indicate who is responsible for the production and the version of the product.

(b) Category 'academic quality'

This section shall evaluate the suitability of the information presented in the educational resource. Two essential criteria shall be assessed:

Information reliability: the information is reliable, current, and relatively free of errors. The information complies with the current regulatory requirements.

Information relevance: the information is relevant to the learning objectives defined for the course. It supports the student in achieving the learning objectives.

(c) Category 'pedagogical quality'

The system emphasises the activities which promote the development of required knowledge and skills.

The main criteria for each product are related to three aspects:

Pedagogical formulation/construction: it is characterised by the quality of simplification, the presence of summaries as well as the use of diagrams, figures, animations, and illustrations. It evaluates whether the structure of the learning resource promotes its use in a pedagogical context. This means: the ease of orientation (summary, lesson plan), presence of appropriate interactions, usability (back, forward, scroll boxes, etc.), and communication resources (questions and answers, FAQs, forum, etc.)

Pedagogical strategies: teaching and learning styles should be based on active teaching approaches to build meaningful situations related to learning objectives and to learner motivation.

Student assessment methods: methods are implemented to measure the achievement of learning objectives.

(d) Category 'didactic quality'

The content refers to real situations the student could possibly face in an actual maintenance environment. The content is adequate to meet the learning objectives.

(e) Category 'technical quality'

This section assesses the design, browsing and technological aspects of the learning resources:

Design: the content and organisation of the learning resource shall promote the appropriate use of colours, interactivity, graphic quality for selected images, animations and illustrations.

Browsing: while navigating, the student should be able to find a plan, an index or a detailed table of contents. The suggested choices or guidelines shall be clear and the groupings within the menus shall be consistent.

Technological aspects: multimedia techniques aim to combine and exploit the capacities of any new technology in education to enhance the transfer of knowledge. Therefore, the system shall favour the use of animations, simulations, or any other interactive elements.

For the assessment process, each statement within the category shall be rated separately.

The competent person that carries out the assessment shall put themselves in the position of the student or the end user and shall rate each question in the attached form on a rating scale from 1 to 5. The final grade shall be calculated according to the sum of scores.

The following principle shall be observed: if one or more statements within the categories is rated below 3, an alternative learning process shall be considered in order to enhance the suitability level or a product update, which fulfils the required suitability level, shall be requested.

Assessment table for the multimedia-based training (MBT)		
Product identification:		
Name:	Version:	
		SCORE (1–5)
Category 'academic quality'		
Information reliability	1. The information is reliable.	
Information relevance	2. The information is relevant.	
Category 'pedagogical quality'		
Pedagogical formulation / construction	3. The quality of the resource simplification is adequate.	
	4. The educational resource presents an appropriate number of overviews and summaries.	
	5. The resource is clearly structured (summaries, plans).	
	6. The structure promotes its use in the pedagogical context.	
Pedagogical strategies	7. The learning objectives are stated.	
	8. The resource includes stimuli to promote learning.	
	9. The resource creates interaction between student and instructor.	
	10. The active engagement of the student is fostered.	
	11. Student-centred learning is present.	
	12. Problem-solving tasks encourage learning.	
	13. The resource enables communication between students.	
	14. The student is able to see their learning progress.	
Student assessment methods	15. The resource provides a self-assessment procedure.	
Category 'didactic quality'		
Learning activities	16. The content refers to real situations that the student could possibly face in an actual maintenance environment.	

Assessment table for the multimedia-based training (MBT)		
Product identification:		
Name:	Version:	
		SCORE (1–5)
Learning content	17. The content is adequate to meet the learning objectives.	
Category 'technical quality'		
Design	18. The content and organisation of the learning resource includes the appropriate use of colours, interactivity, graphic quality, animations, and illustrations.	
Browsing	19. Navigation methods are clear, consistent, and intuitive.	
Technological aspects	20. Multimedia techniques promote the transfer of information.	
	Final score:	

The following rating intervals show the suitability level for each assessed learning resource:

100–80: Excellent learning resource. It offers different functionalities and meets the required suitability criteria.

79–60: The learning resource meets the required suitability criteria.

59–40: The learning resource does not allow for a sufficiently worthy educational use. It can be used for 'informal' training only.

39–20: The learning resource is below the average. It does not meet several required suitability criteria.

Although the final score is equal to or above 60, it shall be checked if there is no single rating within the categories that is below 3.

Definition of scores:

1: Not acceptable. Does not meet the required criteria.

2: Partially acceptable, but improvement is needed to meet the required criteria.

3: Acceptable. Meets the required criteria.

4: Good. Meets the required criteria with enhancements made.

5: Excellent. Exceeds the required criteria.

[…]

APPENDICES TO THE ACCEPTABLE MEANS OF COMPLIANCE TO ANNEX III (PART-66)

[…]

Appendix I — Aircraft Type Ratings for Part-66 Aircraft Maintenance Licences

New type rating lists for:

— new definition of Group 1 (pressurised above FL290)
— introduction of Group E

[…]

Appendix II — Aircraft Type Practical Experience and On-the-Job Training — List of Tasks

Tasks are divided in categories of aircraft:

A) aeroplanes and helicopters
B) sailplanes and powered sailplanes
C) balloons and airships

A. SPECIFIC TASKS FOR AEROPLANES AND HELICOPTERS

~~**Time limits/Maintenance checks**~~

~~100 hour check (general aviation aircraft).~~

~~'B' or 'C' check (transport category aircraft).~~

~~Assist carrying out a scheduled maintenance check i.a.w. AMM.~~

~~Review Aircraft maintenance log for correct completion.~~

~~Review records for compliance with Airworthiness Directives.~~

~~Review records for compliance with component life limits.~~

~~Procedure for inspection following heavy landing.~~

~~Procedure for inspection following lightning strike.~~

~~**Dimensions/Areas**~~

~~Locate component(s) by zone/station number.~~

~~Perform symmetry check.~~

~~**Lifting and Shoring**~~

~~Assist in:~~

~~Jack aircraft nose or tail wheel.~~

~~Jack complete aircraft.~~

~~Sling or trestle major component.~~

~~**Levelling/Weighing**~~

~~Level aircraft.~~

~~Weigh aircraft.~~

~~Prepare weight and balance amendment.~~

~~Check aircraft against equipment list.~~

~~**Towing and Taxiing**~~

~~Prepare for aircraft towing.~~

~~Tow aircraft.~~

~~Be part of aircraft towing team.~~

~~**Parking and mooring**~~

~~Tie down aircraft.~~

~~Park, secure and cover aircraft.~~

~~Position aircraft in dock.~~

~~Secure rotor blades.~~

~~**Placards and Markings**~~

~~Check aircraft for correct placards.~~

~~Check aircraft for correct markings.~~

~~**Servicing**~~

~~Refuel aircraft.~~

~~Defuel aircraft.~~

~~Carry out tank to tank fuel transfer.~~

~~Check/adjust tire pressures.~~

~~Check/replenish oil level.~~

~~Check/replenish hydraulic fluid level.~~

~~Check/replenish accumulator pressure.~~

~~Charge pneumatic system.~~

~~Grease aircraft.~~

~~Connect ground power.~~

~~Service toilet/water system~~

~~Perform pre-flight/daily check.~~

~~**Vibration and Noise Analysis**~~

~~Analyse helicopter vibration problem.~~

~~Analyse noise spectrum.~~

~~Analyse engine vibration.~~

~~**Air Conditioning**~~

~~Replace combustion heater.~~

~~Replace flow control valve.~~

~~Replace outflow valve.~~

~~Replace safety valve.~~

~~Replace vapour cycle unit.~~

~~Replace air cycle unit.~~

~~Replace cabin blower.~~

~~Replace heat exchanger.~~

~~Replace pressurisation controller.~~

~~Clean outflow valves.~~

~~Deactivate/reactivate cargo isolation valve.~~

~~Deactivate/reactivate avionics ventilation components.~~

~~Check operation of air conditioning/heating system.~~

~~Check operation of pressurisation system.~~

~~Troubleshoot faulty system.~~

~~**Auto flight**~~

~~Install servos.~~

~~Rig bridle cables Replace controller.~~

~~Replace amplifier.~~

~~Replacement of the auto flight system LRUs in case of fly-by-wire aircraft.~~

~~Check operation of auto-pilot.~~

~~Check operation of auto-throttle/auto-thrust.~~

~~Check operation of yaw damper.~~

~~Check and adjust servo clutch.~~

~~Perform autopilot gain adjustments.~~

~~Perform mach trim functional check.~~

~~Troubleshoot faulty system.~~

~~Check autoland system.~~

~~Check flight management systems.~~

~~Check stability augmentation system.~~

~~**Communications**~~

~~Replace VHF COM unit.~~

~~Replace HF COM unit.~~

~~Replace existing antenna.~~

~~Replace static discharge wicks.~~

~~Check operation of radios.~~

~~Perform antenna VSWR check.~~

~~Perform SELCAL operational check.~~

~~Perform operational check of passenger address system.~~

~~Functionally check audio integrating system.~~

~~Repair coaxial cable.~~

~~Troubleshoot faulty system.~~

~~Check SATCOM.~~

~~**Electrical Power**~~

~~Charge lead/acid battery.~~

~~Charge Ni-Cad battery.~~

~~Check battery capacity.~~

~~Deep-cycle Ni-Cad battery.~~

~~Replace integrated drive/generator/alternator.~~

~~Replace switches.~~

~~Replace circuit breakers.~~

~~Adjust voltage regulator.~~

~~Change voltage regulator.~~

~~Amend electrical load analysis report.~~

~~Repair/replace electrical feeder cable.~~

~~Troubleshoot faulty system.~~

~~Perform functional check of integrated drive/generator/alternator.~~

~~Perform functional check of voltage regulator.~~

~~Perform functional check of emergency generation system.~~

~~**Equipment/Furnishings**~~

~~Replace carpets~~

~~Replace crew seats.~~

~~Replace passenger seats.~~

~~Check inertia reels.~~

~~Check seats/belts for security.~~

~~Check emergency equipment.~~

~~Check ELT for compliance with regulations.~~

~~Repair toilet waste container.~~

~~Remove and install ceiling and sidewall panels.~~

~~Repair upholstery.~~

~~Change cabin configuration.~~

~~Replace cargo loading system actuator.~~

~~Test cargo loading system.~~

~~Replace escape slides/ropes.~~

~~Fire protection~~

~~Check fire bottle contents.~~

~~Check/test operation of fire/smoke detection and warning system.~~

~~Check cabin fire extinguisher contents.~~

~~Check lavatory smoke detector system.~~

~~Check cargo panel sealing.~~

~~Install new fire bottle.~~

~~Replace fire bottle squib.~~

~~Troubleshoot faulty system.~~

~~Inspect engine fire wire detection systems.~~

~~Flight Controls~~

~~Inspect primary flight controls and related components i.a.w. AMM.~~

~~Extending/retracting flaps & slats.~~

~~Replace horizontal stabiliser.~~

~~Replace spoiler/lift damper.~~

~~Replace elevator.~~

~~Deactivation/reactivation of aileron servo control.~~

~~Replace aileron.~~

~~Replace rudder.~~

~~Replace trim tabs.~~

~~Install control cable and fittings.~~

~~Replace slats.~~

~~Replace flaps.~~

~~Replace powered flying control unit.~~

~~Replace flat actuator.~~

~~Rig primary flight controls.~~

~~Adjust trim tab.~~

~~Adjust control cable tension.~~

~~Check control range and direction of movement.~~

~~Check for correct assembly and locking.~~

~~Troubleshoot faulty system.~~

~~Functional test of primary flight controls.~~

~~Functional test of flap system.~~

~~Operational test of the side stick assembly.~~

~~Operational test of the THS.~~

~~THS system wear check.~~

~~**Fuel**~~

~~Water drain system (operation).~~

~~Replace booster pump.~~

~~Replace fuel selector.~~

~~Replace fuel tank cells.~~

~~Replace/test fuel control valves.~~

~~Replace magnetic fuel level indicators.~~

~~Replace water drain valve.~~

~~Check/calculate fuel contents manually.~~

~~Check filters.~~

~~Flow check system.~~

~~Check calibration of fuel quantity gauges.~~

~~Check operation feed/selectors.~~

~~Check operation of fuel dump/jettison system.~~

~~Fuel transfer between tanks.~~

~~Pressure defuel.~~

~~Pressure refuel (manual control).~~

~~Deactivation/reactivation of the fuel valves (transfer defuel, X-feed, refuel).~~

~~Troubleshoot faulty system.~~

~~**Hydraulics**~~

~~Replace engine driven pump.~~

~~Check/replace case drain filter.~~

~~Replace standby pump.~~

~~Replace hydraulic motor pump/generator.~~

~~Replace accumulator.~~

~~Check operation of shut off valve.~~

~~Check filters/clog indicators.~~

~~Check indicating systems.~~

~~Perform functional checks.~~

~~Pressurisation/depressurisation of the hydraulic system.~~

~~Power Transfer Unit (PTU) operation.~~

~~Replacement of PTU.~~

~~Troubleshoot faulty system.~~

~~Ice and rain protection~~

~~Replace pump.~~

~~Replace timer.~~

~~Inspect repair propeller deice boot.~~

~~Test propeller de-icing system.~~

~~Inspect/test wing leading edge de-icer boot.~~

~~Replace anti-ice/deice valve.~~

~~Install wiper motor.~~

~~Check operation of systems.~~

~~Operational test of the pitot probe ice protection.~~

~~Operational test of the TAT ice protection.~~

~~Operational test of the wing ice protection system.~~

~~Assistance to the operational test of the engine air intake ice protection (with engines operating).~~

~~Troubleshoot faulty system.~~

~~Indicating/recording systems~~

~~Replace flight data recorder.~~

~~Replace cockpit voice recorder.~~

~~Replace clock.~~

~~Replace master caution unit.~~

~~Replace FDR.~~

~~Perform FDR data retrieval.~~

~~Troubleshoot faulty system.~~

~~Implement ESDS procedures.~~

~~Inspect for HIRF requirements.~~

~~Start/stop EIS procedure.~~

~~Bite test of the CFDIU.~~

~~Ground scanning of the central warning system.~~

~~Landing Gear~~

~~Build up wheel.~~

~~Replace main wheel.~~

~~Replace nose wheel.~~

~~Replace steering actuator.~~

~~Replace truck tilt actuator.~~

~~Replace gear retraction actuator.~~

~~Replace uplock/downlock assembly.~~

~~Replace shimmy damper.~~

~~Rig nose wheel steering.~~

~~Functional test of the nose wheel steering system.~~

~~Replace shock strut seals.~~

~~Replace brake unit.~~

~~Replace brake control valve.~~

~~Bleed brakes.~~

~~Replace brake fan.~~

~~Test anti-skid unit.~~

~~Test gear retraction.~~

~~Change bungees.~~

~~Adjust micro switches/sensors.~~

~~Charge struts with oil and air.~~

~~Troubleshoot faulty system.~~

~~Test auto-brake system.~~

~~Replace rotorcraft skids.~~

~~Replace rotorcraft skid shoes.~~

~~Pack and check floats.~~

~~Flotation equipment.~~

~~Check/test emergency blowdown (emergency landing gear extension).~~

~~Operational test of the landing gear doors.~~

~~**Lights**~~

~~Repair/replace rotating beacon.~~

~~Repair/replace landing lights.~~

~~Repair/replace navigation lights.~~

~~Repair/replace interior lights.~~

~~Replace ice inspection lights.~~

~~Repair/replace logo lights.~~

~~Repair/replace emergency lighting system.~~

~~Perform emergency lighting system checks.~~

~~Troubleshoot faulty system~~

~~**Instruments**~~

~~Troubleshoot faulty system.~~

~~Calibrate magnetic direction indicator.~~

~~Replace airspeed indicator.~~

~~Replace altimeter.~~

~~Replace air data computer.~~

~~Replace ADI.~~

~~Replace HSI.~~

~~Check pitot static system for leaks.~~

~~Check operation of directional gyro.~~

~~Check calibration of pitot static instruments.~~

~~Compass replacement direct/indirect.~~

~~Functional check flight director system.~~

~~**Surveillance**~~

~~Troubleshoot faulty system.~~

~~Functional check weather radar.~~

~~Functional check doppler.~~

~~Functional check TCAS.~~

~~Functional check ATC transponder.~~

~~Check calibration of pressure altitude reporting system.~~

~~**Navigation**~~

~~Functional check inertial navigation system.~~

~~Complete quadrantal error correction of ADF system.~~

~~Check GPS.~~

~~Test AVM.~~

~~Check marker systems.~~

~~Functional check DME.~~

~~**Oxygen**~~

~~Inspect on board oxygen equipment.~~

~~Purge and recharge oxygen system.~~

~~Replace regulator.~~

~~Replace oxygen generator.~~

~~Test crew oxygen system.~~

~~Perform auto oxygen system deployment check.~~

~~Troubleshoot faulty system.~~

~~**Pneumatic systems**~~

~~Replace filter.~~

~~Replace air shut off valve.~~

~~Replace pressure regulating valve.~~

~~Replace compressor.~~

~~Recharge dessicator.~~

~~Adjust regulator.~~

~~Check for leaks.~~

~~Troubleshoot faulty system.~~

~~**Vacuum systems**~~

~~Inspect the vacuum system i.a.w. AMM.~~

~~Replace vacuum pump.~~

~~Check/replace filters.~~

~~Adjust regulator.~~

~~Troubleshoot faulty system.~~

~~**Water/Waste**~~

~~Replace water pump.~~

~~Replace tap.~~

~~Replace toilet pump.~~

~~Perform water heater functional check.~~

~~Troubleshoot faulty system.~~

~~Inspect waste bin flap closure.~~

~~**Central Maintenance System**~~

~~Retrieve data from CMU.~~

~~Replace CMU.~~

~~Perform Bite check.~~

~~Troubleshoot faulty system.~~

~~**Airborne Auxiliary power**~~

~~Install APU.~~

~~Inspect hot section.~~

~~Troubleshoot faulty system.~~

~~**Structures**~~

~~Assessment of damage.~~

~~Sheet metal repair.~~

~~Fibre glass repair.~~

~~Wooden repair.~~

~~Fabric repair.~~

~~Recover fabric control surface.~~

~~Treat corrosion.~~

~~Apply protective treatment.~~

~~Doors~~

~~Inspect passenger door i.a.w. AMM.~~

~~Rig/adjust locking mechanism.~~

~~Adjust air stair system.~~

~~Check operation of emergency exits.~~

~~Test door warning system.~~

~~Troubleshoot faulty system.~~

~~Remove and install passenger door i.a.w. AMM.~~

~~Remove and install emergency exit i.a.w. AMM.~~

~~Inspect cargo door i.a.w. AMM.~~

~~Windows~~

~~Replace windshield.~~

~~Replace direct vision window.~~

~~Replace cabin window.~~

~~Repair transparency.~~

~~Wings~~

~~Skin repair.~~

~~Recover fabric wing.~~

~~Replace tip.~~

~~Replace rib.~~

~~Replace integral fuel tank panel.~~

~~Check incidence/rig.~~

~~Propeller~~

~~Assemble prop after transportation.~~

~~Replace propeller.~~

~~Replace governor.~~

~~Adjust governor.~~

~~Perform static functional checks.~~

~~Check operation during ground run.~~

~~Check track.~~

~~Check setting of micro switches.~~

~~Assessment of blade damage i.a.w. AMM.~~

~~Dynamically balance prop.~~

~~Troubleshoot faulty system.~~

~~Main Rotors~~

~~Install rotor assembly.~~

~~Replace blades.~~

~~Replace damper assembly.~~

~~Check track.~~

~~Check static balance.~~

~~Check dynamic balance.~~

~~Troubleshoot.~~

~~Rotor Drive~~

~~Replace mast.~~

~~Replace drive coupling.~~

~~Replace clutch/freewheel unit~~

~~Replace drive belt.~~

~~Install main gearbox.~~

~~Overhaul main gearbox.~~

~~Check gearbox chip detectors.~~

~~Tail Rotors~~

~~Install rotor assembly.~~

~~Replace blades.~~

~~Troubleshoot.~~

~~Tail Rotor Drive~~

~~Replace bevel gearbox.~~

~~Replace universal joints.~~

~~Overhaul bevel gearbox.~~

~~Install drive assembly.~~

~~Check chip detectors.~~

~~Check/install bearings and hangers.~~

~~Check/service/assemble flexible couplings.~~

~~Check alignment of drive shafts.~~

~~Install and rig drive shafts.~~

~~Rotorcraft flight controls~~

~~Install swash plate.~~

~~Install mixing box.~~

~~Adjust pitch links.~~

~~Rig collective system.~~

~~Rig cyclic system.~~

~~Rig anti-torque system.~~

~~Check controls for assembly and locking.~~

~~Check controls for operation and sense.~~

~~Troubleshoot faulty system.~~

~~Power Plant~~

~~Build up ECU.~~

~~Replace engine.~~

~~Repair cooling baffles.~~

~~Repair cowling.~~

~~Adjust cowl flaps.~~

~~Repair faulty wiring.~~

~~Troubleshoot.~~

~~Assist in dry motoring check.~~

~~Assist in wet motoring check.~~

~~Assist in engine start (manual mode).~~

~~Piston Engines~~

~~Remove/install reduction gear.~~

~~Check crankshaft run-out.~~

~~Check tappet clearance.~~

~~Check compression.~~

~~Extract broken stud.~~

~~Install helicoil.~~

~~Perform ground run.~~

~~Establish/check reference RPM.~~

~~Troubleshoot.~~

~~Turbine Engines~~

~~Replace module.~~

~~Replace fan blade.~~

~~Hot section inspection/boroscope check.~~

~~Carry out engine/compressor wash.~~

~~Carry out engine dry cycle.~~

~~Engine ground run.~~

~~Establish reference power.~~

~~Trend monitoring/gas path analysis.~~

~~Troubleshoot.~~

~~Fuel and control, piston~~

~~Replace engine driven pump.~~

~~Adjust AMC.~~

~~Adjust ABC.~~

~~Install carburettor/injector.~~

~~Adjust carburettor/injector.~~

~~Clean injector nozzles.~~

~~Replace primer line.~~

~~Check carburettor float setting.~~

~~Troubleshoot faulty system.~~

~~Fuel and control, turbine~~

~~Replace FCU.~~

~~Replace Engine Electronic Control Unit (FADEC).~~

~~Replace Fuel Metering Unit (FADEC).~~

~~Replace engine driven pump.~~

~~Clean/test fuel nozzles.~~

~~Clean/replace filters.~~

~~Adjust FCU.~~

~~Troubleshoot faulty system.~~

~~Functional test of FADEC.~~

~~Ignition systems, piston~~

~~Change magneto.~~

~~Change ignition vibrator.~~

~~Change plugs.~~

~~Test plugs.~~

~~Check H.T. leads.~~

~~Install new leads.~~

~~Check timing.~~

~~Check system bonding.~~

~~Troubleshoot faulty system.~~

~~Ignition systems, turbine~~

~~Perform functional test of the ignition system.~~

~~Check glow plugs/ignitors.~~

~~Check H.T. leads.~~

~~Check ignition unit.~~

~~Replace ignition unit.~~

~~Troubleshoot faulty system.~~

~~**Engine Controls**~~

~~Rig thrust lever.~~

~~Rig RPM control.~~

~~Rig mixture HP cock lever.~~

~~Rig power lever.~~

~~Check control sync (multi-eng).~~

~~Check controls for correct assembly and locking.~~

~~Check controls for range and direction of movement.~~

~~Adjust pedestal micro-switches.~~

~~Troubleshoot faulty system.~~

~~**Engine Indicating**~~

~~Replace engine instruments(s).~~

~~Replace oil temperature bulb.~~

~~Replace thermocouples.~~

~~Check calibration.~~

~~Troubleshoot faulty system.~~

~~**Exhaust, piston**~~

~~Replace exhaust gasket.~~

~~Inspect welded repair.~~

~~Pressure check cabin heater muff.~~

~~Troubleshoot faulty system.~~

~~**Exhaust, turbine**~~

~~Change jet pipe.~~

~~Change shroud assembly.~~

~~Install trimmers.~~

~~Inspect/replace thrust reverser.~~

~~Replace thrust reverser component.~~

~~Deactivate/reactivate thrust reverser.~~

~~Operational test of the thrust reverser system.~~

~~**Oil**~~

~~Change oil.~~

~~Check filter(s).~~

~~Adjust pressure relief valve.~~

~~Replace oil tank.~~

~~Replace oil pump.~~

~~Replace oil cooler.~~

~~Replace firewall shut off valve.~~

~~Perform oil dilution test.~~

~~Troubleshoot faulty system.~~

~~Starting~~

~~Replace starter.~~

~~Replace start relay.~~

~~Replace start control valve.~~

~~Check cranking speed.~~

~~Troubleshoot faulty system.~~

~~Turbines, piston engines~~

~~Replace PRT.~~

~~Replace turbo-blower.~~

~~Replace heat shields.~~

~~Replace waste gate.~~

~~Adjust density controller.~~

~~Engine water injection~~

~~Replace water/methanol pump.~~

~~Flow check water/methanol system.~~

~~Adjust water/methanol control unit.~~

~~Check fluid for quality.~~

~~Troubleshoot faulty system~~

~~Accessory gear boxes~~

~~Replace gearbox.~~

~~Replace drive shaft.~~

~~Inspect magnetic chip detector.~~

~~APU~~

~~Removal/installation of the APU.~~

~~Removal/installation of the inlet guide-vane actuator.~~

~~Operational test of the APU emergency shut-down test.~~

~~Operational test of the APU.~~

A1: Skills related to the duties and responsibilities of B1 or B2 certifying staff

— Understanding of the importance of professional integrity, behaviour and appropriate attitude towards safety;

— Understanding of the conditions for ensuring the continuing airworthiness of aircraft and components;

— Ability to identify and rectify existing and potential unsafe conditions;

— Ability to prioritise tasks, coordinate with a team and report discrepancies;

— Ability to determine the required qualifications for the performance of maintenance tasks;

— Ability to confirm the proper accomplishment of maintenance tasks;

— Understanding of critical maintenance tasks;

— Ability to compile and control completed work cards;

— Knowledge of safety risks linked to a particular working environment;

— Understanding of human performance and limitations;

— Understanding of the AMO (where the OJT is performed) privileges and limitations;

— Understanding of AMO personnel authorisations and limitations;

— Be familiar with AMO documents/forms (work packages, work orders, work cards, etc.);

— Be familiar with AMO release-to-service procedures: use of the aircraft technical logbook (ATLB), deferral of items and dispatch under MEL/CDL;

— Accomplishment and reporting of ADs, SBs, etc.;

— Access, use and control of the required tools and equipment;

— Access, use and control of the required ICAs (AMM, TSM, SRM, etc.).

A2: Tasks related to aircraft type

The minimum list of tasks should be selected from the table below according to the following procedures and criteria:

(i) Filter the ATA sub-chapters applicable to the specific aircraft type (add aircraft types if there is any missing);

Identify relevant and significant tasks for each required category of INS, FOT, SGH, R/I, MEL and TS.

(ii) Retain the required percentage for each task category.

The selection of tasks should give precedence to tasks which are critical and complex in terms of:

— being difficult to execute;

— interpretation of the maintenance procedures / work instructions;

— specific tools and equipment;

— coordination between maintenance staff (teamwork).

— human factors (accessibility, human–machine interface (HMI), etc.);

— safety impact on the aircraft and the crew.

Removal and installation tasks include the final confirmation test.

Credit may be given for similar tasks between ATA systems (e.g. pneumatic valves in ATA 21, 30, and 36) but this should be kept to a minimum and shall be approved by the assessor.

A task that is unavailable at the time of the OJT can be replaced by a similar task in terms of complexity and shall be approved by the assessor.

Some tasks can be performed on another aircraft type as long as both the system and the task are similar.

ATA Chapters	B1						B2					
	INS	FOT	SGH	R/I	MEL	TS	INS	FOT	SGH	R/I	MEL	TS
Requirements: % of task categories:	75 %	50 %	50 %	50 %	25 %	25 %	75 %	50 %	50 %	50 %	25 %	25 %
Introduction subjects:												
05 Time limits / maintenance checks (see *Note* below)	X	-	-	-	-	-	X	-	-	-	-	-
06 Dimensions/areas	X	-	-	-	-	-	X	-	-	-	-	-
07 Lifting and shoring	X	-	-	-	-	-	X	-	-	-	-	-
08 Levelling and weighing	-	-	X	-	-	-	X	-	X	-	-	-
09 Towing and taxiing	-	-	X	-	-	-	-	-	X	-	-	-
10 Parking/mooring, storing and return to service	-	-	X	-	-	-	-	-	X	-	-	-
11 Placards and markings	X	-	-	-	-	-	X	-	-	-	-	-
12 Servicing	-	-	X	-	-	-	-	-	X	-	-	-
20 Standard practices — only type particular (ATA 50 or 60)	X	-	X	-	-	-	X	-	X	-	-	-
Rotorcraft (only):												
18 Vibration and noise analysis (blade tracking)	-	-	-	-	-	X	-	-	-	-	-	-
62 Rotors												
62-10 Rotor blades	X	-	-	X	-	-	-	-	-	-	-	-
62-20 Rotor head(s)	X	-	-	X	-	-	-	-	-	-	-	-
62-30 Rotor shaft(s) / swashplate assy(ies)	X	-	-	X	-	-	-	-	-	-	-	-
62-40 Indicating	-	X	X	-	X	X	-	-	-	-	-	X
63 Rotor drives												
63-10 Engine/gearbox couplings	X	-	X	X	-	-	-	-	-	-	-	-
63-20 Gearbox(es)	X	-	X	X	-	-	-	-	-	-	-	-

ATA Chapters	B1						B2					
	INS	FOT	SGH	R/I	MEL	TS	INS	FOT	SGH	R/I	MEL	TS
Requirements: % of task categories:	75 %	50 %	50 %	50 %	25 %	25 %	75 %	50 %	50 %	50 %	25 %	25 %
63-30 Mounts, attachments	X	-	X	-	-	-	-	-	-	-	-	-
63-40 Indicating	-	X	-	-	X	X	-	-	-	-	-	X
63-50 Rotor brake	X	-	-	X	-	-	-	-	-	-	-	-
63-60 Drain lines	X	-	-	-	-	-	-	-	-	-	-	-
64 Tail rotor												
64-10 Rotor blades	X	-	X	X	-	-	-	-	-	-	-	-
64-20 Rotor head	X	-	-	X	-	-	-	-	-	-	-	-
64-40 Indicating	-	X	-	X	X	X	-	-	-	-	-	X
65 Tail-rotor drive												
65-10 Shafts	X	-	X	X	-	-	-	-	-	-	-	-
65-20 Gearboxes	X	-	X	X	-	-	-	-	-	-	-	-
65-40 Indicating	-	X	-	-	X	X	-	-	-	-	-	X
66 Folding blades/pylon												
66-10 Rotor blades	X	-	-	X	-	-	-	-	-	-	-	-
66-20 Tail pylon	X	-	-	-	-	-	-	-	-	-	-	-
66-30 Controls and indicating	-	X	-	-	-	X	-	-	-	-	-	X
67 Rotors flight control												
67-10 Rotor	X	-	-	-	-	-	-	-	-	-	-	-
67-20 Antitorque rotor control (yaw control)	X	-	-	-	-	X	-	-	-	-	-	-
67-30 Servocontrol system	X	-	-	-	-	X	-	-	-	-	-	-
Airframe systems:												
21 Air conditioning												
21-10 Compression	-	-	X	X	-	X	-	-	-	-	-	-
21-20 Distribution	-	X	-	X	-	-	-	-	-	-	-	-
21-30 Pressurisation control	-	X	-	X	-	X	-	-	-	-	-	-
21-40 Heating	-	-	-	X	-	-	-	-	-	-	-	-
21-50 Cooling	-	-	-	X	-	-	-	-	-	-	-	-
21-60 Temperature control	-	X	-	X	-	X	-	-	-	-	-	-
22 Autoflight												
22-10 Autopilot	-	-	-	-	-	-	-	X	X	X	X	X
22-20 Speed attitude correction	-	-	-	-	-	-	-	X	-	-	-	X
22-30 Autothrottle	-	X	-	-	-	-	X	X	-	X	-	X
22-40 System monitor	-	-	-	-	-	-	-	X	-	-	-	X

ATA Chapters	B1						B2					
	INS	FOT	SGH	R/I	MEL	TS	INS	FOT	SGH	R/I	MEL	TS
Requirements: % of task categories:	75 %	50 %	50 %	50 %	25 %	25 %	75 %	50 %	50 %	50 %	25 %	25 %
22-50 Aerodynamic load alleviating	-	-	-	-	-	-	-	X	-	-	-	X
23 Communications												
23-10 Speech communications	-	X	-	-	-	-	-	X	-	X	-	X
23-15 SATCOM	-	X	-	-	-	-	X	X	-	X	-	X
23-20 Data transmission and automatic calling	-	X	-	-	-	-	-	X	-	X	-	X
23-30 Passenger address, entertainment and comfort	-	X	-	-	-	-	X	-	-	X	-	X
23-40 Interphone	-	X	-	-	-	-	X	-	-	X	-	X
23-50 Audio integrating	-	X	-	-	-	-	-	X	-	X	-	X
23-60 Static discharging	X	-	-	-	X	-	X	-	-	X	X	X
23-70 Audio and video monitoring	-	X	-	-	-	-	X	X	-	X	-	X
23-80 Integrated automatic tuning	-	-	-	-	-	-	-	X	-	X	-	X
24 Electrical power												
24-10 Generator drive	X	X	X	X	X	X	X	X	-	-	X	X
24-20 AC Generation	-	X	-	-	-	X	X	X	-	-	X	X
24-30 DC generation	-	X	-	X	-	X	X	X	-	X	X	X
24-40 External power	X	-	X	-	-	-	X	X	X	-	X	X
24-50 AC electrical load distribution	-	X	-	-	-	X	X	X	-	-	-	X
24-60 DC Electrical load distribution	-	X	-	-	-	X	X	X	-	-	-	X
25 Equipment and furnishings												
25-10 Flight compartment	X	X	X	X	X	-	X	X	-	-	-	-
25-20 Passenger compartment	X	-	-	X	-	-	-	-	-	-	-	-
25-30 Galley	X	X	-	X	-	-	X	X	-	-	-	-
25-40 Lavatories	X	X	-	-	-	-	X	-	-	-	-	-
25-50 Additional compartments	X	X	-	-	-	-	-	-	-	-	-	-
50-00 Cargo accessory compartment	X	-	-	-	-	-	-	-	-	-	-	-
50-10 Cargo compartments	X	-	-	-	-	-	-	-	-	-	-	-

ATA Chapters	B1						B2					
	INS	FOT	SGH	R/I	MEL	TS	INS	FOT	SGH	R/I	MEL	TS
Requirements: % of task categories:	75 %	50 %	50 %	50 %	25 %	25 %	75 %	50 %	50 %	50 %	25 %	25 %
50-20 Cargo loading systems	X	X	-	-	-	X	-	X	-	-	-	X
50-30 Cargo-related systems	X	-	-	-	-	-	-	-	-	-	-	-
50-50 Accessory	X	-	-	-	-	-	-	-	-	-	-	-
50-60 Insulation	X	-	-	-	-	-	-	-	-	-	-	-
25-60 Emergency	X	X	X	X	-	-	X	X	-	-	-	-
26 Fire protection												
26-10 Detection	-	X	-	X	-	X	-	X	-	-	-	X
26-20 Extinguishing	-	X	X	X	-	-	-	-	-	-	-	-
26-30 Explosion suppression	X	-	-	-	-	-	-	-	-	-	-	-
27 Flight controls												
27-10 Aileron and tab	X	X	-	X	-	X	-	X	-	-	-	-
27-20 Rudder and tab	X	X	-	X	-	X	-	X	-	-	-	-
27-30 Elevator and tab	X	X	-	X	-	X	-	X	-	-	-	-
27-40 Horizontal stabiliser	X	X	-	X	-	X	-	X	-	-	-	-
27-50 Flaps	X	X	-	X	-	X	-	X	-	-	-	-
27-60 Spoiler, drag devices and variable aerodynamic fairings	X	X	-	X	-	X	-	X	-	-	-	-
27-70 Gust lock and dampener	X	X	X	X	-	X	-	X	-	-	-	-
27-80 Lift augmenting	-	X	X	X	-	X	-	X	-	-	-	-
28 Fuel systems												
28-10 Storage	X	-	X	X	X	-	-	-	X	-	-	-
28-20 Distribution	-	-	-	X	-	-	-	X	-	-	-	-
28-30 Dump	X	-	-	-	-	-	-	-	-	-	-	-
28-40 Indicating	-	X	-	-	-	X	X	X	-	-	-	X
47-00 Nitrogen generation system	X	X	X	X	X	X	-	X	-	-	-	-
29 Hydraulic power												
29-10 Main	X	X	X	X	-	-	-	X	-	-	-	-
29-20 Auxiliary	-	X	X	X	-	-	-	X	-	-	-	-
29-30 Indicating	-	X	-	X	-	X	-	X	-	-	-	X
30 Ice and rain protection												
30-10 Aerofoil	X	X	-	X	-	-	-	-	-	-	-	-
30-20 Air intakes	X	X	-	-	-	-	-	-	-	-	-	-
30-30 Pitot and static	X	-	-	X	-	-	X	X	-	-	-	X

ATA Chapters	B1						B2					
	INS	FOT	SGH	R/I	MEL	TS	INS	FOT	SGH	R/I	MEL	TS
Requirements: % of task categories:	75 %	50 %	50 %	50 %	25 %	25 %	75 %	50 %	50 %	50 %	25 %	25 %
30-40 Windows, windshields and doors	-	X	-	X	-	-	-	X	-	-	-	X
30-50 Antennas and radomes	X	-	-	X	-	-	X	X	-	-	-	X
30-60 Propellers/rotors	X	-	-	-	-	-	-	-	-	-	-	-
30-70 Water lines	X	-	-	-	-	-	X	-	-	-	-	-
30-80 Detection	-	X	-	X	-	X	-	X	-	-	-	X
31 Indicating/recording systems												
31-10 Instrument and control panels	-	X	-	X	-	-	-	X	-	X	X	X
31-20 Independent instruments	-	X	-	-	-	-	-	X	-	X	-	X
31-30 Recorders	-	X	-	-	-	-	-	X	X	X	-	-
31-40 Central computers	-	-	-	-	-	-	-	X	-	X	-	X
31-50 Central warning systems	-	X	-	-	-	-	-	X	-	X	X	X
31-60 Central display systems	-	X	-	-	-	-	-	X	-	X	-	X
31-70 Automatic data reporting systems	-	-	-	-	-	-	-	X	X	X	-	X
32 Landing gear												
32-10 Main gear and doors	X	X	X	X	-	-	-	-	-	-	-	-
32-20 Nose gear and doors	X	X	X	X	-	-	-	-	-	-	-	-
32-30 Extension and retraction	X	X	-	X	-	X	-	-	-	-	-	-
32-40 Wheels and brakes	X	-	X	X	-	-	-	-	-	-	-	-
32-50 Steering	X	X	X	X	-	X	-	-	-	-	-	-
32-60 Position indication and warning	-	X	-	X	-	X	X	X	-	X	-	X
32-70 Supplementary gear	X	X	X	X	-	-	-	-	-	-	-	-
33 Lights												
33-10 Flight compartment	X	X	-	X	-	-	X	X	-	X	-	X
33-20 Passenger compartment	X	X	-	X	-	-	X	X	-	X	-	X
33-30 Cargo and service compartments	X	X	-	-	-	-	X	X	-	-	-	X

ATA Chapters	B1						B2					
	INS	FOT	SGH	R/I	MEL	TS	INS	FOT	SGH	R/I	MEL	TS
Requirements: % of task categories:	75 %	50 %	50 %	50 %	25 %	25 %	75 %	50 %	50 %	50 %	25 %	25 %
33-40 Exterior	X	X	-	X	-	-	X	X	-	-	-	X
33-50 Emergency lighting	X	-	-	X	-	-	X	X	-	X	-	X
34 Navigation												
34-10 Flight environment data	-	X	-	-	-	-	-	X	-	-	-	X
34-20 Attitude and direction	-	X	-	-	-	-	-	X	-	X	X	X
34-30 Landing and taxiing aids	-	-	-	-	-	-	-	X	-	X	X	X
34-40 Independent position determining	-	X	-	-	-	-	-	X	-	X	X	X
34-50 Dependent position determining	-	-	-	-	-	-	-	X	-	X	X	X
34-60 Flight management computing	-	X	-	-	-	-	-	X	X	X	X	X
35 Oxygen												
35-10 Crew	X	X	X	X	-	X	-	-	-	-	-	-
35-20 Passengers	X	X	-	X	-	-	-	-	-	-	-	-
35-30 Portable	X	-	-	-	-	-	-	-	-	-	-	-
36 Pneumatic												
36-10 Distribution	X	X	-	X	-	X	-	X	-	-	-	-
36-20 Indicating	-	X	-	X	-	X	X	X	-	-	-	X
37 Vacuum												
37-10 Distribution	-	X	-	X	-	X	-	-	-	-	-	-
37-20 Indicating	-	X	-	X	-	X	-	X	-	-	-	X
38 Water/waste												
38-10 Potable	-	X	X	X	-	-	-	X	-	-	-	-
38-20 Wash	-	-	-	-	-	-	-	-	-	-	-	-
38-30 Waste disposal	-	X	X	X	-	-	-	X	-	-	-	-
38-40 Air supply	X	X	-	-	-	-	-	-	-	-	-	-
41 Water ballast												
41-10 Storage	X	-	-	-	-	-	-	-	-	-	-	-
41-20 Dump	X	-	-	-	-	-	-	-	-	-	-	-
41-30 Indication	X	-	-	-	-	-	-	-	-	-	-	X
42 Integrated modular avionics	-	X	-	-	-	-	X	X	X	X	X	X
44 Cabin systems												
44-20 In-flight entertainment system	-	X	-	-	-	-	-	X	-	X	X	X
44-30 External communication system	-	X	-	-	-	-	-	X	-	X	X	X

ATA Chapters	B1						B2					
	INS	FOT	SGH	R/I	MEL	TS	INS	FOT	SGH	R/I	MEL	TS
Requirements: % of task categories:	75 %	50 %	50 %	50 %	25 %	25 %	75 %	50 %	50 %	50 %	25 %	25 %
44-40 Cabin mass memory system	-	-	-	-	-	-	-	X	-	X	X	X
44-50 Cabin monitoring system	-	-	-	-	-	-	-	X	-	X	X	X
44-60 Miscellaneous cabin system	-	-	-	-	-	-	-	X	-	X	X	X
45 On-board maintenance system	-	X	-	-	-	-	-	X	-	X	X	X
46 Information Systems												
46-10 Aeroplane general information systems	-	-	-	-	-	-	-	X	-	X	X	X
46-20 Flight deck information systems	-	X	-	-	-	-	-	X	-	X	X	X
46-30 Maintenance information systems	-	X	-	-	-	-	-	X	-	X	X	X
46-40 Passenger cabin information systems	-	X	-	-	-	-	-	X	-	X	X	X
46-50 Miscellaneous information systems	-	-	-	-	-	-	-	X	-	X	X	X
Airframe structures:												
52 Doors												
52-10 Passenger/crew	X	-	X	X	X	-	-	-	-	-	-	-
52-20 Emergency exits	X	-	X	X	X	-	-	-	-	-	-	-
52-30 Cargo	X	-	-	-	-	-	-	-	-	-	-	-
52-40 Service and miscellaneous	X	-	-	-	-	-	-	-	-	-	-	-
52-50 Fixed interior	X	-	-	-	-	-	-	-	-	-	-	-
52-60 Entrance stairs	X	-	-	-	-	-	-	-	-	-	-	-
52-70 Monitoring and operation	-	X	-	-	-	-	X	X	-	-	-	X
52-80 Landing gear	X	-	X	-	-	-	-	-	-	-	-	-
53 Fuselage	X	-	-	-	-	X	-	-	-	-	-	-
54 Nacelles/pylons	X	-	-	-	-	-	-	-	-	-	-	-
55 Stabilisers	X	-	-	-	-	-	-	-	-	-	-	-
56 Windows	X	-	-	-	-	X	-	-	-	-	-	-
57 Wings	X	-	-	-	-	-	-	-	-	-	-	-
Auxiliary power units (APUs):												
49-10 Power plant	X	X	-	X	X	X	-	X	-	-	-	-
49-20 Engine	X	X	-	X	-	-	-	-	-	-	-	-
49-30 Engine fuel and control	-	X	-	X	-	-	-	-	-	-	-	-

ATA Chapters	B1						B2					
	INS	FOT	SGH	R/I	MEL	TS	INS	FOT	SGH	R/I	MEL	TS
Requirements: % of task categories:	75 %	50 %	50 %	50 %	25 %	25 %	75 %	50 %	50 %	50 %	25 %	25 %
49-40 Ignition/starting	-	X	-	-	-	-	X	-	-	-	-	X
49-50 Air	X	-	-	-	-	-	-	-	-	-	-	-
49-60 Engine controls	-	-	-	X	-	-	-	-	-	-	-	-
49-70 Indicating	-	X	-	-	-	-	-	-	-	-	-	-
49-80 Exhaust	X	-	-	-	-	-	-	-	-	-	-	-
49-90 Oil	-	-	X	-	-	-	-	-	-	-	-	-
Turbine engines:												
70 Standard practices and engine performance	X	-	-	-	-	X	-	-	-	-	-	-
71 Power plant	X	-	X	-	-	-	-	-	-	-	-	-
71-10 Cowling	X	-	X	X			-	-	-	-	-	-
71-20 Mounts	X	-	-	-	-	-	-	-	-	-	-	-
71-30 Fire seals	X	-	-	-	-	-	-	-	-	-	-	-
71-40 Attach fittings	X	-	-	-	-	-	-	-	-	-	-	-
71-50 Electrical harness	X	X	-	X	-	-	X	-	-	-	-	X
71-60 Air intakes	X	-	-		-	-	-	-	-	-	-	-
72T Engine turbine / turboprop / ducted fan / unducted fan	X	-	X	X	-	-	-	-	-	-	-	-
73 Engine fuel and control												
73-10 Distribution	X	-	-	-	-	-	-	-	-	-	-	-
73-20 Controlling (FADEC)	X	X	-	X	X	X	-	X	-	-	-	X
73-30 Indicating	X	X	-	-	X	-	-	X	-	-	-	X
74 Ignition												
74-10 Electrical power	X	X	-	X	-	X	X	X	-	-	-	X
74-20 Distribution	X	X	-	-	-	-	X	X	-	-	-	X
74-30 Switching	X	X	-	X	-	-	X	X	-	-	-	X
75 Air												
75-10 Engine anti-icing	X	X	-	X	X	X	-	-	-	-	-	-
75-20 Cooling	X	-	-	-	-	-	-	-	-	-	-	-
75-30 Compressor control	-	X	-	-	-	-	-	-	-	-	-	-
75-40 Indicating	-	X	-	-	-	-	-	X	-	-	-	X
76 Engine controls												
76-10 Power control (FADEC)	-	X	-	X	X	-	-	X	-	-	-	X

ATA Chapters	B1						B2					
	INS	FOT	SGH	R/I	MEL	TS	INS	FOT	SGH	R/I	MEL	TS
Requirements: % of task categories:	75 %	50 %	50 %	50 %	25 %	25 %	75 %	50 %	50 %	50 %	25 %	25 %
76-20 Emergency shutdown	-	-	-	-	X	-	-	-	-	-	-	-
77 Engine indicating	-	X	-	-	X	X	X	X	-	-	X	X
78 Exhaust												
78-30 Thrust reverser	X	-	-	X	X	X	-	X	-	-	-	X
79 Oil	X	-	X	X	-	-	-	-	-	-	-	-
80 Starting	X	X	-	X	X	X	-	-	-	-	-	-
83 Accessory gearboxes	X	-	X	X	-	-	-	-	-	-	-	-
Piston engines:												
70 Standard practices and engine performance	X	-	-	-	-	X	-	-	-	-	-	-
71 Power plant	X	-	X	-	-	-	-	-	-	-	-	-
71-10 Cowling	X	-	X	X			-	-	-	-	-	-
71-20 Mounts	X	-	-	-	-	-	-	-	-	-	-	-
71-30 Fire seals	X	-	-	-	-	-	-	-	-	-	-	-
71-40 Attach fittings	X	-	-	-	-	-	-	-	-	-	-	-
71-50 Electrical harness	X	X	-	X	-	-	X	-	-	-	-	X
71-60 Air intakes	X	-	-		-	-	-	-	-	-	-	-
72R Engine — reciprocating	X	-	X	X	-	-	-	-	-	-	-	-
73 Engine fuel and control	X	X	-	X	X	X	-	-	-	-	-	-
73-10 Distribution	X	-	-	-	-	-	-	-	-	-	-	-
73-20 Controlling (FADEC)	X	X	-	X	X	X	-	X	-	-	-	X
73-30 Indicating	X	X	-	-	X	-	X	X	-	-	-	X
74 Ignition												
74-10 Electrical power	X	X	-	X	-	X	X	X	-	-	-	X
74-20 Distribution	X	X	-	-	-	-	X	X	-	-	-	X
74-30 Switching	X	X	-	X	-	-	X	X	-	-	-	X
76 Engine controls	X	X	-	X	-	X	-	X	-	-	-	X
77 Engine indicating	-	X	-	-	X	X	X	X	-	-	X	X
78 Exhaust	X	-	-	-	-	-	-	-	-	-	-	-
79 Oil	X	-	X	X	-	-	-	-	-	-	-	-
80 Starting	X	X	-	X	X	X	-	-	-	-	-	-
81 Turbines (reciprocating engine)	X	X	X	X	-	-	-	-	-	-	-	-
83 Accessory gearboxes	X	-	X	X	-	-	-	-	-	-	-	-
Propellers:												

ATA Chapters	B1						B2					
	INS	FOT	SGH	R/I	MEL	TS	INS	FOT	SGH	R/I	MEL	TS
Requirements: % of task categories:	75 %	50 %	50 %	50 %	25 %	25 %	75 %	50 %	50 %	50 %	25 %	25 %
61 Propellers/ propulsion												
61-10 Propeller Assembly	X	-	X	X	-	-	-	-	-	-	-	-
61-20 Controlling	-	-	-	X	X	-	-	-	-	-	-	-
61-30 Braking	X	-	-	-	-	-	-	-	-	-	-	-
61-40 Indicating	-	X	-	-	X	X	-	X	-	-	-	X
61-50 Propulsor duct	X	-	-	-	-	-	-	-	-	-	-	-
61B Propeller pitch control	-	X	-	X	X	X	-	-	-	-	-	-
61C Propeller synchronising	-	X	-	-	-	X	-	X	-	-	-	X
61D Propeller electronic control	-	X	X	X	X	X	-	X	-	-	-	X
61E Propeller ice protection	X	X	-	-	X	X	-	-	-	-	-	-

Note: Select at least one from category (a), two from category (b), and three from category (c):

(a) Perform and/or assist in performing a scheduled maintenance check:

- accomplishment of 100-hour check (general aviation (GA) aircraft);
- accomplishment of a 'daily' or 'weekly' or 'service' or 'transit' or equivalent check;
- active participation in a scheduled check, e.g.: 'A-Check' or 'B-Check' or 'C-Check' or equivalent of a base maintenance check.

(b) Review the aircraft maintenance log for correct completion:

- closure of MEL/CDL items;
- dent and buckle chart review, including inspections on fuselage and skin damages assessment in accordance with the SRM;
- fuel or oil leakage tests.

(c) Perform unscheduled inspection following:

- hard landing;
- overweight taxiing;
- bird/hail strike;
- aborted take-off;
- high-energy stop;
- wheel-bearing failure;
- exceedance of max NLG steering angle;
- landing gear shimmy/vibrations;
- lightning strike / HIRF;
- tail strike;
- winglet strike;

— severe turbulence / extreme high winds;
— airframe vibrations;
— ice/snow conditions;
— flight control overspeed down;
— hot-air duct rupture;
— relief pressure panels open;
— mercury spillage;
— galley spill;
— hydraulic fluid reaction with titanium;
— cabin overpressure;
— exceedance of fuel imbalance;
— smoke/fumes in the cabin;
— abnormal doors operations;
— ferry flight maintenance;
— others.

[…]

C. SPECIFIC TASKS FOR BALLOONS AND AIRSHIPS

Tasks	Balloon	Balloon	Airship	
	Hot-air	Gas (free/tethered)	Hot-air	Gas
General activities:				
Functionality test of aircraft (*)	x	x	x	x
Placards check or replacement	x	x	x	x
Documentation annual inspection, repair, ADs, equipment (*)	x	x	x	x
Classification repair (*)	x	x	x	x
Weighing:				
Weighing and weighing report (*)	x	x	x	x
Servicing:				
Lubrication of controls when applicable		x	x	x
Cleaning of envelope, basket, burner	x	x	x	x
Inspections:				
Eight annual inspections (covering at least ~~3~~ three different types) (*)	x			
Five annual inspections (covering at least ~~2~~ two different types) (*)		x		
Three annual inspections (covering at least ~~2~~ two different types) (*)		x	x	
Two annual inspections (*)				x
Strength test of envelope fabric (*)	x	x	x	x
Flight control systems — Removal — Inspection — Reinstallation				
Control surface cable				x
Trim system				x
Safeguarding of pins, screws, castellated nuts (*)		x	x	x
Stick and pedals				x
Hydromechanical control systems		x		x
Ballonet control systems (*)		x	x	x
Electrical control systems		x		x
Valves (gas valve, turning vent, parachute or rip panel) (*)	x	x	x	x
Control and shroud lines and pulleys	x	x	x	x
Elevator — stabiliser (including balancing if applicable)				x
Rudder (including balancing if applicable)				x
Drag rope		x		
Electrical system:				
Removal — installation of electrical wires		x	x	x
Removal — installation of electrical components		x	x	x
Servicing of batteries	x	x	x	x
Communication system — Transponder:				
Removal — installation of COM	x	x	x	x

Tasks	Balloon	Balloon	Airship	
	Hot-air	Gas (free/tethered)	Hot-air	Gas
Removal — installation of NAV				x
Removal — installation of XPDR	x	x	x	x
Installation of antenna	x	x	x	x
Replacement of antenna cable	x	x	x	x
Cabin — Equipment:				
Pitot / static systems — tubes removal — installation — replacement				x
Flight instruments removal — installation — replacement	x	x	x	x
Installation of an approved system	x	x	x	x
Magnetic compass installation — compensation				x
Fire extinguisher	x		x	x
Ballast — Replacement of:				
Water ballast (when applicable)				x
Sand/shot ballast (when applicable)		x		x
Valves — inspection and rigging of valves				x
Envelope:				
Inspection and repair of envelope panels/ gores/seams	x	x	x	x
Inspection and repair of load tapes and attachment points	x	x	x	x
Inspection and repair of deflation system	x	x	x	
Inspection and repair of net		x		
Inspection and repair of mooring system		x		
Electrostatic conductivity test (if type is approved for hydrogen) (*)		x		x
Ballonet inspection and repair		x		x
Inspection and fabrication of a suspension cable or rope	x	x	x	x
Inspection and fabrication of a catena			x	x
Load ring/frame:				
Crack detection (welded and machined parts) (*)	x	x	x	
Heater system:				
Removal, inspection and reinstallation	x		x	
Inspection and cleaning of vaporis~~z~~er and filter (*)	x		x	
Inspection and replacement of hoses (*)	x		x	
Inspection and replacement of pilot flame ignition unit (*)	x		x	
Sealing of fittings (*)	x		x	
Pressure and leak test (*)	x		x	
Disassembly and assembly of fuel cell (*)	x		x	
10-year inspection of fuel cell	x		x	
Basket/gondola:				

Tasks	Balloon	Balloon	Airship	
	Hot-air	Gas (free/tethered)	Hot-air	Gas
Removal, inspection and reinstallation (as applicable)	x	x	x	x
Inspection and fabrication of a suspension cable or rope (*)	x	x		
Removal — installation of padding	x	x		
Removal — installation of belts — safety harness			x	x
Removal — installation of essential elements of the cabin	x	x	x	x
Inspection and fabrication of a basket wire	x	x		
Inspection of operational equipment and its fixation points	x	x	x	x
Crack detection and repair (welded parts and frames)	x	x	x	x
Landing gear:				
Removal, inspection and reinstallation of wheels		x	x	x
Removal, inspection and reinstallation of brakes				x
Removal, inspection and reinstallation of shock absorber				x
Fuel — Engine — Propeller — Engine instrument~~s~~ systems:				
Refer to tasks in blocks for aeroplanes			x	x
Wood structure:				
Structure repair	x	x		
Protective coating				
Composite structure:				
Laminate repair		x		x
Sandwich structure repair		x		x
Metallic structures:				
Crack detection (welded and machined parts)	x	x	x	x
Riveting jobs			x	x
Bonding of structures		x	x	x
Anti-corrosion treatment		x	x	x
Repair of fairings		x		x
Engine:				
Tasks for aeroplanes of comparable certification level			x	x
Exhaust system:				
Tasks for aeroplanes of comparable certification level			x	x
Propeller:				
Tasks for aeroplanes of comparable certification level			x	x
Fuel system:				
Tasks for aeroplanes of comparable certification level			x	x

Tasks	Balloon	Balloon	Airship	
	Hot-air	Gas (free/tethered)	Hot-air	Gas
Hydraulic system:				
Tasks for aeroplanes of comparable certification level			x	x
Pneumatic system:				
Tasks for aeroplanes of comparable certification level			x	x
Winch system:				
Witness winch inspection		x		

[…]

ANNEX IV (PART-147)

[…]

147.A.100 Facility requirements

[…]

(b) ~~Fully enclosed appropriate accommodation separate from other facilities shall be provided for the instruction of theory and the conduct of knowledge examinations.~~

~~1. The maximum number of students undergoing knowledge training during any training course shall not exceed 28.~~

~~2. The size of accommodation for examination purposes shall be such that no student can read the paperwork or computer screen of any other student from his/her position during examinations.~~

Fully enclosed, appropriate accommodation, separate from other facilities, shall be provided for the delivery of the theoretical training and the conduct of knowledge examinations.

[…]

(j) By way of derogation from paragraphs (a) through (d) and (f), in the case of distance learning performed at a location where the Part-147 organisation has no control over the environment where the student is located, the Part-147 organisation shall brief the student and raise their awareness regarding the suitability of their learning location. This derogation applies only to distance learning and not to the corresponding examination and/or assessment.

[…]

AMC 147.A.100(i) Facility requirements

For approved basic maintenance training courses

1. ~~For approved basic maintenance training courses this~~It means holding and ensuring reasonable access to copies of all relevant ~~Parts~~ EU regulations and the Member States' national aviation legislation, examples of typical aircraft maintenance manuals and service bulletins, Airworthiness Directives, aircraft and component records, release documentation, procedures manuals and aircraft maintenance programmes.
2. Except for the relevant ~~Parts~~ EU regulations and the Member States' national aviation regulations, the remainder of the documentation should represent typical examples for both large and small aircraft and cover both aeroplanes and helicopters as appropriate. Avionic documentation should cover a representative range of available equipment. All documentation should be reviewed and updated on a regular basis.

[…]

GM 147.A.100(i) Facility requirements

Where the organisation has an existing library of regulations, manuals and documentation required by another EU regulation ~~Part~~, it is not necessary to duplicate such a facility subject to student access being under controlled supervision.

147.A.105 Personnel requirements

(c) ~~The maintenance training organisation shall contract sufficient staff to plan/perform knowledge and practical training, conduct knowledge examinations and practical assessments in accordance with the approval.~~

The maintenance training organisation shall contract with sufficient staff to plan/perform theoretical and practical training, conduct knowledge examinations and practical assessments in accordance with the approval.

[…]

AMC 147.A.105 Personnel requirements

1. ~~The larger~~Any maintenance training organisation (~~an organisation~~ with the capacity to train, examine and/or assess ~~provide training for~~ 50 students or more at the same time) should appoint a training manager with the responsibility of managing the training organisation on a day-to-day basis. Such person could also be the accountable manager. In addition, the organisation should appoint a quality manager with the responsibility of managing the quality system as specified in point~~paragraph~~ 147.A.130(b) and an examination manager with the responsibility of managing the relevant Part-147 Subpart C or Subpart D examination system. Such person(s) may also be an instructor and/or examiner.
2. ~~The smaller~~Any maintenance training organisation (~~an organisation~~ with the capacity to ~~provide training for~~ train, examine and/or assess less than 50 students at the same time) may combine any or all of the ~~sub-paragraph~~subparagraph (1) positions subject to the competent authority verifying and being satisfied that all functions can be properly carried out in combination.

[…]

AMC 147.A.105(f) Personnel requirements

[…]

The instructors should be trained in the subject they deliver, including the appropriate training methods and tools, as applicable.

GM ~~to~~ 147.A.105(f) Personnel requirements

~~It is recommended that potential instructors be trained in instructional techniques.~~

The instructor that uses new training technologies (e.g. e-tutor, tele-tutor, tele-trainer) should be trained in using these technologies, as well as in the coaching, guiding and assisting of e-learning students. It is important that the instructor understands the electronically based distance-learning process, has the competence to remotely evaluate the learning behaviour of e-learning students and is able to proactively support their learning process.

The following structure provides an example of such an instructor training, as applicable:

— Changes and tendencies of today's training;

— Fundamentals of methodology and didactics;

— Basics and theory of e-learning and tele-tutoring;

— Communication in virtual environments;

— The changed role of students and instructors;

— Competence profile of a tele-tutor;

— Practical guide to support learning processes;

— Assessment of students' performance;

— The learning management system.

[…]

147.A.115 Instructional equipment

(a) Each classroom shall have appropriate presentation equipment of a standard that ensures students can easily read presentation text/drawings/diagrams and figures from any position in the classroom.

~~Presentation equipment shall include representative synthetic training devices to assist students in their understanding of the particular subject matter where such devices are considered beneficial for such purposes.~~

For virtual training environments, the training content shall be designed in such a way to assist students in their understanding of the particular subject matter, ensuring that students can easily read presentation text/drawings/diagrams and figures.

The presentation equipment may include representative maintenance simulation training devices (MSTDs) to assist students in their understanding of the particular subject matter where such devices are considered beneficial for such purposes.

[...]

(d) ~~The aircraft type training organisation as specified in point 147.A.100(e) must have access to the appropriate aircraft type. Synthetic training devices may be used when such synthetic training devices ensure adequate training standards.~~

The aircraft type training organisation as specified in 147.A.100(e) must have access to the appropriate aircraft type. MSTDs may be used when such training devices ensure adequate training standards.

AMC 147.A.115(a) Instructional equipment

If the Part-147 organisation transfers knowledge through a virtually controlled environment (e.g. distance learning, computer-based training (CBT) or multimedia-based training (MBT)), the organisation should ensure that:

— the computer system requirements are made known to the end user;

— the students' activities are traceable, documented and recorded; and

— the computer system requirements of any third-party provider are covered by a written agreement concluded between the two parties and includes the terms of delivery, data security and data integrity.

GM to 147.A.115(a);(d) Instructional equipment

~~1. Synthetic training devices are working models of a particular system or component and include computer simulations.~~

~~2. A synthetic training device is considered beneficial for complex systems and fault diagnostic purposes.~~

1. Refer to the GM to Section 3 of Appendix III to Part-66 for the description, and to point 7 of the AMC to Section 1 of Appendix III to Part-66 for the definitions.

2. It is acknowledged that situations could exist where the size and complexity of such MSTDs and/or MTDs may require a dedicated infrastructure. Such instances should be acceptable provided that student access to and use of the respective MSTDs/MTDs is appropriately ensured.

[…]

147.A.120 Maintenance training material

[…]

(c) Access to the maintenance training material relevant to basic or type-training courses can be provided in any medium (hard copy or electronic) provided the student has the appropriate means to access such material at any given time during the entire duration of the course.

[…]

AMC 147.A.130(a) Training procedures and quality system

[…]

Table 1 lists existing training tools that may be selected for ~~basic~~ the training.

[…]

Table 2 lists existing training methods that may be selected for ~~basic~~ the training.

[…]

Table 3 Combination of training methods and tools, and their use

[…]	[…]	[…]	[…]	[…]	[…]	[…]	[…]	[…]
[…]								
(1) Limited suitability. It means that the respective training method may be used but with limited results, thus requiring the support of a complementary training method to fulfil the learning objectives. NOTE: Instructor (human) involvement should be considered in Basic Knowledge Module~~s~~ 9~~A/9B~~.								

[…]

147.A.135 Examinations

[…]

(d) The examination shall be performed in a controlled environment by a Part-147 training organisation and described in its maintenance training organisation exposition (MTOE).

For examination purposes, a 'controlled environment' shall be that for which the following can be established and verified: the identity of the students, the proper conduct of the examination process, the integrity of the examination, and the security of the examination material.

[…]

147.A.145 Privileges of the maintenance training organisation

[…]

(b) ~~Training, knowledge examinations and practical assessments may only be carried out at the locations identified in the approval certificate and/or at any location specified in the maintenance training organisation exposition.~~

Theoretical training, knowledge examinations, practical training and practical assessments may be carried out only at the locations identified in the approval certificate and/or at any location specified in the maintenance training organisation exposition (MTOE).

[…]

AMC 147.A.145(c) Distance learning via uniform resource locator (URL) addresses

Distance training may also be delivered via uniform resource locator (URL) addresses. When delivering distance training, the learning location is the responsibility of the student and need not be controlled by the training organisation. Refer to 147.A.100(j).

Knowledge examinations may also be conducted by accessing the examination questions via uniform resource locator (URL) addresses, provided the knowledge examination environment is under the control of the maintenance training organisation.

[…]

147.A.200 Approved basic training course

[…]

(g) Notwithstanding point (f), in order to benefit from changes in training technologies and methods (theoretical training), the number of hours as established in Appendix I (Basic training course duration) may be amended provided the syllabus content and schedule describe and justify the proposed changes. A procedure shall be included in the maintenance training organisation exposition (MTOE) to justify these changes.

(gh) The duration of the conversion courses between (sub)categories shall be determined through an assessment of the basic training syllabus and the related practical training needs.

[…]

AMC 147.A.200(f) Approved basic training course

1. […]

2. ~~The minimum participation time for the trainee to meet the objectives of the course should not be less than 90 % of the tuition hours. Additional training may be provided by the training organisation in order to meet the minimum participation time. If the minimum participation defined for the course is not met, a certificate of recognition should not be issued.~~

   The minimum participation criteria for the trainee in order to meet the objectives of the basic training course should not be less than 90 % of the tuition hours or 95 % completion of the content for student-centred methods in a theoretical training course. Additional training may be provided by the training organisation for the trainee to meet the minimum participation criteria. If the minimum participation that is defined for the basic training course is not met, a certificate of recognition (CoR) should not be issued.

[…]

AMC 147.A.300 Aircraft type / task training

[…]

5. For task training, MBT methods may be used.

[…]

AMC 147.B.10(b) Competent authority

[…]

3. […]

   3.2. knowledge of maintenance training standards, including training methods and technologies.

[…]

APPENDICES TO ANNEX IV (PART-147)

[…]

Appendix III — Certificates of Recognition (CoR) referred to in Annex IV (Part-14) — EASA Forms 148 and 149

1. Basic Training/Examination

[…]

EASA Form 148a shall be used for training and examinations conducted by a Part-147 training organisation.

EASA Form 148b shall be used for examinations conducted by the competent authority.

Page 1 of 1

CERTIFICATE OF RECOGNITION

Reference: [MEMBER STATE CODE (*)].147.[XXXX].[YYYYY]

This~~The~~ certificate of recognition is issued to:

[NAME]

[DATE and PLACE OF BIRTH]

By:

[COMPANY NAME AND ADDRESS]

Reference: [MEMBER STATE CODE (*)].147.[XXXX]

a maintenance training organisation approved to provide training and conduct examinations within its approval schedule and in accordance with Annex IV (Part-147) to~~of~~ Commission Regulation (EU) No 1321/2014.

This certificate attests~~confirms~~ that the above-named person has ~~either~~ successfully passed the approved basic training course (**) /~~or~~ the basic examination (**) stated below in compliance with Regulation (EU)~~(EC) No~~ 2018/1139 of the European Parliament and of the Council and with~~to~~ Commission Regulation (EU) No 1321/2014 currently~~for the time being~~ in force.

[BASIC TRAINING COURSE (**)] ~~or~~/~~and~~ [BASIC EXAMINATION (**)]

[LIST OF PART-66 MODULES / ~~DATE OF~~ EXAMINATION PASSED ON]

Date: .....

Signed: .....

For: [COMPANY NAME]

EASA Form 148a Issue 4

(*) Or 'EASA', if EASA is the competent authority.
(**) Delete as appropriate.

Page 1 of 1

CERTIFICATE OF RECOGNITION

Reference: [MEMBER STATE CODE]

This certificate of recognition is issued to:

[NAME]

[DATE and PLACE OF BIRTH]

By:

[COMPETENT AUTHORITY NAME]

[COMPETENT AUTHORITY ADDRESS]

eligible to conduct examinations in accordance with Subpart C of Annex III (Part-66) to Commission Regulation (EU) No 1321/2014.

This certificate attests that the above-named person has successfully passed the basic examination stated below in compliance with Regulation (EU) 2018/1139 of the European Parliament and of the Council and with Commission Regulation (EU) No 1321/2014 currently in force.

[BASIC EXAMINATION]

[LIST OF PART-66 MODULES / ~~DATE OF~~ EXAMINATION PASSED ON]

Date: ……..

Signed: ……..

For: [COMPETENT AUTHORITY NAME]

EASA Form 148b Issue 1

2. Type Training/Examination (Appendix III to Part-147)

[...]

EASA Form 149a shall be used for training and examinations conducted by a Part-147 training organisation.

EASA Form 149b shall be used for examinations conducted by the competent authority.

EASA Form 149c shall be used for the recognition of completion of aircraft type-rating training approved through the direct approval procedure of point 66.B.130.

Page 1 of 1

CERTIFICATE OF RECOGNITION

Reference: [MEMBER STATE CODE (*)].147.[XXXX].[YYYYY]

This~~The~~ certificate of recognition is issued to:

[NAME]

[DATE and PLACE OF BIRTH]

By:

[COMPANY NAME AND ADDRESS]

Reference: [MEMBER STATE CODE (*)].147.[XXXX]

a maintenance training organisation approved to provide training and conduct examinations within its approval schedule and in accordance with Annex IV (Part-147) to~~of~~ Commission Regulation (EU) No 1321/2014.

This certificate attests~~confirms~~ that the above-named person has ~~either~~ successfully passed the theoretical (**) ~~and~~/~~or~~ the practical elements (**) of the approved aircraft type training course stated below and the related examinations in compliance with Regulation (EU)~~(EC) No~~ 2018/1139 of the European Parliament and of the Council and with~~to~~ Commission Regulation (EU) No 1321/2014 currently~~for the time being~~ in force.

[AIRCRAFT TYPE TRAINING COURSE (**)]

[START and END DATES]

[SPECIFY THE THEORETICAL ~~ELEMENTS AND~~/~~OR~~ PRACTICAL ELEMENTS]
or
[AIRCRAFT TYPE EXAMINATION (**)]

[END DATE]

Date: .....

Signed: .....

For: [COMPANY NAME]

EASA Form 149a Issue 5

(*) Or 'EASA', if EASA is the competent authority.
(**) Delete as appropriate.

Page 1 of 1

CERTIFICATE OF RECOGNITION

Reference: [MEMBER STATE CODE]

This certificate of recognition is issued to:

[NAME]

[DATE and PLACE OF BIRTH]

By:

[COMPETENT AUTHORITY NAME]

[COMPETENT AUTHORITY ADDRESS]

eligible to conduct examinations in accordance with Subpart C of Annex III (Part-66) to Commission Regulation (EU) No 1321/2014.

This certificate attests that the above-named person has successfully passed the theoretical/practical elements (*) of the approved type training course stated below and the related examinations in compliance with Regulation (EU) 2018/1139 of the European Parliament and of the Council and with Commission Regulation (EU) No 1321/2014 currently in force.

[SPECIFY THE THEORETICAL ELEMENTS AND/OR THE PRACTICAL ELEMENTS]

or

[AIRCRAFT TYPE EXAMINATION (*)]

[END DATE]

Date: .....

Signed: .....

For: [COMPETENT AUTHORITY NAME]

EASA Form 149b Issue 1

(*) Delete as appropriate.

Page 1 of 1

CERTIFICATE OF RECOGNITION

[Reference code of the organisation]

This certificate of recognition is issued to:

[FULL NAME]

[DATE and PLACE OF BIRTH]

By:

[COMPANY NAME]

[COMPANY ADDRESS]

Reference: [MEMBER STATE CODE]

an organisation approved to provide type training and conduct the related examinations according to the procedure for the direct approval of aircraft type training of point 66.B.130 of Annex III (Part-66) to Commission Regulation (EU) No 1321/2014.

This certificate attests that the above-named person has successfully passed the theoretical/practical elements (*) of the approved aircraft type training course stated below and the related examinations in compliance with Regulation (EU) 2018/1139 of the European Parliament and of the Council and with Commission Regulation (EU) No 1321/2014 currently in force.

[AIRCRAFT TYPE TRAINING COURSE (*)]

[START and END DATES]

[SPECIFY THE THEORETICAL/PRACTICAL ELEMENTS]

or

[AIRCRAFT TYPE EXAMINATION (*)]

[END DATE]

Date: ……..

Signed: ……..

For: [COMPANY NAME]

EASA Form 149c Issue 1

(*) Delete as appropriate.

4. Proposed actions to support implementation

— Focused communication for Advisory Body meeting(s) (MAB/SAB/TeB/TEC/COM)

(Advisory Body members)

— Dedicated thematic workshop/session

(Primarily targeted audience: industry, competent authorities)

5. References

5.1. Related regulation

— Commission Regulation (EU) No 1321/2014 of 26 November 2014 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organisations and personnel involved in these tasks (OJ L 362, 17.12.2014, p. 1)

5.2. Related decision

— Executive Director Decision 2020/002/R of 13 March 2020 amending the Acceptable Means of Compliance and Guidance Material to Annex I (Part-M), Annex II (Part-145), Annex III (Part-66), Annex IV (Part-147) and Annex Va (Part-T) to as well as to the articles of Commission Regulation (EU) No 1321/2014, and issuing Acceptable Means of Compliance and Guidance Material to Annex Vb (Part-ML), Annex Vc (Part-CAMO) and Annex Vd (Part-CAO) to that Regulation

'AMC & GM to Annex I (Part-M) to Commission Regulation (EU) No 1321/2014 "Issue 2 — Amendment 3"
AMC & GM to Annex II (Part-145) to Commission Regulation (EU) No 1321/2014 "Issue 2 — Amendment 3"
AMC & GM to Annex III (Part-66) to Commission Regulation (EU) No 1321/2014 "Issue 2 — Amendment 5"
AMC & GM to Annex IV (Part-147) to Commission Regulation (EU) No 1321/2014 "Issue 2 — Amendment 2"
AMC & GM to Annex Va (Part-T) to Commission Regulation (EU) No 1321/2014 "Issue 1 — Amendment 2"
AMC & GM to the articles of Commission Regulation (EU) No 1321/2014 "Issue 1 — Amendment 1"
AMC & GM to Annex Vb (Part-ML) to Commission Regulation (EU) No 1321/2014 "Issue 1"
AMC & GM to Annex Vc (Part-CAMO) to Commission Regulation (EU) No 1321/2014 "Issue 1"
AMC & GM to Annex Vd (Part-CAO) to Commission Regulation (EU) No 1321/2014 "Issue 1"'

5.3. Other reference documents

n/a

6. Quality of the document

If you are not satisfied with the quality of this document, please indicate the areas which you believe could be improved, and provide a short justification/explanation:

— the technical **quality** of the draft proposed rules and/or regulations and/or the draft proposed amendments to them;

— the clarity and readability of the text;

— the quality of the impact assessment (IA);

— application of the 'better regulation' principles[10]; and/or

— others (please specify).

Note: Your replies and/or comments in reply to this section will be considered for internal quality assurance and management purposes only and will not be published in the related CRD.

[10] For guidance, please refer to the following:
https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox_en
https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how_en
https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox/better-regulation-toolbox_en