Maldives Civil Aviation Authority
Republic of Maldives

Maldivian Civil Aviation Regulations

MCAR-66 Aircraft Maintenance Licensing

Issue 2, Amendment 0, 15 April 2015

Foreword

Maldives Civil Aviation Authority, in exercise of the powers conferred on it under Articles 5 and 6 of the Maldives Civil Aviation Act 2/2012 has adopted this Regulation.

This Regulation shall be cited as MCAR-66 Aircraft Maintenance Licencing and shall come in to force on 15 April 2015.

Existing aviation requirements in the field of airworthiness as listed in MCAR-66 Aircraft Maintenance Licencing dated 25 May 2009 will be repealed as from 15 April 2015.

Definitions of the terms and abbreviations used in this regulation, unless the context requires otherwise, are in MCAR-1 Definitions and Abbreviations.

'Acceptable Means of Compliance' (AMC) illustrate a means, or several alternative means, but not necessarily the only possible means by which a requirement can be met.

'Guidance Material' (GM) helps to illustrate the meaning of a requirement.

For the Civil Aviation Authority
Hussain Jaleel
Chief Executive

List of Amendments

Rev #	Date	Remarks
Issue 1 Amendment 0	15-07-2007	Initial issue
Issue 1 Amendment 1	16-03-2008	
Issue 1 Amendment 2	25-05-2009	
Issue 2 Amendment 0	15-04-2015	Incorporated up to EU No. 593/2012 and EDD 2013/024/R Incorporated SARI Part 66 Issue 1

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Section A — TECHNICAL REQUIREMENTS

Subpart A — GENERAL

MCAR-66.A.1 Scope

This section defines the aircraft maintenance licence and establishes the requirements for application, ~~the~~ issue ~~of an aircraft maintenance licence~~ and continuation ~~conditions~~ of its validity. ~~and use, for aeroplanes and helicopters of the following categories:~~

~~MCAR-66.A.3 Effectivity~~

~~This MCAR-66 becomes effective on 15 July 2007.~~

MCAR-66.A.3 Licence categories

(a) Aircraft maintenance licence include the following categories
- Category A
- Category B1
- Category B2
- Category C

(b) Categories A and B1 are subdivided into subcategories relative to combinations of aeroplanes, helicopters, turbine and piston engines. The subcategories are:
- A1 and B1.1 Aeroplanes Turbine
- A2 and B1.2 Aeroplanes Piston
- A3 and B1.3 Helicopters Turbine
- A4 and B1.4 Helicopters Piston

(c) Category B3 is applicable to piston-engine non-pressurized aeroplanes of 2000 Kg MTOM and below.

GM 66.A.3 Licence categories

Individual aircraft maintenance licence holders need not be restricted to a single category. Provided that each qualification requirement is satisfied, any combination of categories may be granted.

MCAR-66.A.5 Aircraft groups

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

1. Group 1: complex motor-powered aircraft as well as multiple engine helicopters, aeroplanes with maximum certified operating altitude exceeding FL290, aircraft equipped with fly-by-wire systems and other aircraft requiring an aircraft type rating when defined so by the CAA.

2. Group 2: aircraft other than those in Group 1 belonging to the following subgroups:
   - sub-group 2a: single turbo-propeller engine aeroplanes
   - sub-group 2b: single turbine engine helicopters
   - sub-group 2c: single piston engine helicopters

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

MCAR-66.A.10 Application

(a) An application for an aircraft maintenance licence or change to such licence shall be made on CAA Form 19 (see Appendix V) and in a manner established by the CAA and submitted thereto.

(b) (Reserved)

(c) In addition to the documents required in points 66.A.10(a), as appropriate, the applicant for additional basic categories or subcategories to an aircraft maintenance licence shall submit his/her current original aircraft maintenance licence to the CAA together with CAA Form 19

(d) (Reserved)

(e) (Reserved)

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

AMC 66.A.10 Application

1. Maintenance experience should be written up in a manner that the reader has a reasonable understanding of where, when and what maintenance constitutes the experience. A task by task account is not necessary but at the same time a bland statement "X years maintenance experience completed" is not acceptable. A log book of maintenance experience is desirable and the CAA may require such log books to be kept. It is acceptable to cross refer in CAA Form 19 to other documents containing information on maintenance.

2. Applicants claiming the maximum reduction in 66.A.30(a) total experience based upon having successfully completed 147.A.200 approved basic training, should include the MCAR-147 certificate of recognition for approved basic training.

3. Applicants claiming reduction in MCAR 66.A.30(a) total experience based upon having successfully completed technical training in an organisation or institute recognised by the CAA as a competent organisation or institute, should include the relevant certificate of successful completion of training.

MCAR-66.A.15 Eligibility

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

MCAR-66.A.20 Privileges

(a) ~~Subject to compliance with paragraph (b), t~~The following privileges shall apply:

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

Commented [a.mohamed1]: Includes MCAR-M Subpart F now?

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

   - maintenance performed on aircraft structure, power plant and mechanical and electrical systems.
   - work on ~~replacement of~~ avionic ~~line replaceable units~~ systems, requiring simple tests to prove their serviceability and not requiring troubleshooting. ~~shall also be included in the privileges.~~

   Category B1 ~~shall automatically~~ includes the ~~appropriate~~ corresponding A subcategory.

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

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

      - maintenance performed on avionic and electrical systems, and
      - electrical and avionics tasks within powerplant and mechanical systems, requiring only simple tests to prove their serviceability.

   ii. (Reserved)

   Commented [AM2]: It seems a bit unfair to reserve this after putting the burden of Module 13 on the student.

   The category B2 licence does not include any A subcategory.

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

   - maintenance performed on aeroplane structure, powerplant and mechanical and electrical systems,
   - work on avionic systems requiring only simple tests to prove their serviceability and not requiring troubleshooting.

5. A category C aircraft maintenance licence shall permit the holder to issue certificates of release to service following base maintenance on aircraft. The privileges apply to the aircraft in its entirety. ~~in a MCAR-145 organisation.~~

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

1. in compliance with the applicable requirements of MCAR-M and~~/or~~ MCAR-145; and

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

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

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

GM 66.A.20(a) Privileges

1. The following definitions ~~of line and base maintenance should~~ apply:

Electrical system means the aircraft electrical power supply source, plus the distribution system to the different components contained in the aircraft and relevant connectors. Lighting systems are also included in this definition. When working on cables and connectors which are part of these electrical systems, the following typical practices are included in the privileges:

- Continuity, insulation and bonding techniques and testing;
- Crimping and testing of crimped joints;
- Connector pin removal and insertion;
- Wiring protection techniques.

Avionics system means an aircraft system that transfers, processes, displays or stores analogue or digital data using data lines, data buses, coaxial cables, wireless or other data transmission medium, and includes the system's components and connectors. Examples of avionics systems include the following:

- Autoflight;
- Communication, Radar and Navigation;
- Instruments (see NOTE below);
- In Flight Entertainment Systems;
- Integrated Modular Avionics (IMA);
- On-Board Maintenance Systems;
- Information Systems;
- Fly by Wire Systems (related to ATA27 "Flight Controls");
- Fibre Optic Control Systems.

NOTE: Instruments are formally included within the privileges of the B2 licence holders. However, maintenance on electromechanical and pitot-static components may also be released by a B1 license holder.

Simple test means a test described in approved maintenance data and meeting all the following criteria:

- The serviceability of the system can be verified using aircraft controls, switches, Built-in Test Equipment (BITE), Central Maintenance Computer (CMC) or external test equipment not involving special training.
- The outcome of the test is a unique go – no go indication or parameter, which can be a single value or a value within an interval tolerance. No interpretation of the test result or interdependence of different values is allowed.
- The test does not involve more than 10 actions as described in the approved maintenance data (not including those required to configure the aircraft prior to the test, i.e. jacking, flaps down, etc, or to return the aircraft to its initial configuration). Pushing a control, switch or button, and reading the corresponding outcome may be considered as a single step even if the maintenance data shows them separated.

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

Line maintenance is any maintenance that is carried out before flight to ensure that the aircraft is fit for the intended flight. It may include:

- troubleshooting;
- defect rectification;
- component replacement with use of external test equipment, if required. Component replacement may include components such as engines and propellers;
- scheduled maintenance and/or checks including visual inspections that will detect obvious unsatisfactory conditions/discrepancies but do not require extensive in depth inspection. It may also include internal structure, systems and power plant items which are visible through quick opening access panels/doors;
- minor repairs and modifications which do not require extensive disassembly and can be accomplished by simple means;
- for temporary or occasional cases (Airworthiness Directives, hereinafter AD; service bulletins, hereinafter SB) the quality manager may accept base maintenance tasks to be performed by a line maintenance organisation provided all requirements are fulfilled. CAA will prescribe the conditions under which these tasks may be performed.

Base maintenance means tasks falling outside these criteria that are given above for Line Maintenance ~~considered to be base maintenance~~.

Note:
Aircraft maintained in accordance with "progressive" type programmes need to be individually assessed in relation to this paragraph. In principle, the decision to allow some "progressive" checks to be carried out is determined by the assessment that all tasks within the particular check can be carried out safely to the required standards at the designated line maintenance station

2. The category B3 licence does not include any A subcategory. Nevertheless, this does not prevent the B3 licence holder from releasing maintenance tasks typical of the A1.2 subcategory for piston-engine non-pressurized aeroplanes of 2000 Kg MTOM and below, within the limitations contained in the B3 licence.

3. The category C licence permits certification of scheduled base maintenance by the issue of a single certificate of release to service for the complete aircraft after the completion of all such maintenance. The basis for this certification is that the maintenance has been carried out by competent mechanics and category B1, B2 and B3 support staff, as appropriate, have signed for the maintenance tasks under their respective specialisation. The principal function of the category C certifying staff is to ensure that all required maintenance has been called up and signed off by the category B1, B2 and B3 support staff, as appropriate, before issue of the certificate of release to service. Only category C personnel who also hold category B1, B2 and B3 qualifications may perform both roles in base maintenance.

AMC 66.A.20(b)2 Privileges.

The 6 months maintenance experience in 2 years should be understood as consisting of two elements, duration and nature of the experience. The minimum to meet the requirements for these elements may vary depending on the size and complexity of the aircraft and type of operation and maintenance.

1. Duration:

   Within an approved maintenance organization:

   - 6 months ~~continuous employment~~ working with~~in~~ the same organisation; or
   - 6 months split up into different blocks, working ~~employed~~ within the same or in different organisations.

   The 6 months period can be replaced by 100 days of maintenance experience in accordance with the privileges, whether they have been performed within an approved organisation, or as independent certifying staff according to MCAR-M.A.801(b)2 or as a combination thereof.

   When certifying staff maintains and releases aircraft in accordance with MCAR-M.A.801(b)2, in certain circumstances this number of days may even be reduced by 50% when agreed in advance by the CAA. These circumstances consider the cases where the holder of a MCAR-66 licence happens to be the owner of an aircraft and carries out maintenance on his own aircraft, or where a licence holder maintains an aircraft operated for low utilization, that does not allow the licence holder to accumulate the required experience. This reduction should not be combined with the 20% reduction permitted when carrying out technical support, or maintenance planning, continuing airworthiness management or engineering activities. To avoid a too long period without experience, the working days should be spread over the intended 6 months period.

2. Nature of the experience:

   Depending on the category of the aircraft maintenance licence, the following activities are considered relevant for maintenance experience:

   - Servicing;
   - Inspection;
   - Operational and functional testing;
   - Troubleshooting;

- Repairing;
- Modifying;
- Changing component;
- Supervising these activities;
- Releasing aircraft to service.

For category A licence holders ~~certifying staff~~, the experience should include exercising the privileges, by means of performing tasks related to the authorization on at least one aircraft type for each licence subcategory. This means tasks as mentioned in AMC 145.A.30(g), including servicing, component changes and simple defect rectifications.

For category B1, B2 and B3, for every aircraft included in the authorization the experience should be on that particular aircraft or on a similar aircraft within the same licence (sub)category. Two aircraft can be considered as similar when they have similar technology, construction and comparable systems, which means equally equipped with the following (as applicable to the licence category):

- Propulsion systems (piston or turboprop or turbofan or turboshaft or jet-engine or push propellers); and
- Flight control systems (only mechanical controls or hydromechanically powered controls or electromechanically powered controls); and
- Avionic systems (analogue systems or digital systems); and
- Structure (manufactured of metal or composite or wood).

For licences endorsed with (sub)group ratings ~~As an alternative to the above~~:

- In the case of B1 licence endorsed with group ratings (either manufacturer group or full group) as defined in MCAR-66.A.45~~(g)~~ the holder should ~~may~~ show experience on at least one aircraft type per (sub)group and per aircraft structure (metal, composite, wood).
- In the case of a B2 licence endorsed with (sub)group ratings (either manufacturer subgroup or full (sub)group) as defined in MCAR-66.A.45~~(g)~~ the holder should ~~may~~ show experience on at least one aircraft type per (sub)group.
- In the case of a B3 licence endorsed with the rating "piston-engine non-pressurized aeroplanes of 2000 Kg MTOM and below" as defined in 66.A.45, the holder should show experience on at least one aircraft type per aircraft structure (metal, composite or wood).

For category C, the experience should cover at least one of the aircraft types endorsed on the authorization.

For a combination of categories, the experience should include some activities of the nature shown in paragraph 2 in each category.

A maximum of 20% of the experience duration required may be replaced by the following relevant activities on an aircraft type of similar technology, construction and with comparable systems:

- Aircraft maintenance related training as an instructor/assessor or as a student;
- Maintenance technical support/engineering;
- Maintenance management/planning.

The experience should be documented in an individual log book or in any other recording system (which may be an automated one) containing the following data:

- Date;
- Aircraft type;
- Aircraft identification i.e. registration;
- ATA chapter (optional);
- Operation performed i.e. 100 FH check, MLG wheel change, engine oil check and complement, SB embodiment, troubleshooting, structural repair, STC embodiment…;
- Type of maintenance i.e. base, line;
- Type of activity i.e. perform, supervise, release;
- Category used A, B1, B2, B3 or C.
- Duration in days or partial-days

~~Remark: this experience requirement does not apply to:~~

~~— Certifying staff issuing a certificate of release of aircraft as per MCAR-M.A.607(b);~~
~~— Pilot-owner certifying tasks according to MCAR-M.A.803; and~~
~~— Certifying staff according to MCAR-145.A.30(j) and Appendix IV of MCAR-145.~~

Commented [a.mohamed3]: This came from article 5 of regulation 2042/2003. In current revision of MCAR-66 but not in Part 66. Needs impact assessment and an exploration of why it was included in the first place.

~~**GM 66.A.20(a) — Privileges**~~

~~1. The following titles shown against each category designator below are intended to provide a readily understandable indication of the job function:~~

~~Category A — Line maintenance certifying mechanic.~~
~~Category B1 — Maintenance certifying technician – mechanical.~~
~~Category B2 — Maintenance certifying technician – avionic.~~
~~Category C — Base maintenance certifying engineer.~~

~~2. Individual aircraft maintenance licence holders need not be restricted to a single category. Provided that each qualification requirement is satisfied, any combination of categories may be granted.~~

~~**GM 66.A.20(a) — Privileges**~~

~~1. Tasks permitted by 66.A.20 (a) 1. to be certified under the category A certification authorisation as part of minor scheduled maintenance or simple defect rectification are as specified in MCAR 145 and agreed by the CAA. MCAR 145 contains a typical example list of such tasks.~~

~~2. For the purposes of category A minor scheduled line maintenance means any minor check up to but not including the A check where functional tests can be carried out by the aircrew to ensure system serviceability. In the case of an aircraft type not controlled by a maintenance programme based upon the A/B/C/D check principle, minor scheduled line maintenance means any minor check up to and including the weekly check or equivalent.~~

3. The category B1 licence also permits the certification of work involving avionic systems, providing the serviceability of the system can be established by a simple self-test facility, other on board test systems/equipment or by simple ramp test equipment. Defect rectification involving test equipment which requires an element of decision making in its application – other than a simple go/no-go decision – cannot be certified. The category B2 will need to be qualified as category A in order to carry out simple mechanical tasks and be able to make certifications for such work.

4. The category C certification authorisation permits certification of scheduled base maintenance by the issue of a single certificate of release to service for the complete aircraft after the completion of all such maintenance. The basis for this certification is that the maintenance has been carried out by competent mechanics and both category B1 and B2 staff have signed for the maintenance under their respective specialisation. The principal function of the category C certifying staff is to ensure that all required maintenance has been called up and signed off by the category B1 and B2 staff before issue of the certificate of release to service. Category C personnel who also hold category B1 or B2 qualifications may perform both roles in base maintenance.

GM 66.A.20(b)2 Privileges

The sentence "met the provision for the issue of the appropriate privileges" included in 66.A.20(b)2 means that during the previous 2 years the person has met all the requirements for the endorsement of the corresponding aircraft rating (for example, in the case of aircraft in Group 1, theoretical plus practical element plus, if applicable, on-the-job training). This supersedes the need for 6 months of experience for the first 2 years. However, the requirement of 6 months of experience in the preceding 2 years will need to be met after the second year.

AMC 66.A.20(b)3 Privileges

The wording "has the adequate competence to certify maintenance on the corresponding aircraft" means that the licence holder and, if applicable, the organisation where he/she is contracted/employed, should ensure that he/she has acquired the appropriate knowledge, skills, attitude and experience to release the aircraft being maintained. This is essential because some systems and technology present in the particular aircraft being maintained may not have been covered by the training/examination/experience required to obtain the licence and ratings.

This is typically the case, among others, in the following situations:

- Type ratings which have been endorsed on a licence in accordance with Appendix I to AMC to Part-66 "List of Type Ratings" after attending type training/on-the-job training which did not cover all the models/variants included in such rating. For example, a licence endorsed with the rating Airbus A318/A319/A320/A321 (CFM56) after attending type training/on-the-job training covering only the Airbus 320 (CFM56).
- Type ratings which have been endorsed on a licence in accordance with Appendix I to AMC to MCAR-66 "List of Type Ratings" after a new variant has been added to the rating in Appendix I, without performing difference training. For example, a licence endorsed with the rating Boeing 737-600/700/800/900 for a person who already had the rating Boeing 737-600/700/800, without performing any difference training for the 737-900.

- Work being carried out on a model/variant for which the technical design and maintenance techniques have significantly evolved from the original model used in the type training/on-the-job training.
- Specific technology and options selected by each customer which may not have been covered by the type training/on-the-job training.
- Changes in the basic knowledge requirements of Appendix I to MCAR-66 not requiring re-examination of existing licence holders (grandfathered privileges).
- The endorsement of group/subgroup ratings based on experience on a representative number of tasks/aircraft or based on type training/examination on a representative number of aircraft.
- Persons meeting the requirements of 6 months of experience every 2 years only on certain similar aircraft types as allowed by AMC 66.A.20(b)2.
- Persons holding a MCAR-66 licence with limitations, obtained through conversion of national qualifications (66.A.70), where such limitations are going to be lifted after performing the corresponding basic knowledge examinations. In this case, the type ratings endorsed in the licence may have been obtained in the national system without covering all the aircraft systems (because of the previous limitations) and there will be a need to assess and, if applicable, to train this person on the missing systems.

Additional information is provided in AMC 145.A.35(a).

GM 66.A.20(b)34 Privileges

1. Holders of a MCAR-66 aircraft maintenance licence may not exercise certification privileges unless they have a general knowledge of the language used within the maintenance environment including knowledge of common aeronautical terms in the language. The level of knowledge should be such that the licence holder is able to:

   – read and understand the instructions and technical manuals in use within the organisation;
   – make written technical entries and any maintenance documentation entries, which can be understood by those with whom they are normally required to communicate;
   – read and understand the maintenance organisation procedures;
   – communicate at such a level as to prevent any misunderstanding when exercising certification privileges.

2. In all cases, the level of understanding should be compatible with the level of certification privileges exercised.

MCAR-66.A.25 Basic knowledge requirements

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

The ~~basic knowledge~~ examinations shall be conducted by a training organisation appropriately approved in accordance with MCAR-147 or by the CAA.

(b) The training courses and examinations shall be passed within ten years prior to the application for an aircraft maintenance licence or the addition of a category or subcategory to such aircraft maintenance licence. Should this not be the case, examination credits may however be obtained in accordance with point (c).

(c) The applicant may apply to the competent authority for full or partial examination credit ~~against~~ to the basic knowledge requirements ~~and associated examination shall be given for~~:

1. basic knowledge examinations that do not meet the requirement described in point (b) above; and
2. any other technical qualification considered by the CAA to be equivalent to the knowledge standard of this MCAR.

~~Such Credits shall be established in accordance with Section B, Subpart E of this Part.~~

(d) Credits expire ten years after they were granted to the applicant by the competent authority. The applicant may apply for new credits after expiration.

Commented [a.mohamed4]: Not possible without Section B

Commented [A5]: CAA – 5 years. Should this be made 10 years, would it apply to certificates issued prior to entry of force?

Answer: YES.

AMC 66.A.25 Basic knowledge requirements

1. For an applicant being a person qualified by holding an academic degree in an aeronautical, mechanical or electronic discipline from a recognised university or other higher educational institute the need for any examination will depend upon the course taken in relation to Appendix I to MCAR-66.

2. Knowledge gained and examinations passed during previous experiences, for example, in military aviation and civilian apprenticeships will be credited where the CAA is satisfied that such knowledge and examinations are equivalent to that required by Appendix I to MCAR-66.

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 ~~appropriate to the particular MCAR 66.A.I~~ related to the corresponding (sub)category, which means that category A must demonstrate a limited but adequate level of knowledge, whereas category B1, ~~and~~ B2 and B3 must demonstrate a complete level of knowledge in the appropriate subject modules.

~~Category C certifying staff must meet the relevant level of knowledge for B1 or B2.~~

Commented [a.mohamed6]: This is moved to Appendix I in Part 66

MCAR-66.A.30 Experience requirements

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

1. for category A and subcategories B1.2 and B1.4 and category B3:
   (i) three years of practical maintenance experience on operating aircraft, if the applicant has no previous relevant technical training; or
   (ii) two years of practical maintenance experience on operating aircraft and completion of training considered relevant by the CAA as a skilled worker, in a technical trade; or
   (iii) one year of practical maintenance experience on operating aircraft and completion of a ~~MCAR-147 approved~~ basic training course approved in accordance with MCAR-147.

2. for category B2 and subcategories B1.1 and B1.3:
   (i) five years of practical maintenance experience on operating aircraft if the applicant has no previous relevant technical training; or
   (ii) three years of practical maintenance experience on operating aircraft and completion of training considered relevant by the CAA as a skilled worker, in a technical trade; or
   (iii) two years of practical maintenance experience on operating aircraft and completion of a ~~MCAR-147 approved~~ basic training course approved in accordance with MCAR-147.

3. for category C with respect to large aircraft:
   (i) three years of experience exercising category B1.1, B1.3 or B2 privileges on large aircraft or as support staff according to point MCAR-145.A.35 ~~B1.1, B1.3 or B2 support staff~~, or, a combination of both; or
   (ii) five years of experience exercising category B1.2 or B1.4 privileges on large aircraft or as support staff according to point MCAR-145.A.35 ~~B1.1, B1.3 or B2 support staff~~, or a combination of both; ~~or~~

4. for category C with respect to ~~non~~ other than large aircraft: three years of experience exercising category B1 or B2 privileges on ~~non~~ other than large aircraft or as ~~MCAR-145 B1 or B2~~ support staff according to point 145.A.35, or a combination of both; or

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 CAA, three years of experience working in a civil aircraft maintenance environment on a representative selection of ~~over~~tasks directly associated with aircraft maintenance including six months of observation of base maintenance tasks.

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

(c) ~~For category A, B1 and B2~~The experience must be practical ~~which means being~~ and involve~~d with~~ a representative cross section of maintenance tasks on aircraft.

(d) ~~For all applicants,~~ At least one year of the required experience ~~must~~shall be recent maintenance experience on aircraft of the category/subcategory for which the initial aircraft maintenance licence is sought. For subsequent category/subcategory additions to an existing aircraft maintenance licence, the additional recent maintenance experience required may be less than one year, but must be at least three months. The required experience ~~must~~shall be dependent

Commented [a.mohamed7]: Creating a lot of problems as it was misinterpreted/misused from the start. One way is to remove point (ii) completely.

upon the difference between the licence category/subcategory held and applied for. Such additional experience ~~must~~shall be typical of the new licence category/subcategory sought.

(e) Notwithstanding paragraph (a), aircraft maintenance experience gained outside a civil aircraft maintenance environment shall be accepted when such maintenance is equivalent to that required by this MCAR as established by the CAA. Additional experience of civil aircraft maintenance shall, however, be required to ensure understanding of the civil aircraft maintenance environment.

(f) Experience shall have been acquired within the ten years preceding the application for an aircraft maintenance licence or the addition of a category or subcategory to such a licence.

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.

2. While an applicant to a ~~MCAR-66~~ 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 base maintenance support staff.

3. A skilled worker is a person who has successfully completed a course of training acceptable to the CAA, involving the manufacture, repair, overhaul or inspection of mechanical, electrical or electronic equipment. The training would include the use of tools and measuring devices.

4. Maintenance experience on operating aircraft:

- Means the experience of being involved in maintenance tasks on aircraft which are being operated by airlines, air taxi organisations, owners, etc;
- Should cover a wide range of tasks in length, complexity and variety;
- Aims at gaining sufficient experience in the real environment of maintenance as opposed to only the training school environment;
- May be gained within different types of maintenance organisations (MCAR-145, M.A. Subpart F, FAR-145, etc) or under the supervision of independent certifying staff;
- May be combined with Part-147 approved training so that periods of training can be intermixed with periods of experience, similar to an apprenticeship.

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

To be considered as recent experience, at least 50% of the required 12 month experience should be gained within the 12 month period prior to the date of application for the MCAR-66 aircraft maintenance licence. The remainder of the experience should have been gained within the 7 year period prior to application. It must be noted that the rest of the basic experience required by 66.A.30 must be obtained within the 10 years prior to the application as required by 66.A.30(f).

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, or B2 or B3 the additional experience of civil aircraft maintenance should be a minimum of 12 months.

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

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

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

(b) The holder of an aircraft maintenance licence shall complete the relevant parts of CAA Form 19 (see Appendix V) and submit it with the holder's copy of the licence to the CAA.

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

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

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

Validity of the MCAR-66 aircraft maintenance licence is not affected by recency of maintenance experience whereas the validity of the MCAR 66.A.20 privileges is affected by maintenance experience as specified in MCAR 66.A.20(a)

MCAR-66.A.45 ~~Type/task training and~~ Endorsement with aircraft ratings

(a) In order to be entitled to exercise certification privileges on a specific aircraft type, the holder of an aircraft maintenance licence needs to have his/her licence endorsed with the relevant aircraft ratings. ~~The holder of a category A aircraft maintenance licence may only exercise certification privileges on a specific aircraft type following the satisfactory completion of the relevant category A aircraft task training carried out by an appropriately approved MCAR-145 or MCAR-147 organisation. The training shall include practical hands on training and theoretical training as appropriate for each task authorised. Satisfactory completion of training shall be demonstrated by an examination and/or by workplace assessment carried out by an appropriately approved MCAR-145 or MCAR-147organisation.~~

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

  1. For group 1 aircraft, the appropriate aircraft type rating.
  2. For group 2 aircraft, the appropriate aircraft type rating, manufacturer sub-group rating or full sub-group rating.
  3. For group 3 aircraft, the appropriate aircraft type rating or full group rating.

- For category B3, the relevant rating is "piston-engine non-pressurized aeroplanes of 2000 Kg MTOM and below"

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

(b) The endorsement of aircraft type ratings requires the satisfactory completion of the relevant category B1, B2 or C aircraft type training. ~~Except as otherwise specified in paragraph (g), the holder of a category B1, B2 or C aircraft maintenance licence shall only exercise certification privileges on a specific aircraft type when the aircraft maintenance licence is endorsed with the appropriate aircraft type rating.~~

(c) In addition to the requirement of point (b), the endorsement of the first aircraft type rating within a given category/sub-category requires satisfactory completion of the corresponding On-the-Job Training, as described in Appendix III to MCAR-66. ~~Except as otherwise specified in paragraph (h), ratings shall be granted following satisfactory completion of the relevant category B1, B2 or C aircraft type training approved by the CAA or conducted by an appropriately approved MCAR-147 maintenance training organisation.~~

(d) By derogation from points (b) and (c), for group 2 and 3 aircraft, aircraft type ratings may also be granted after:

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

In the case of a category C rating for a person qualified by holding an academic degree as specified in point 66.A.30(a)(5), the first relevant aircraft type examination shall be at the category B1 or B2 level.

~~Category B1 and B2 approved type training shall include theoretical and practical elements and consist of the appropriate course in relation to the 66.A.20(a) privileges. Theoretical and practical training shall comply with Appendix III to this MCAR.~~

(e) For group 2 aircraft:

1. the endorsement of manufacturer sub-group ratings for category B1 and C licence holders requires complying with the aircraft type rating requirements of at least two aircraft types from the same manufacturer which combined are representative of the applicable manufacturer sub-group;

2. the endorsement of full sub-group ratings for category B1 and C licence holders requires complying with the aircraft type rating requirements of at least three aircraft types from different manufacturers which combined are representative of the applicable sub-group;

3. the endorsement of manufacturer sub-groups and full sub-group ratings for category B2 licence holders requires demonstration of practical experience which shall include a representative cross section of maintenance activities relevant to the licence category and to the applicable aircraft sub-group.

~~Category C approved type training shall comply with Appendix III to this MCAR. In the case of a category C person qualified by holding an academic degree as specified in 66.A.30(a)(5), the first relevant aircraft type theoretical training shall be at the category B1 or B2 level. Practical training is not required.~~

(f) For group 3 aircraft:

1. the endorsement of the full group 3 rating for category B1, B2 and C licence holders requires demonstration of practical experience, which shall include a representative crosssection of maintenance activities relevant to the licence category and to the group 3.

2. for category B1, unless the applicant provides evidence of appropriate experience, the group 3 rating shall be subject to the following limitations, which shall be endorsed on the licence:
   - pressurized aeroplanes
   - metal structure aeroplanes
   - composite structure aeroplanes
   - wooden structure aeroplanes
   - aeroplanes with metal tubing structure covered with fabric.

~~Completion of approved aircraft type training, as required by paragraphs (b) to (e), shall be demonstrated by an examination. The examination shall comply with Appendix III to this MCAR. The examinations in respect of category B1 or B2 or C aircraft type ratings shall be conducted by training organisations appropriately approved underMCAR-147, the CAA, or the training organisation conducting the approved type training course.~~

(g) For the B3 licence:

1. the endorsement of the rating "piston-engine non-pressurized aeroplanes of 2000 Kg MTOM and below" requires demonstration of practical experience which shall include a representative cross-section of maintenance activities relevant to the licence category.

2. unless the applicant provides evidence of appropriate experience, the rating referred to in point 1 shall be subject to the following limitations, which shall be endorsed on the licence:
   - wooden structure aeroplanes
   - aeroplanes with metal tubing structure covered with fabric
   - metal structure aeroplanes
   - composite structure aeroplanes.

~~Notwithstanding paragraph (b), for aircraft other than large aircraft, the holder of a category B1 or B2 aircraft maintenance licence may also exercise certification privileges, when the aircraft maintenance licence is endorsed with the appropriate group ratings, or manufacturer group ratings, unless the CAA has determined that the complexity of the aircraft in question requires a type rating.~~

1. Manufacturer group ratings may be granted after complying with the type rating requirements of two aircraft types representative of the group from the same manufacturer.

2. Full group ratings may be granted after complying with the type rating requirements of three aircraft types representative of the group from different manufacturers. However, no full group rating may be granted to B1 multiple turbine engine aeroplanes, where only manufacturer group rating applies.

3. The groups shall consist of the following:

(i) for category B1 or C:
- helicopter piston engine
- helicopter turbine engine
- aeroplane single piston engine – metal structure
- aeroplane multiple piston engines – metal structure
- aeroplane single piston engine – wooden structure
- aeroplane multiple piston engines – wooden structure
- aeroplane single piston engine – composite structure
- aeroplane multiple piston engines – composite structure
- aeroplane turbine – single engine
- aeroplane turbine – multiple engine

(ii) for category B2 or C:
- aeroplane
- helicopter

(h) Notwithstanding paragraph (c), ratings on aircraft other than large aircraft may also be granted, subject to satisfactory completion of the relevant category B1, B2 or C aircraft type examination and demonstration of practical experience on the aircraft type, unless the CAA has determined that the aircraft is complex, where paragraph 3 approved type training is required.

In the case of a category C ratings on aircraft other than large aircraft, for a person qualified by holding an academic degree as specified in 66.A.30(a)(5), the first relevant aircraft type examination shall be at the category B1 or B2 level.

1. Category B1, B2 and C approved type examinations must consist of a mechanical examination for category B1 and an avionics examination for category B2 and both mechanical and avionics examination for category C.

2. The examination shall comply with Appendix III to this MCAR. The examination shall be conducted by training organisations appropriately approved under MCAR-147, or by the CAA.

3. Aircraft type practical experience shall include a representative cross section of maintenance activities relevant to the category.

GM.66.A.45(b) Endorsement with aircraft type ratings

An aircraft type rating includes all the aircraft models/variants listed in column 2 of Appendix I to

AMC to MCAR-66.

When a person already holds a type rating on the licence and such type rating is amended in the Appendix I to AMC to MCAR-66 in order to include additional models/variants, there is no need for additional type training for the purpose of amending the type rating in the licence. The rating should be amended to include the new variants, upon request by the applicant, without additional requirements. However, it is the responsibility of the licence holder and, if applicable, the maintenance organisation where he/she is employed to comply with 66.A.20(b)3, 145.A.35(a) and M.A.607(a), as applicable, before he/she exercises certification privileges.

Similarly, type training courses covering certain, but not all the models/variants included in a type rating, are valid for the purpose of endorsing the full type rating.

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

1. For the granting of manufacturer subgroup ratings for Group 2 aircraft, for B1 and C licence holders, the sentence "at least two aircraft types from the same manufacturer which combined are representative of the applicable manufacturer subgroup" means that the selected aircraft types should cover the technologies relevant to the manufacturer subgroup in the following areas:

   - Flight control systems (mechanical controls / hydromechanically powered controls / electromechanically powered controls); and
   - Avionic systems (analogue systems / digital systems); and
   - Structure (manufactured of metal / composite / wood).

   In cases where there are very different aircraft types within the same manufacturer subgroup, it may be necessary to cover more than two aircraft types to ensure adequate representation.

   For this purpose it may be possible to use aircraft types from the same manufacturer classified in Group 1 as long as the selected aircraft belong to the same licence subcategory for which the rating will be endorsed.

2. For the granting of full subgroup ratings for Group 2 aircraft, for B1 and C licence holders, the sentence "at least three aircraft types from different manufacturers which combined are representative of the applicable subgroup" means that the selected aircraft types should cover all the technologies relevant to the manufacturer subgroup in the following areas:

   - Flight control systems (mechanical controls / hydromechanically powered controls / electromechanically powered controls); and
   - Avionic systems (analogue systems / digital systems); and
   - Structure (manufactured of metal / composite / wood).

   In cases where there are very different aircraft types within the same subgroup, it may be necessary to cover more than three aircraft types to ensure adequate representation.

For this purpose it may be possible to use aircraft types from different manufacturers classified in Group 1 as long as the selected aircraft belong to the same licence subcategory for which the rating will be endorsed.

3. For manufacturer subgroup ratings, the term "manufacturer" means the TC holder defined in the certification data sheet, which is reflected in the list of type ratings in Appendix I to AMC to MCAR-66.

In the case of an aircraft rating where the type rating refers to a TC holder made of a combination of two manufacturers which produce a similar aircraft (i.e. AGUSTA / BELL HELICOPTER TEXTRON or any case of aircraft similarly built by another manufacturer) this combination should be considered as one manufacturer.

As a consequence:

- When a licence holder gets a manufacturer type or a manufacturer subgroup rating made of a combination of manufacturers, it covers the combination of such manufacturers.
- When a licence holder who intends to endorse a full subgroup rating selects three aircraft from different manufacturers, this means from different combinations of manufacturers as applicable.

AMC 66.A.45(d), (e)3, (f)1 and (g)1 Endorsement with aircraft ratings

1. The "practical experience" should cover a representative cross section including at least 50% of tasks contained in Appendix II to AMC relevant to the licence category and to the applicable aircraft type ratings or aircraft (sub)group ratings being endorsed. This experience should cover tasks from each paragraph of the Appendix II list. Other tasks than those in the Appendix II may be considered as a replacement when they are relevant. In the case of (sub)group ratings, this experience may be shown by covering one or several aircraft types of the applicable (sub)group and may include experience on aircraft classified in group 1, 2 and/or 3 as long as the experience is relevant. The practical experience should be obtained under the supervision of authorised certifying staff.

2. In the case of endorsement of individual type ratings for Group 2 and Group 3 aircraft, for the second aircraft type of each manufacturer (sub)group the practical experience should be reduced to 30% of the tasks contained in Appendix II to AMC relevant to the licence category and to the applicable aircraft type. For subsequent aircraft types of each manufacturer (sub) group this should be reduced to 20%.

3. Practical experience should be demonstrated by the submission of records or a log book showing the Appendix II tasks performed by the applicant. Typical data to be recorded are similar to those described in AMC 66.A.20(b)2.

GM 66.A.45 Endorsement with aircraft ratings

The following table shows a summary of the aircraft rating requirements contained in 66.A.45, 66.A.50 and Appendix III to MCAR-66.

The table contains the following:

- The different aircraft groups.
- For each licence (sub)category, which ratings are possible (at the choice of the applicant):
  - Individual type ratings.
  - Full and/or Manufacturer (sub)group ratings
- For each rating option, which are the qualification options.
- For the B1.2 licence (Group 3 aircraft) and for the B3 licence (piston-engine non-pressurized aeroplanes of 2000 Kg MTOM and below), which are the possible limitations to be included in the licence if not sufficient experience can be demonstrated in those areas.

Note: OJT means "On-the-Job Training" (Appendix III to MCAR-66, Section 6) and is only required for the first aircraft rating in the licence (sub)category

Aircraft rating requirements			
Aircraft Groups	**B1/B3 licence**	**B2 licence**	**C licence**
Group1 - Complex motorpowered aircraft. - Multiple engine helicopters. - Aeroplanes certified above FL290. - Aircraft equipped with fly-by-wire. - Other aircraft when defined by the CAA.	**(For B1)** **Individual TYPE RATING** Type training: - Theory + examination - Practical + assessment PLUS OJT (for first aircraft in licence subcategory)	**Individual TYPE RATING** Type training: - Theory + examination - Practical + assessment PLUS OJT (for first aircraft in licence subcategory)	**Individual TYPE RATING** Type training: - Theory + examination
Group 2 **Subgroups:** 2a: single turboprop aeroplanes (*) 2b: single turbine engine helicopters (*) 2c: single piston engine helicopters (*) (*) Except those classified in Group 1.	**(For B1.1, B1.3, B1.4)** **Individual TYPE RATING** (type training + OJT) or (type examination + practical experience) **Full SUBGROUP RATING** (type training + OJT) or (type examination + practical experience) on at least 3 aircraft representative of that subgroup **Manufacturer SUBGROUP RATING** (type training + OJT) or (type examination + practical experience) on at least 2 aircraft representative of that manufacturer subgroup	**Individual TYPE RATING** (type training + OJT) or (type examination + practical experience) **Full SUBGROUP RATING** based on demonstration of practical experience **Manufacturer SUBGROUP RATING** based on demonstration of practical experience	**Individual TYPE RATING** type training or type examination **Full SUBGROUP RATING** type training or type examination on at least 3 aircraft representative of that subgroup **Manufacturer SUBGROUP RATING** type training or type examination on at least 2 aircraft representative of that manufacturer subgroup
Group3 Piston engine aeroplanes (except those classified in Group 1)	**(For B1.2)** **Individual TYPE RATING** (type training + OJT) or (type examination + practical experience) **Full GROUP 3 RATING** based on demonstration of practical experience **Limitations:** - Pressurized aeroplanes - Metal aeroplanes - Composite aeroplanes - Wooden aeroplanes - Metal tubing & fabric aeroplanes	**Individual TYPE RATING** (type training + OJT) or (type examination + practical experience) **Full GROUP 3 RATING** based on demonstration of appropriate experience	**Individual TYPE RATING** type training or type examination **Full GROUP 3 RATING** based on demonstration of practical experience

Commented [AM8]: It was intended to make this Theory + (Practical or OJT)

Piston engine non-pressurized aeroplanes of 2000 kg MTOM and below	**(For B3)** **FULL RATING "Piston engine non-pressurized aeroplanes of 2000 kg MTOM and below"** based on demonstration of practical experience **Limitations:** - Pressurized aeroplanes - Metal aeroplanes - Composite aeroplanes - Wooden aeroplanes - Metal tubing & fabric aeroplanes	**Not applicable**	**Not applicable**

~~AMC 66.A.45(a) Type/task training and ratings~~

~~1. For category A certifying staff specific training on each aircraft type will be required reflecting the authorised task(s) as indicated under MCAR 66.A.20(a) 1.~~

~~2. Appropriately approved MCAR 145 or MCAR 147 organisation means compliance with the applicable paragraphs of AMC 66.A.45.~~

~~AMC 66.A.45(d) Type/task training and ratings~~

~~1. The training should give adequate detailed theoretical knowledge of the aircraft, its main parts, systems, equipment, interior and applicable components, including training in the systems in use for technical manuals and maintenance procedures.~~

~~The course should also take into account the following:~~

~~(a) in service experience on the aircraft type;~~
~~(b) feedback from in service difficulties/occurrence reporting etc;~~
~~(c) significant airworthiness directives and/or service bulletins;~~
~~(d) known human factors issues associated with the particular aircraft type.~~

~~2. Theoretical training should be supported by training aids such as aircraft system components. Ground simulator time, engine ground running and computer based training (CBT) etc may also be utilised.~~

~~3. Theoretical and practical training should also take into account the critical aspects of Fuel Tank Safety (FTS) airworthiness limitation items (ALI) including Critical Design Configuration Control Limitations (CDCCL).~~

~~4. Knowledge is also recommended of relevant inspections and limitations as applicable to the effects of environmental factors such as cold and hot climates, wind, moisture, etc.~~

~~5. The practical training must comprise a period of 4 months for applicants with no recent recorded previous practical experience of aircraft of comparable construction and systems,~~

Commented [a.mohamed9]: Needs some mapping of how things are done now and in the future.

~~including the engines, but this can be reduced to a minimum of two weeks for applicant with such previous experience.~~

~~6. A programme of structured on-job training (OJT) may be prepared to satisfy the practical training requirement.~~

~~Where the practical training element is conducted by or under the responsibility of the training organisation under a MCAR-147 approval or a direct type course approval, it should be considered as part of the approved course and as such, its acceptance by the CAA should be supported by a detailed syllabus showing its content and duration. The individual practical training records should be designed in a manner that they demonstrate compliance with the detailed practical training syllabus. Such records may take the form of an individual training logbook. The logbook should be designed such that tasks may be countersigned by the MCAR-147 school or other course provider.~~

~~Where the practical training element is conducted by a maintenance organisation approved under MCAR-145, under its own responsibility, its acceptance by the CAA should be supported by a detailed syllabus showing its content and duration. The individual practical training records should be designed in a manner that they demonstrate compliance with the detailed practical training syllabus. Alternatively, the practical training element may consist of a structured OJT programme. In this case the maintenance organisation approved under MCAR-145 should provide applicants for a type rating a logbook indicating a list of tasks to be performed under supervision. The logbook should be designed such that tasks may be countersigned by the supervisor. The list of tasks should be accepted either directly for each individual – depending on the individuals previous experience, or indirectly through the acceptance of a procedure giving delegation to the maintenance organisation.~~

~~In all cases the practical element should include an acceptable cross section of maintenance tasks, which, in the case of a structured OJT, can be tailored to accommodate the operating profile of the MCAR-145 organisation whilst also supplementing the theoretical course elements. The means by which the practical element is supervised and the control of the standard should be acceptable to the CAA. The duration of the practical type training element should take into account significant differences between types and be acceptable to the CAA. These differences will require considerably more practical training for certifying staff who are not familiar with the new techniques and technologies. Some examples of differences may include, but are not limited to, the following elements: Fly by wire, glass cockpit avionics, significant structural differences, etc.~~

~~7. Before grant of the aircraft type, the applicant should be able to:~~

~~(a) demonstrate by knowledge examination a detailed understanding of applicable systems, their operation and maintenance;~~

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

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

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

8. The practical assessment should also 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 trouble shooting, repairs, adjustments (rigging), replacements and functional / operational checks etc including engine operation (ground running) if required.

GM 66.A.45(d) Type/task training and ratings

1. The required duration of practical training must be accepted on a case by case basis by the CAA prior to the type rating endorsement. It is strongly recommended that the agreement on the practical training duration be reached before the training starts. For applicants from a MCAR-145 organisation, the required duration may be approved through the organisation's MOE procedures.

2. While it is not feasible to establish a formula giving the required training duration in all cases, the following may be used as a guideline:

(a) For a first type training course with no recent recorded maintenance experience six months practical training is required.

(b) Some factors that may lead to a reduction in the maximum duration of 6 months practical training required are as follows:

- experience on aircraft type of a similar technology, construction and systems including engines;
- recency on type;
- the quantity of the practical experience. For example experience gained will depend upon the environment e.g. line maintenance environment with one aircraft per week would permit limited experience compared with the constant base maintenance check environment;
- the quality of the practical experience. The type of tasks carried out. These tasks should reflect, at a minimum, those tasks specified by the practical training needs matrix developed by the organisation approved under MCAR-147.

3. The minimum two weeks practical training is normally required for all type training courses. This includes the addition of similar type ratings on a MCAR-66 licence (differences courses). There may be cases where the practical differences training required is less than two weeks for example an engineer with a MCAR-66 type license in category B2 on an Airbus A330 with PW 4000 engines who takes a differences course to an Airbus A330 with Rolls Royce Trent engines.

It should be noted however that while AMC 66.A.45(d) specifies a practical training duration between 2 weeks and 4 months, in the case of a structured OJT performed at line stations, due to the availability of aircraft its duration may need be subsequently extended in order to fulfill the required list of supervised tasks.

4. Except in those cases where the MCAR 147 organisation determines the practical training required it is the responsibility of the maintenance organisation to determine that the duration of practical training is commensurate with the candidates' recency and experience. However, in either case the CAA must satisfy itself that the practical training is of sufficient duration before adding a type rating.

Limited avionics system training should be included in the category B1 type training as the B1 privileges include the replacement of avionic line replaceable units. Electrical systems should be included in both categories type training.

GM 66.A.45(d) and (e) Type/task training and ratings

MCAR 66 Appendix III type training levels are based upon ATA 104 (Air Transport Association) corresponding type training levels.

AMC 66.A.45(e) Type/task training and ratings

Category C certifying staff may not carry out the duties of category B1 or B2, or equivalent within base maintenance, unless they hold the relevant B1 or B2 category and have passed type training corresponding to the relevant B1 or B2 category

AMC 66.A.45(g) Type/task training and ratings

1. "Aircraft types representative of a group" means that:

— for the B1 category the aircraft type should include typical systems and engines relevant to the group (e.g. retractable undercarriage, pressurisation, variable pitch propeller, etc. for the single piston engine metal subgroup) and,

— for the B2 category the aircraft type should include complex avionics systems such as radio coupled autopilot, EFIS (Electronic flight instrument system), flight guidance systems, etc.

2. A "multiple engines" group automatically includes the corresponding "single engine" group.

AMC 66.A.45(h) Type/task training and ratings

1. Type experience should cover an acceptable cross section of tasks from Appendix II. For the first aircraft type of each manufacturer group, at least 50% of the Appendix II tasks, as applicable to the concerned aircraft type and licence category, should be performed. For the second aircraft type of each manufacturer group, this should be reduced to 30%. For subsequent aircraft types of each manufacturer group, this should be reduced to 20%.

2. Type experience should be demonstrated by the submission of records or logbook showing the Appendix II tasks performed by the applicant as specified by the CAA.

GM 66.A.45(f) Type/task training and ratings

The examinations in respect of category B1 or B2 or C aircraft type ratings may be conducted by training organisations appropriately approved under MCAR-147, CAD or an organisation accepted by the CAA to conduct such examination.

MCAR-66.A.50 Limitations

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

(b) For limitations referred to in point 66.A.45, limitations shall be removed upon:
1. demonstration of appropriate experience, or
2. after a satisfactory practical assessment performed by the CAA.

(c) For limitations referred to in point 66.A.70, limitations shall be removed upon satisfactory completion of examination on those modules/subjects defined in the applicable conversion report. ~~referred to in point 66.B.300.~~

AMC 66.A.50(b) Limitations

1. The appropriate experience required to remove the limitations referred in 66.A.45(f) and (g) should consist of the performance of a variety of tasks appropriate to the limitations under the supervision of authorised certifying staff. This should include the tasks required by a scheduled annual inspection. Alternatively, this experience may also be gained, if agreed by the competent authority, by theoretical and practical training provided by the manufacturer, as long as an assessment is further carried out and recorded by this manufacturer.

2. It may be acceptable to have this experience on just one aircraft type, provided this type is representative of the (sub)group in relation to the limitation being removed.

3. The application for the limitation removal should be supported by a record of experience signed by the authorised certifying staff or by an assessment signed by the manufacturer after completion of the applicable theoretical and practical training.

MCAR-66.A.55 Evidence of qualification

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

MCAR-66.A.70 Conversion Provisions

(a) The holder of a valid certifying staff qualification issued by the CAA, prior to the date of entry into force of ~~this~~ MCAR-66 shall be issued an aircraft maintenance licence without further examinations subject to conditions specified by the CAA.

(b) A person undergoing a qualification process approved by the CAA, prior to the date of entry into force of ~~this~~ MCAR-66 may continue to be qualified. The holder of a certifying staff qualification gained following such qualification process shall be issued an aircraft maintenance licence without further examination subject to the conditions specified by the CAA.

(c) Where necessary, the aircraft maintenance licence shall contain ~~technical~~ limitations in ~~relation to the scope of the pre-existing qualification~~ accordance with point 66.A.50 to reflect the differences between (i) the scope of the certifying staff qualification valid in the Maldives ~~Member~~

~~State~~ before the entry into force of MCAR-66 and (ii) the basic knowledge requirements and the basic examination standards laid down in Appendix I and II to MCAR-66.

~~(d) By derogation to paragraph (c) for aircraft not involved in commercial air transport other than large aircraft, the aircraft maintenance licence shall contain limitations in accordance with point 66.A.50 to ensure that the certifying staff privileges valid in the Maldives Member State before the entry into force of MCAR-66 and the privileges of the converted MCAR-66 aircraft maintenance licence remain the same.~~

Commented [AM10]: This for B3 only? All licences converted and same standard was used irrespective of type of operation.

GM 66.A.70 Conversion provisions

1. As described in point 66.A.70, the conversion provisions apply to the holder of a valid certifying staff qualification issued by the CAA ~~valid in a Member State~~ prior to the date of entry into force of MCAR-66. The sentence "the holder of a valid certifying staff qualification issued by the CAA ~~valid in a Member State~~" means any person who had a qualification issued by the CAA ~~valid in the Maldives that Member State~~ allowing that person the performance of activities identical to the privileges of "certifying staff" contained in MCAR-66 ~~Regulation (EC) 2042/2003~~. This means that the signature of that person was sufficient to declare that the maintenance had been properly performed and the aircraft was ready for service and fit for flight in respect to such maintenance.

Commented [a.mohamed11]: 2042/2003 is the full continuing airworthiness package but we have changed to MCAR-66 only. Impact?

~~This should not been mistaken with the responsibilities linked to the airworthiness review, which was performed at different periods (typically varying from 6 months to 3 years) in the national systems. This is an activity which is performed at very specific points of time and not after every maintenance activity. Since an airworthiness review (or equivalent term used in the national systems) is not performed after every maintenance event before the aircraft takes flight, an airworthiness review cannot be considered as a maintenance release. This means that the conversion provisions described in 66.A.70 are not applicable to persons performing airworthiness review functions unless their signature was required after every maintenance event before the aircraft can take flight.~~

Commented [a.mohamed12]: No airworthiness review staff in the Maldives prior to the promulgation of force of MCAR-66

2. The conversion applies to "certifying staff qualifications" such as holding a Maldivian licence (or completed the process to obtain such a licence). ~~, for example:~~

~~- Holding a national licence (or completed the process to obtain such a national licence);~~
~~- Having completed a qualification process defined by the competent authority to become certifying staff;~~
~~- Having completed the qualification requirements for certifying staff within a maintenance organisation, as defined in their procedures.~~

This does not mean that in order to be entitled to a conversion process, the applicant has to be exercising certification privileges. A person may hold a "certifying staff qualification" while not having certification privileges (or while exercising very limited certification privileges below his/her qualification) for different reasons such as, for example, the following:

- The person is working as "support staff" in the base maintenance environment;

- The person has been authorised only for a very limited range of tasks (lower than what he/she would be entitled if his/her qualification is considered) since the person is working in a line station where the scope of tasks is very limited;
- The person holds a licence with a wider scope than the scope of the organisation where he/she is employed;
- The person is working outside the aviation industry or is temporarily on leave due to different reasons (medical, personal, etc).

These persons are entitled to have the conversion performed in accordance with the full scope of their qualification and the full privileges that they would be entitled to hold on the basis of such qualification.

3. As described in point 66.A.70, certifying staff qualifications eligible for conversion are those valid "prior to the date of entry into force of MCAR-66", which means those qualifications valid before 01 January 2007. ~~the following dates:~~

~~- 28 September 2005 for aircraft above 5700 Kg MTOM (ref. EC2042/2003, Article 7, point 3(e));~~
~~- 28 September 2006 for aircraft of 5700 Kg MTOM and below (ref. EC2042/2003, Article 7, point 3(f)).~~

Nevertheless, since the B3 licence did not exist at those dates, certifying staff qualifications eligible for conversion to a B3 licence are those valid before [[EFFECTIVITY DATE]], which is the date where the authority has the obligation to start issuing such licences. ~~in accordance with (EC)2042/2003, Article 7, point 3(h), item (i)~~

~~4. Although only those certifying staff qualifications gained prior to the dates indicated above are eligible for conversion, this does not mean that the application for conversion has to be submitted prior to those dates. The applicant is entitled to have the conversion performed irrespective of when he/she applies for conversion.~~

~~5. A certifying staff qualification can be subject to more than one conversion process and can also be converted to more than one licence (with any applicable limitations). This could be the case, for example, of a person who already had the certifying staff qualification converted to a B1.2licence with limitations linked to some missing elements of the Part-66 Appendix I and II standard(following 66.A.70(c)). This person would be entitled to apply and have his/her certifying staff qualification converted to a B1.2 or a B3 licence on the basis of 66.A.70(d), which would mean no need to compare with the Part-66 Appendix I and II standard, introducing only those limitations required in order to maintain the existing privileges.~~

Commented [a.mohamed13]: Date!

Commented [a.mohamed14]: Conversion ended in the Maldives.

Commented [AM15]: Any need to keep this point?

~~AMC 66.A.70 Conversion provisions~~

~~Technical limitations will be deleted, as appropriate, when the person satisfactorily sits the relevant conversion examination and gains relevant experience.~~

~~Licences issued under MAR-66 will be valid until the expiry date specified on the licence.~~

~~Upon meeting all the requirements for the renewal of the licence, a MCAR-66 licence will be issued to the MAR-66 licence holder.~~

GM 66.A.70(c) Conversion provisions

For example, a ~~technical~~ limitation could be where a person holds a pre-existing certifying staff qualification which covered, to the standard of MCAR-66 Appendix I and II, all the modules/subjects corresponding to the B1 licence except for ~~MCAR-66 licence or authorisation limited to the release of the airframe and engine but not the~~ electrical power systems. This person would be issued ~~with~~ an MCAR-66 aircraft maintenance licence in the B1 category with a limitation (exclusion)~~ding~~ on electrical power systems.

For removal of limitations, refer to 66.A.50(c).

~~**GM 66.A.70(d) Conversion provisions**~~

~~In the case of aircraft not involved in commercial air transport other than large aircraft, an example of limitations could be where a person holds a pre Part-66 qualification which covered privileges to release work performed on aircraft structures, powerplant, mechanical and electrical systems but excluded privileges on aircraft equipped with turbine engine, aircraft above 2000 Kg MTOM, pressurized aircraft and aircraft equipped with retractable landing gear. This person would be issued a Part-66 aircraft maintenance licence in the B1.2 or B3 (sub)category with the following limitations (exclusions):~~

~~- Aircraft involved in commercial air transport (this limitation always exists);~~
~~- Aircraft above 2000 Kg MTOM;~~
~~- Pressurized aircraft;~~
~~- Aircraft equipped with retractable landing gear.~~

~~Another example of limitations could be where a pilot owner holds a pre Part-66 qualification which covered privileges to release work performed on aircraft structures, powerplant, mechanical and electrical systems but limited to his/her own aircraft and limited to a particular aircraft type (for example, a Cessna 172). This pilot owner would receive a Part-66 aircraft maintenance licence in theB1.2 or B3 (sub)category with the following limitations (exclusions):~~

~~- Aircraft involved in commercial air transport (this limitation always exists);~~
~~- Aircraft other than a Cessna 172;~~
~~- Aircraft not owned by the licence holder.~~

~~The essential aspect is that the limitations are established in order to maintain the privileges of the pre Part-66 qualification, without comparing the previous qualification with the standard of Part-66 Appendix I and II.~~

~~For removal of limitations, refer to 66.A.50(c).~~

Commented [AM16]: We need this for B3?

Subpart B — AIRCRAFT OTHER THAN AEROPLANES AND HELICOPTERS

MCAR-66.A.100 General

This subpart is reserved.

Subpart C — COMPONENTS

MCAR-66.A.200 General

This subpart is reserved.

Section B — PROCEDURE FOR CAA

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APPENDICES TO THE REGULATIONS

Appendix I Basic Knowledge Requirements

1. Knowledge levels for Category A, B1, B2, B3 and C Aircraft Maintenance Licence

Basic knowledge for categories A, B1, B2 and B3 are indicated by the allocation of knowledge levels indicators (1, 2 or 3) against each applicable subject. Category C applicants must meet either the category B1 or the category B2 basic knowledge levels.

The knowledge level indicators are defined as follows:

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

Objectives:

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

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

(c) The applicant should be able to use typical terms.

LEVEL 2: A general knowledge of the theoretical and practical aspects of the subject and an ability to apply that knowledge.

Objectives:

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

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

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

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

(e) The applicant should be able to apply his knowledge in a practical manner using detailed procedures.

LEVEL 3: A detailed knowledge of the theoretical and practical aspects of the subject and a capacity to combine and apply the separate elements of knowledge in a logical and comprehensive manner.

Objectives:

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

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

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

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

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

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

2. Modularisation

Qualification on basic subjects for each MCAR-66 aircraft maintenance licence category or subcategory should be in accordance with the following matrix. Applicable subjects are indicated by an 'X':

Subject modules	A or B1 aeroplane with:		A or B1 helicopter with:		B2	B3
	Turbine engine(s)	Piston engine(s)	Turbine engine(s)	Piston engine(s)	Avionics	Piston-engine non-pressurised aeroplanes 2000kg MTOM and below
1	X	X	X	X	X	X
2	X	X	X	X	X	X
3	X	X	X	X	X	X
4	X	X	X	X	X	X
5	X	X	X	X	X	X
6	X	X	X	X	X	X
7A	X	X	X	X	X	
7B						X
8	X	X	X	X	X	X
9A	X	X	X	X	X	
9B						X
10	X	X	X	X	X	X
11A	X	X				
11B		X				
11C						X
12			X	X		

13					X	
14					X	
15	X		X			
16		X		X		X
17A	X	X				
17B						X

MODULE 1. MATHEMATICS

		Level			
		A	B1	B2	B3
1.1	**Arithmetic** Arithmetical terms and signs, methods of multiplication and division, fractions and decimals, factors and multiples, weights, measures and conversion factors, ratio and proportion, averages and percentages, areas and volumes, squares, cubes, square and cube roots.	1	2	2	2
1.2	**Algebra**				
(a)	Evaluating simple algebraic expressions, addition, subtraction, multiplication and division, use of brackets, simple algebraic fractions;	1	2	2	2
(b)	Linear equations and their solutions; Indices and powers, negative and fractional indices; Binary and other applicable numbering systems; Simultaneous equations and second degree equations with one unknown; logarithms;	—	1	1	1
1.3	**Geometry**				
(a)	Simple geometrical constructions;	—	1	1	1
(b)	Graphical representation; nature and uses of graphs, graphs of equations/functions;	2	2	2	2
(c)	Simple trigonometry; trigonometrical relationships, use of tables and rectangular and polar coordinates.	—	2	2	2

MODULE 2. PHYSICS

		Level			
		A	B1	B2	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	1	1	1
2.2	**Mechanics**				
2.2.1	*Statics* Forces, moments and couples, representation as vectors; Centre of gravity. Elements of theory of stress, strain and elasticity: tension, compression, shear and torsion; Nature and properties of solid, fluid and gas; Pressure and buoyancy in liquids (barometers).	1	2	1	1
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); Periodic motion: pendular movement; Simple theory of vibration, harmonics and resonance; Velocity ratio, mechanical advantage and efficiency.	1	2	1	1
2.2.3	*Dynamics*				
(a)	Mass Force, inertia, work, power, energy (potential, kinetic and total energy), heat, efficiency;	1	2	1	1
(b)	Momentum, conservation of momentum; Impulse; Gyroscopic principles; Friction: nature and effects, coefficient of friction (rolling resistance).	1	2	2	1
2.2.4	*Fluid dynamics*				

(a)	Specific gravity and density;	2	2	2	2
(b)	Viscosity, fluid resistance, effects of streamlining; effects of compressibility on fluids; Static, dynamic and total pressure: Bernoulli's Theorem, venturi.	1	2	1	1
2.3	**Thermodynamics**				
(a)	Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin; Heat definition.	2	2	2	2
(b)	Heat capacity, specific heat; Heat transfer: convection, radiation and conduction; Volumetric expansion; First and second law of thermodynamics; Gases: ideal gases laws; specific heat at constant volume and constant pressure, work done by expanding gas; Isothermal, adiabatic expansion and compression, engine cycles, constant volume and constant pressure, refrigerators and heat pumps; Latent heats of fusion and evaporation, thermal energy, heat of combustion.	—	2	2	1
2.4	**Optics (Light)**				
	Nature of light; speed of light; Laws of reflection and refraction: reflection at plane surfaces, reflection by spherical mirrors, refraction, lenses; Fibre optics.	—	2	2	—
2.5	**Wave Motion and Sound**				
	Wave motion: mechanical waves, sinusoidal wave motion, interference phenomena, standing waves; Sound: speed of sound, production of sound, intensity, pitch and quality, Doppler effect.	—	2	2	—

MODULE 3. ELECTRICAL FUNDAMENTALS

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

	Resistor colour code, values and tolerances, preferred values, wattage ratings; Resistors in series and parallel; Calculation of total resistance using series, parallel and series parallel combinations; Operation and use of potentiometers and rheostats; Operation of Wheatstone Bridge.				
(b)	Positive and negative temperature coefficient conductance; Fixed resistors, stability, tolerance and limitations, methods of construction; Variable resistors, thermistors, voltage dependent resistors; Construction of potentiometers and rheostats; Construction of Wheatstone Bridge;	—	1	1	—
3.8	**Power** Power, work and energy (kinetic and potential); Dissipation of power by a resistor; Power formula; Calculations involving power, work and energy.	—	2	2	I
3.9	**Capacitance/Capacitor** Operation and function of a capacitor; Factors affecting capacitance area of plates, distance between plates, number of plates, dielectric and dielectric constant, working voltage, voltage rating; Capacitor types, construction and function; Capacitor colour coding; Calculations of capacitance and voltage in series and parallel circuits; Exponential charge and discharge of a capacitor, time constants; Testing of capacitors.	—	2	2	I
3.10	**Magnetism**				
(a)	Theory of magnetism; Properties of a magnet; Action of a magnet suspended in the Earth's magnetic field; Magnetisation and demagnetisation; Magnetic shielding; Various types of magnetic material; Electromagnets construction and principles of operation; Hand clasp rules to determine: magnetic field around current carrying conductor.	—	2	2	I

(b)	Magnetomotive force, field strength, magnetic flux density, permeability, hysteresis loop, retentivity, coercive force reluctance, saturation point, eddy currents; Precautions for care and storage of magnets.	—	2	2	I
3.11	**Inductance/Inductor** Faraday's Law; Action of inducing a voltage in a conductor moving in a magnetic field; Induction principles; Effects of the following on the magnitude of an induced voltage: magnetic field strength, rate of change of flux, number of conductor turns; Mutual induction; The effect the rate of change of primary current and mutual inductance has on induced voltage; Factors affecting mutual inductance: number of turns in coil, physical size of coil, permeability of coil, position of coils with respect to each other; Lenz's Law and polarity determining rules; Back emf, self induction; Saturation point; Principle uses of inductors;	—	2	2	I
3.12	**DC Motor/Generator Theory** Basic motor and generator theory; Construction and purpose of components in DC generator; Operation of, and factors affecting output and direction of current flow in DC generators; Operation of, and factors affecting output power, torque, speed and direction of rotation of DC motors; Series wound, shunt wound and compound motors; Starter Generator construction.	—	2	2	I
3.13	**AC Theory** Sinusoidal waveform: phase, period, frequency, cycle; Instantaneous, average, root mean square, peak, peak to peak current values and calculations of these values, in relation to voltage, current and power Triangular/Square waves; Single/3 phase principles.	I	2	2	I
3.14	**Resistive (R), Capacitive (C) and Inductive (L) Circuits**	—	2	2	I

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

MODULE 4. ELECTRONIC FUNDAMENTALS

		Level			
		A	B1	B2	B3
4.1	**Semiconductors**				
4.1.1	*Diodes*				
(a)	Diode symbols; Diode characteristics and properties; Diodes in series and parallel; Main characteristics and use of silicon controlled rectifiers (thyristors), light emitting diode, photo conductive diode, varistor, rectifier diodes; Functional testing of diodes.	—	2	2	I
(b)	Materials, electron configuration, electrical properties; P and N type materials: effects of impurities on conduction, majority and minority characters; PN junction in a semiconductor, development of a potential across a PN junction in unbiased, forward biased and reverse biased conditions; Diode parameters: peak inverse voltage, maximum forward current, temperature, frequency, leakage current, power dissipation; Operation and function of diodes in the following circuits: clippers, clampers, full and half wave rectifiers, bridge rectifiers, voltage doublers and triplers; Detailed operation and characteristics of the following devices: silicon controlled rectifier (thyristor), light emitting diode, Schottky diode, photo conductive diode, varactor diode, varistor, rectifier diodes, Zener diode.	—	—	2	—
4.1.2	*Transistors*				
(a)	Transistor symbols; Component description and orientation; Transistor characteristics and properties.	—	1	2	I
(b)	Construction and operation of PNP and NPN transistors; Base, collector and emitter configurations; Testing of transistors. Basic appreciation of other transistor types and their uses. Application of transistors: classes of amplifier (A, B, C); Simple circuits including: bias, decoupling, feedback and stabilisation;	—	—	2	—

	Multistage circuit principles: cascades, push-pull, oscillators, multivibrators, flip-flop circuits.				
4.1.3	*Integrated Circuits*				
(a)	Description and operation of logic circuits and linear circuits/operational amplifiers.	—	1	—	1
(b)	Description and operation of logic circuits and linear circuits; Introduction to operation and function of an operational amplifier used as: integrator, differentiator, voltage follower, comparator; Operation and amplifier stages connecting methods: resistive capacitive, inductive (transformer), inductive resistive(IR), direct; Advantages and disadvantages of positive and negative feedback.	—	—	2	—
4.2	**Printed Circuit Boards** Description and use of printed circuit boards.	—	1	2	—
4.3	**Servomechanisms**				
(a)	Understanding of the following terms: Open and closed loop systems, feedback, follow up, analogue transducers; Principles of operation and use of the following synchro system components/features: resolvers, differential, control and torque, transformers, inductance and capacitance transmitters.	—	1	—	—
(b)	Understanding of the following terms: Open and closed loop, follow up, servomechanism, analogue, transducer, null, damping, feedback, deadband; Construction operation and use of the following synchro system components: resolvers, differential, control and torque, E and I transformers, inductance transmitters, capacitance transmitters, synchronous transmitters; Servomechanism defects, reversal of synchro leads, hunting.	—	—	2	—

MODULE 5. DIGITAL TECHNIQUES / ELECTRONIC INSTRUMENT SYSTEMS

		Level				
		A	B1.1 B1.3	B1.2 B1.4	B2	B3
5.1	**Electronic Instrument Systems** Typical systems arrangements and cockpit layout of electronic instrument systems.	1	2	2	3	1
5.2	**Numbering Systems** Numbering systems: binary, octal and hexadecimal; Demonstration of conversions between the decimal and binary, octal and hexadecimal systems and vice versa.	—	1	—	2	—
5.3	**Data Conversion** Analogue Data, Digital Data; Operation and application of analogue to digital, and digital to analogue converters, inputs and outputs, limitations of various types.	—	1	—	2	—
5.4	**Data Buses** Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications. Aircraft Network / Ethernet.	—	2	—	2	—
5.5	**Logic Circuits**					
(a)	Identification of common logic gate symbols, tables and equivalent circuits; Applications used for aircraft systems, schematic diagrams.	—	2	—	2	1
(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);	1	2	—	—	—

	Computer technology (as applied in aircraft systems).					
(b)	Computer related terminology; Operation, layout and interface of the major components in a micro computer including their associated bus systems; Information contained in single and multiaddress instruction words; Memory associated terms; Operation of typical memory devices; Operation, advantages and disadvantages of the various data storage systems.	—	—	—	2	—
5.7	**Microprocessors** Functions performed and overall operation of a microprocessor; Basic operation of each of the following microprocessor elements: control and processing unit, clock, register, arithmetic logic unit.	—	—	—	2	—
5.8	**Integrated Circuits** Operation and use of encoders and decoders; Function of encoder types; Uses of medium, large and very large scale integration.	—	—	—	2	—
5.9	**Multiplexing** Operation, application and identification in logic diagrams of multiplexers and demultiplexers.	—	—	—	2	—
5.10	**Fibre Optics** Advantages and disadvantages of fibre optic data transmission over electrical wire propagation; Fibre optic data bus; Fibre optic related terms; Terminations; Couplers, control terminals, remote terminals; Application of fibre optics in aircraft systems.	—	1	1	2	—
5.11	**Electronic Displays** Principles of operation of common types of displays used in modern aircraft, including	—	2	—	2	1

	Cathode Ray Tubes, Light Emitting Diodes and Liquid Crystal Display.					
5.12	**Electrostatic Sensitive Devices** Special handling of components sensitive to electrostatic discharges; Awareness of risks and possible damage, component and personnel anti-static protection devices.	1	2	2	2	I
5.13	**Software Management Control** Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programmes.	—	2	1	2	I
5.14	**Electromagnetic Environment** Influence of the following phenomena on maintenance practices for electronic system: EMC-Electromagnetic Compatibility EMI-Electromagnetic Interference HIRF-High Intensity Radiated Field Lightning/lightning protection	—	2	2	2	I
5.15	**Typical Electronic/Digital Aircraft Systems** General arrangement of typical electronic/digital aircraft systems and associated BITE (Built In Test Equipment) testing such as: ACARS-ARINC Communication and Addressing and Reporting System ECAM-Electronic Centralised Aircraft Monitoring EFIS-Electronic Flight Instrument System EICAS-Engine Indication and Crew Alerting System FBW-Fly by Wire FMS-Flight Management System GPS-Global Positioning System IRS-Inertial Reference System TCAS-Traffic Alert Collision Avoidance System Integrated Modular Avionics Cabin Systems Information Systems	—	2	2	2	I

MODULE 6. MATERIALS AND HARDWARE

		Level			
		A	B1	B2	B3
6.1	**Aircraft Materials — Ferrous**				
(a)	Characteristics, properties and identification of common alloy steels used in aircraft; Heat treatment and application of alloy steels;	1	2	1	2
(b)	Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.	—	1	1	1
6.2	**Aircraft Materials — Non-Ferrous**				
(a)	Characteristics, properties and identification of common non-ferrous materials used in aircraft; Heat treatment and application of non-ferrous materials;	1	2	1	2
(b)	Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.	—	1	1	1
6.3	**Aircraft Materials — Composite and Non-Metallic**				
6.3.1	*Composite and non-metallic other than wood and fabric*				
(a)	Characteristics, properties and identification of common composite and non-metallic materials, other than wood, used in aircraft; Sealant and bonding agents.	1	2	2	2
(b)	The detection of defects/deterioration in composite and non-metallic material. Repair of composite and non-metallic material.	1	2	—	2
6.3.2	*Wooden structures* Construction methods of wooden airframe structures; Characteristics, properties and types of wood and glue used in aeroplanes; Preservation and maintenance of wooden structure; Types of defects in wood material and wooden structures; The detection of defects in wooden structure; Repair of wooden structure.	1	2	—	2
6.3.3	*Fabric covering*	1	2	—	2

	Characteristics, properties and types of fabrics used in aeroplanes; Inspections methods for fabric; Types of defects in fabric; Repair of fabric covering.				
6.4	*Corrosion*				
(a)	Chemical fundamentals; Formation by, galvanic action process, microbiological, stress;	1	1	1	1
(b)	Types of corrosion and their identification; Causes of corrosion; Material types, susceptibility to corrosion.	2	3	2	2
6.5	**Fasteners**				
6.5.1	*Screw threads* Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; Measuring screw threads;	2	2	2	2
6.5.2	*Bolts, studs and screws* Bolt types: specification, identification and marking of aircraft bolts, international standards; Nuts: self locking, anchor, standard types; Machine screws: aircraft specifications; Studs: types and uses, insertion and removal; Self tapping screws, dowels.	2	2	2	2
6.5.3	*Locking devices* Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick release fasteners, keys, circlips, cotter pins.	2	2	2	2
6.5.4	*Aircraft rivets* Types of solid and blind rivets: specifications and identification, heat treatment.	1	2	1	2
6.6	**Pipes and Unions**				

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

MODULE 7A. MAINTENANCE PRACTICES

		Level		
		A	B1	B2
7.1	**Safety Precautions — Aircraft and Workshop** Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals. Also, instruction in the remedial action to be taken in the event of a fire or another accident with one or more of these hazards including knowledge on extinguishing agents.	3	3	3
7.2	**Workshop Practices** Care of tools, control of tools, use of workshop materials; Dimensions, allowances and tolerances, standards of workmanship; Calibration of tools and equipment, calibration standards.	3	3	3
7.3	**Tools** Common hand tool types; Common power tool types; Operation and use of precision measuring tools; Lubrication equipment and methods. Operation, function and use of electrical general test equipment;	3	3	3
7.4	**Avionic General Test Equipment** Operation, function and use of avionic general test equipment.	—	2	3
7.5	**Engineering Drawings, Diagrams and Standards** Drawing types and diagrams, their symbols, dimensions, tolerances and projections; Identifying title block information; Microfilm, microfiche and computerised presentations; Specification 100 of the Air Transport Association (ATA) of America; Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL; Wiring diagrams and schematic diagrams.	1	2	2
7.6	**Fits and Clearances** Drill sizes for bolt holes, classes of fits;	1	2	1

	Common system of fits and clearances; Schedule of fits and clearances for aircraft and engines; Limits for bow, twist and wear; Standard methods for checking shafts, bearings and other parts.			
7.7	**Electrical Wiring Interconnections Systems (EWIS) ~~Cables and Connectors~~** Continuity, insulation and bonding techniques and testing; Use of crimp tools: hand and hydraulic operated; Testing of crimp joints; Connector pin removal and insertion; Co-axial cables: testing and installation precautions; Identification of wire types, their inspection criteria and damage tolerance. Wiring protection techniques: Cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding. EWIS installations, inspection, repair, maintenance and cleanliness standards.	1	2	2
7.8	**Riveting** Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.	1	2	—
7.9	**Pipes and Hoses** Bending and belling/flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes.	1	2	—
7.10	**Springs** Inspection and testing of springs.	1	2	—
7.11	**Bearings** Testing, cleaning and inspection of bearings; Lubrication requirements of bearings; Defects in bearings and their causes.	1	2	—
7.12	**Transmissions** Inspection of gears, backlash; Inspection of belts and pulleys, chains and sprockets; Inspection of screw jacks, lever devices, push-pull rod systems.	1	2	—

7.13	**Control Cables** Swaging of end fittings; Inspection and testing of control cables; Bowden cables; aircraft flexible control systems.	1	2	—
7.14	**Material handling**			
7.14.1	*Sheet Metal* Marking out and calculation of bend allowance; Sheet metal working, including bending and forming; Inspection of sheet metal work.	—	2	—
7.14.2	*Composite and non-metallic* Bonding practices; Environmental conditions Inspection methods	—	2	—
7.15	**Welding, Brazing, Soldering and Bonding**			
(a)	Soldering methods; inspection of soldered joints.	—	2	2
(b)	Welding and brazing methods; Inspection of welded and brazed joints; Bonding methods and inspection of bonded joints.	—	2	—
7.16	**Aircraft Weight and Balance**			
(a)	Centre of Gravity/Balance limits calculation: use of relevant documents;	—	2	2
(b)	Preparation of aircraft for weighing; Aircraft weighing;	—	2	—
7.17	**Aircraft Handling and Storage** Aircraft taxiing/towing and associated safety precautions; Aircraft jacking, chocking, securing and associated safety precautions; Aircraft storage methods; Refuelling/defuelling procedures; De-icing/anti-icing procedures; Electrical, hydraulic and pneumatic ground supplies. Effects of environmental conditions on aircraft handling and operation.	2	2	2

7.18	**Disassembly, Inspection, Repair and Assembly Techniques**			
(a)	Types of defects and visual inspection techniques. Corrosion removal, assessment and reprotection.	2	3	2
(b)	General repair methods, Structural Repair Manual; Ageing, fatigue and corrosion control programmes;	—	2	—
(c)	Non destructive inspection techniques including, penetrant, radiographic, eddy current, ultrasonic and boroscope methods.	—	2	1
(d)	Disassembly and re-assembly techniques.	2	2	2
(e)	Trouble shooting techniques	—	2	2
7.19	**Abnormal Events**			
(a)	Inspections following lightning strikes and HIRF penetration.	2	2	2
(b)	Inspections following abnormal events such as heavy landings and flight through turbulence.	2	2	—
7.20	**Maintenance Procedures** Maintenance planning; Modification procedures; Stores procedures; Certification/release procedures; Interface with aircraft operation; Maintenance Inspection/Quality Control/Quality Assurance; Additional maintenance procedures. Control of life limited components	1	2	2

MODULE 7B. MAINTENANCE PRACTICES

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

	Level B3
7.1 Safety Precautions — Aircraft and Workshop	3
Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals. Also, instruction in the remedial action to be taken in the event of a fire or another accident with one or more of these hazards including knowledge on extinguishing agents.	
7.2 Workshop Practices	3
Care of tools, control of tools, use of workshop materials; Dimensions, allowances and tolerances, standards of workmanship; Calibration of tools and equipment, calibration standards.	
7.3 Tools	3
Common hand tool types; Common power tool types; Operation and use of precision measuring tools; Lubrication equipment and methods. Operation, function and use of electrical general test equipment;	
7.4 Avionic General Test Equipment	3
Operation, function and use of avionic general test equipment.	
7.5 Engineering Drawings, Diagrams and Standards	2
Drawing types and diagrams, their symbols, dimensions, tolerances and projections; Identifying title block information; Microfilm, microfiche and computerised presentations; Specification 100 of the 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	2
Drill sizes for bolt holes, classes of fits; Common system of fits and clearances; Schedule of fits and clearances for aircraft and engines;	

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	Limits for bow, twist and wear; Standard methods for checking shafts, bearings and other parts.	
7.7 Electrical Cables and Connectors		2
	Continuity, insulation and bonding techniques and testing; Use of crimp tools: hand and hydraulic operated; Testing of crimp joints; Connector pin removal and insertion; Co-axial cables: testing and installation precautions; Wiring protection techniques: Cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding.	
7.8 Riveting		2
	Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.	
7.9 Pipes and Hoses		2
	Bending and belling/flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes.	
7.10 Springs		1
	Inspection and testing of springs.	
7.11 Bearings		2
	Testing, cleaning and inspection of bearings; Lubrication requirements of bearings; Defects in bearings and their causes.	
7.12 Transmissions		2
	Inspection of gears, backlash; Inspection of belts and pulleys, chains and sprockets; Inspection of screw jacks, lever devices, push-pull rod systems.	
7.13 Control Cables		2
	Swaging of end fittings; Inspection and testing of control cables; Bowden cables; aircraft flexible control systems.	
7.14 Material handling		

7.14.1 Sheet Metal		2
	Marking out and calculation of bend allowance; Sheet metal working, including bending and forming; Inspection of sheet metal work.	
7.14.2 Composite and non-metallic		2
	Bonding practices; Environmental conditions Inspection methods	
7.15 Welding, Brazing, Soldering and Bonding		
(a)	Soldering methods; inspection of soldered joints.	2
(b)	Welding and brazing methods; Inspection of welded and brazed joints; Bonding methods and inspection of bonded joints.	2
7.16 Aircraft Weight and Balance		
(a)	Centre of Gravity/Balance limits calculation: use of relevant documents;	2
(b)	Preparation of aircraft for weighing; Aircraft weighing;	2
7.17 Aircraft Handling and Storage		2
	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.	
7.18 Disassembly, Inspection, Repair and Assembly Techniques		
(a)	Types of defects and visual inspection techniques. Corrosion removal, assessment and reprotection.	3
(b)	General repair methods, Structural Repair Manual; Ageing, fatigue and corrosion control programmes;	2

(c)	Non destructive inspection techniques including, penetrant, radiographic, eddy current, ultrasonic and boroscope methods.	2
(d)	Disassembly and re-assembly techniques.	2
(e)	Trouble shooting techniques	2
7.19	**Abnormal Events**	
(a)	Inspections following lightning strikes and HIRF penetration.	2
(b)	Inspections following abnormal events such as heavy landings and flight through turbulence.	2
7.20	**Maintenance Procedures**	2
	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	

MODULE 8. BASIC AERODYNAMICS

		Level			
		A	B1	B2	B3
8.1	**Physics of the Atmosphere** International Standard Atmosphere (ISA), application to aerodynamics.	1	2	2	1
8.2	**Aerodynamics** Airflow around a body; Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, upwash and downwash, vortices, stagnation; The terms: camber, chord, mean aerodynamic chord, profile (parasite) drag, induced drag, centre of pressure, angle of attack, wash in and wash out, fineness ratio, wing shape and aspect ratio; Thrust, Weight, Aerodynamic Resultant; Generation of Lift and Drag: Angle of Attack, Lift coefficient, Drag coefficient, polar curve, stall; Aerofoil contamination including ice, snow, frost.	1	2	2	1
8.3	**Theory of Flight** Relationship between lift, weight, thrust and drag; Glide ratio; Steady state flights, performance; Theory of the turn; Influence of load factor: stall, flight envelope and structural limitations; Lift augmentation.	1	2	2	1
8.4	**Flight Stability and Dynamics** Longitudinal, lateral and directional stability (active and passive).	1	2	2	1

MODULE 9A. HUMAN FACTORS

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

	Physical work; Repetitive tasks; Visual inspection; Complex systems.			
9.7	**Communication** Within and between teams; Work logging and recording; Keeping up to date, currency; Dissemination of information.	2	2	2
9.8	**Human Error** Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e accidents) Avoiding and managing errors.	1	2	2
9.9	**Hazards in the Workplace** Recognising and avoiding hazards; Dealing with emergencies.	1	2	2

MODULE 9B. HUMAN FACTORS

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

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

9.6	**Tasks** Physical work; Repetitive tasks; Visual inspection; Complex systems.	1
9.7	**Communication** Within and between teams; Work logging and recording; Keeping up to date, currency; Dissemination of information.	2
9.8	**Human Error** Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e accidents) Avoiding and managing errors.	2
9.9	**Hazards in the Workplace** Recognising and avoiding hazards; Dealing with emergencies.	2

MODULE 10. AVIATION LEGISLATION

		Level			
		A	B1	B2	B3
10.1	**Regulatory Framework** Role of International Civil Aviation Organisation; Role of CAA and general understanding of civil aviation regulations; Relationship between MCAR-145, MCAR-66, MCAR-147, MCAR-21, MCAR- M and MCAR-OPS 1; Relationship with other Aviation Authorities.	1	1	1	1
10.2	**Certifying Staff - Maintenance** Detailed understanding of MCAR-66.	2	2	2	2
10.3	**Approved Maintenance Organisations** Detailed understanding of MCAR-145 and MCAR-M Subpart F.	2	2	2	2
10.4	**Operation of Aircraft** Air Operators Certificates; Operators responsibilities, in particular regarding continuing airworthiness and maintenance; Aircraft Maintenance Programme; MEL/CDL; Documents to be carried on board; Aircraft placarding (markings);	1	1	1	1
10.5	**~~Aircraft~~ Certification of aircraft, parts and appliances**				
(a)	*General* Certification rules; Type Certification; Supplemental Type Certification; MCAR-21 Design/Production Organisation Approvals.	—	1	1	1
(b)	*Documents* Certificate of Airworthiness and ~~restricted certificates of airworthiness and~~ permit to fly; Certificate of Registration; Noise Certificate; Weight Schedule;	—	2	2	2

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	Radio Station Licence and Approval.				
10.6	**Continuing Airworthiness**	2	2	2	
	Detailed understanding of MCAR-21 provisions related to continuing airworthiness Detailed understanding of MCAR-M.				
10.7	**~~Other~~ Applicable National and International Requirements for**				
(a)	(Reserved)~~ Maintenance Programmes, Maintenance checks and inspections~~; ~~Master Minimum Equipment Lists, Minimum Equipment List, Dispatch Deviation Lists; Mandatory Aircraft Equipment~~ ~~Airworthiness Directives;~~ ~~Service Bulletins, manufacturers service information;~~ ~~Modifications and repairs;~~ ~~Maintenance documentation: maintenance manuals, structural repair manual, illustrated parts catalogue, etc.;~~	~~1~~	~~2~~	~~2~~	~~2~~
(b)	Continuing airworthiness; Minimum equipment requirements - Test flights; ETOPS, maintenance and dispatch requirements; All Weather Operations, Category 2/3 operations. ~~and minimum equipment requirements.~~ PBN RVSM SMS / SSP	—	1	1	1

MODULE 11A. TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

	Level	
	A1	B1.1
11.1 Theory of Flight		
11.1.1 Aeroplane Aerodynamics and Flight Controls	1	2
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;	—	—
11.1.2 High Speed Flight	1	2
Speed of sound, subsonic flight, transonic flight, supersonic flight, Mach number, critical Mach number, compressibility buffet, shock wave, aerodynamic heating, area rule; Factors affecting airflow in engine intakes of high speed aircraft; Effects of sweepback on critical Mach number.		
11.2 Airframe Structures — General Concepts		
(a) Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision. Aircraft bonding	2	2
(b) Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor	1	2

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	structures, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments; Structure assembly techniques: riveting, bolting, bonding; Methods of surface protection, such as chromating, anodising, painting; Surface cleaning; Airframe symmetry: methods of alignment and symmetry checks.		
11.3	**Airframe Structures — Aeroplanes**		
11.3.1	*Fuselage (ATA 52/53/56)*	1	2
	Construction and pressurisation sealing; Wing, stabiliser, pylon and undercarriage attachments; Seat installation and cargo loading system; Doors and emergency exits: construction, mechanisms, operation and safety devices; Windows and windscreen construction and mechanisms.		
11.3.2	*Wings (ATA 57)*	1	2
	Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.		
11.3.3	*Stabilisers (ATA 55)*	1	2
	Construction; Control surface attachment.		
11.3.4	*Flight Control Surfaces (ATA 55/57)*	1	2
	Construction and attachment; Balancing — mass and aerodynamic.		
11.3.5	*Nacelles/Pylons (ATA 54)*	1	2
	Nacelles/Pylons: - Construction, - Firewalls, - Engine mounts.	—	—
11.4	**Air Conditioning and Cabin Pressurisation (ATA21)**		
11.4.1	*Air supply*	1	2
	Sources of air supply including engine bleed, APU and ground cart;		
11.4.2	*Air Conditioning*	1	3

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	Air conditioning systems; Air cycle and vapour cycle machines; Distribution systems; Flow, temperature and humidity control system.		
11.4.3	*Pressurisation*	1	3
	Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers.		
11.4.4	*Safety and warning devices*	1	3
	Protection and warning devices.		
11.5	**Instruments/Avionic Systems**		
11.5.1	*Instrument Systems (ATA 31)*	1	2
	Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Angle of attack indication, stall warning systems; Other aircraft system indication.		
11.5.2	*Avionic Systems*	1	1
	Fundamentals of system lay-outs and operation of; - Auto Flight (ATA 22); - Communications (ATA 23); - Navigation Systems (ATA 34).	—	—
11.6	**Electrical Power (ATA 24)**	1	3
	Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection. External/Ground power;		
11.7	**Equipment and Furnishings (ATA 25)**		

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(a)	Emergency equipment requirements; Seats, harnesses and belts.	2	2
(b)	Cabin lay-out; Equipment lay-out; Cabin Furnishing Installation; Cabin entertainment equipment; Galley installation; Cargo handling and retention equipment; Airstairs.	1	1
11.8	**Fire Protection (ATA 26)**		
(a)	Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.	1	3
(b)	Portable fire extinguisher	1	1
11.9	**Flight Controls (ATA 27)** Primary controls: aileron, elevator, rudder, spoiler; Trim control; Active load control; High lift devices; Lift dump, speed brakes; System operation: manual, hydraulic, pneumatic, electrical, fly-by- wire; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks systems; Balancing and rigging; Stall protection / warning system.	1	3
11.10	**Fuel Systems (ATA 28)** System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling; Longitudinal balance fuel systems.	1	3
11.11	**Hydraulic Power (ATA 29)** System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic;	1	3

Emergency pressure generation; Filters; Pressure Control; Power distribution; Indication and warning systems; Interface with other systems.		
11.12 Ice and Rain Protection (ATA 30)	1	3
Ice formation, classification and detection; Anti-icing systems: electrical, hot air and chemical; De-icing systems: electrical, hot air, pneumatic and chemical; Rain repellant; Probe and drain heating. Wiper systems		
11.13 Landing Gear (ATA 32)	2	3
Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering; Air-ground sensing.		
11.14 Lights (ATA 33)	2	3
External: navigation, anti-collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.		
11.15 Oxygen (ATA 35)	1	3
System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings;		
11.16 Pneumatic/Vacuum (ATA 36)	1	3
System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.		
11.17 Water/Waste (ATA 38)	2	3

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Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing; Corrosion aspects.		
11.18 On Board Maintenance Systems (ATA 45)	1	2
Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).		
11.19 Integrated Modular Avionics (ATA 42)	1	2
Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc. Core System; Network Components;		
11.20 Cabin Systems (ATA 44)	1	2
The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service). Includes voice, data, music and video transmissions.		
The Cabin Intercommunication Data System provides an interface between cockpit/cabin crew and cabin systems. These systems support data exchange of the different related LRU's and they are typically operated via Flight Attendant Panels.		
The Cabin Network Service typically consists on a server, typically interfacing with, among others, the following systems: - Data/Radio Communication, In-Flight Entertainment System.	—	—
The Cabin Network Service may host functions such as: - Access to pre-departure/departure reports, - E-mail/intranet/internet access, - Passenger database,	—	—

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Cabin Core System; In-flight Entertainment System; External Communication System; Cabin Mass Memory System; Cabin Monitoring System; Miscellaneous Cabin System.		
11.21 Information Systems (ATA 46)	1	2
The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display. Typical examples include Air Traffic and Information Management Systems and Network Server Systems Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.		

MODULE 11B. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

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

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

	Level	
	A2	B1.2
11.1 Theory of Flight		
11.1.1 Aeroplane Aerodynamics and Flight Controls	1	2
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;	—	—
11.1.2 High Speed Flight – N/A	—	—
11.2 Airframe Structures — General Concepts		
(a) Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision. Aircraft bonding	2	2
(b) Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments;	1	2

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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 (ATA 52/53/56)	1	2
Construction and pressurisation sealing; Wing, tail-plane, pylon and undercarriage attachments; Seat installation; Doors and emergency exits: construction and operation; Windows and windscreen attachment.		
11.3.2 Wings (ATA 57)	1	2
Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.		
11.3.3 Stabilisers (ATA 55)	1	2
Construction; Control surface attachment.		
11.3.4 Flight Control Surfaces (ATA 55/57)	1	2
Construction and attachment; Balancing — mass and aerodynamic.		
11.3.5 Nacelles/Pylons (ATA 54)	1	2
Nacelles/Pylons: - Construction, - Firewalls, - Engine mounts.	—	—
11.4 Air Conditioning and Cabin Pressurisation (ATA21)		
Pressurisation and air conditioning systems; Cabin pressure controllers, protection and warning devices; Heating systems.	1	3
11.5 Instruments/Avionic Systems		
11.5.1 Instrument Systems (ATA 31)	1	2

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	Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Angle of attack indication, stall warning systems; Glass cockpit; Other aircraft system indication.		
11.5.2	*Avionic Systems*	1	1
	Fundamentals of system lay-outs and operation of; - Auto Flight (ATA 22); - Communications (ATA 23); - Navigation Systems (ATA 34).	—	—
11.6	**Electrical Power (ATA 24)**	1	3
	Batteries Installation and Operation; DC power generation; Voltage regulation; Power distribution; Circuit protection. Inverters, transformers;		
11.7	**Equipment and Furnishings (ATA 25)**		
(a)	Emergency equipment requirements; Seats, harnesses and belts.	2	2
(b)	Cabin lay-out; Equipment lay-out; Cabin Furnishing Installation; Cabin entertainment equipment; Galley installation; Cargo handling and retention equipment; Airstairs.	1	1
11.8	**Fire Protection (ATA 26)**		
(a)	Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.	1	3
(b)	Portable fire extinguisher	1	3
11.9	**Flight Controls (ATA 27)**	1	3
	Primary controls: aileron, elevator, rudder, spoiler; Trim control;		

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

11.15 Oxygen (ATA 35)	1	3
System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings;		
11.16 Pneumatic/Vacuum (ATA 36)	1	3
System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.		
11.17 Water/Waste (ATA 38)	2	3
Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing; Corrosion aspects.		

MODULE 11C. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

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

	Level B3
11.1 Theory of Flight	
Aeroplane Aerodynamics and Flight Controls	1
Operation and effect of: — roll control: ailerons; — pitch control: elevators, stabilators, variable incidence stabilisers and canards; — yaw control, rudder limiters; Control using elevons, ruddervators; High lift devices, slots, slats, flaps, flaperons; Drag inducing devices, lift dumpers, speed brakes; Effects of wing fences, saw tooth leading edges; Boundary layer control using, vortex generators, stall wedges or leading edge devices; Operation and effect of trim tabs, balance and anti-balance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels.	—
11.2 Airframe Structures — General Concepts	
(a) Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision. Aircraft bonding	2
(b) Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments; Structure assembly techniques: riveting, bolting, bonding; Methods of surface protection, such as chromating, anodising, painting; Surface cleaning.	2

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Airframe symmetry: methods of alignment and symmetry checks.	
11.3 Airframe Structures — Aeroplanes	
11.3.1 Fuselage (ATA 52/53/56)	I
Construction; Wing, tail-plane, pylon and undercarriage attachments; Seat installation; Doors and emergency exits: construction and operation; Windows and windscreen attachment.	
11.3.2 Wings (ATA 57)	I
Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.	
11.3.3 Stabilisers (ATA 55)	I
Construction; Control surface attachment.	
11.3.4 Flight Control Surfaces (ATA 55/57)	I
Construction and attachment; Balancing — mass and aerodynamic.	
11.3.5 Nacelles/Pylons (ATA 54)	I
Nacelles/Pylons: - Construction, - Firewalls, - Engine mounts.	
11.4 Air Conditioning and Cabin Pressurisation (ATA21)	
Heating and ventilation systems.	I
11.5 Instruments/Avionic Systems	
11.5.1 Instrument Systems (ATA 31)	I
Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Angle of attack indication, stall warning systems; Glass cockpit;	

Other aircraft system indication.	
11.5.2 Avionic Systems	1
Fundamentals of system lay-outs and operation of: - Auto Flight (ATA 22); - Communications (ATA 23); - Navigation Systems (ATA 34).	
11.6 Electrical Power (ATA 24)	2
Batteries Installation and Operation; DC power generation; Voltage regulation; Power distribution; Circuit protection. Inverters, transformers;	
11.7 Equipment and Furnishings (ATA 25)	2
Emergency equipment requirements; Seats, harnesses and belts.	
11.8 Fire Protection (ATA 26)	2
Portable fire extinguisher	
11.9 Flight Controls (ATA 27)	3
Primary controls: aileron, elevator, rudder, spoiler; Trim tabs; High lift devices; System operation: manual; Gust locks; Balancing and rigging; Stall warning system.	
11.10 Fuel Systems (ATA 28)	2
System lay-out; Fuel tanks; Supply systems; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling.	
11.11 Hydraulic Power (ATA 29)	2
System lay-out;	

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Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical; Filters; Pressure Control; Power distribution; Indication and warning systems;	
11.12 Ice and Rain Protection (ATA 30)	1
Ice formation, classification and detection; De-icing systems: electrical, hot air, pneumatic and chemical; Probe and drain heating. Wiper systems	
11.13 Landing Gear (ATA 32)	2
Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering.	
11.14 Lights (ATA 33)	2
External: navigation, anti-collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	
11.15 Oxygen (ATA 35)	2
System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings;	
11.16 Pneumatic/Vacuum (ATA 36)	2
System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure and vacuum pumps Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	

MODULE 12. HELICOPTER AERODYNAMICS, STRUCTURES AND SYSTEMS

	Level	
	A3 A4	B1.3 B1.4
12.1 Theory of Flight — Rotary Wing Aerodynamics Terminology; Effects of gyroscopic precession; Torque reaction and directional control; Dissymmetry of lift, Blade tip stall; Translating tendency and its correction; Coriolis effect and compensation; Vortex ring state, power settling, overpitching; Auto-rotation; Ground effect.	1	2
12.2 Flight Control Systems Cyclic control; Collective control; Swashplate; Yaw control: Anti-Torque Control, Tail rotor, bleed air; Main Rotor Head: Design and Operation features; Blade Dampers: Function and construction; Rotor Blades: Main and tail rotor blade construction and attachment; Trim control, fixed and adjustable stabilisers; System operation: manual, hydraulic, electrical and fly-by- wire; Artificial feel; Balancing and Rigging.	2	3
12.3 Blade Tracking and Vibration Analysis Rotor alignment; Main and tail rotor tracking; Static and dynamic balancing; Vibration types, vibration reduction methods; Ground resonance.	1	3
12.4 Transmissions 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; System installation provisions; Lightning strike protection provision.	2	2
(b)	Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning and anti-corrosive protection. Pylon, stabiliser and undercarriage attachments; Seat installation; Doors: construction, mechanisms, operation and safety devices; Windows and windscreen construction; Fuel storage; Firewalls; Engine mounts; Structure assembly techniques: riveting, bolting, bonding; Methods of surface protection, such as chromating, anodising, painting; Surface cleaning. Airframe symmetry: methods of alignment and symmetry checks.	1	2
12.6	**Air Conditioning (ATA 21)**		
12.6.1	*Air supply* Sources of air supply including engine bleed and ground cart;	1	2
12.6.2	*Air Conditioning* Air conditioning systems; Distribution systems; Flow and temperature control systems; Protection and warning devices.	1	3
12.7	**Instruments/Avionic Systems**		
12.7.1	*Instrument Systems (ATA 31)* Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Vibration indicating systems — HUMS;	1	2

	Glass cockpit; Other aircraft system indication.		
12.7.2	*Avionic Systems*	1	1
	Fundamentals of system layouts and operation of: Auto Flight (ATA 22); Communications (ATA 23); Navigation Systems (ATA 34).		
12.8	**Electrical Power (ATA 24)**	1	3
	Batteries Installation and Operation; DC power generation, AC power generation; Emergency power generation; Voltage regulation, Circuit protection. Power distribution; Inverters, transformers, rectifiers; External/Ground power.		
12.9	**Equipment and Furnishings (ATA 25)**		
(a)	Emergency equipment requirements; Seats, harnesses and belts; Lifting systems.	2	2
(b)	Emergency flotation systems; Cabin lay-out, cargo retention; Equipment lay-out; Cabin Furnishing Installation.	1	1
12.10	**Fire Protection (ATA 26)**	1	3
	Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.		
12.11	**Fuel Systems (ATA 28)**	1	3
	System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling.		
12.12	**Hydraulic Power (ATA 29)**	1	3

System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation; Filters; Pressure Control; Power distribution; Indication and warning systems; Interface with other systems.		
12.13 Ice and Rain Protection (ATA 30)	1	3
Ice formation, classification and detection; Anti-icing and de-icing systems: electrical, hot air and chemical; Rain repellant and removal; Probe and drain heating; Wiper system.		
12.14 Landing Gear (ATA 32)	2	3
Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, tyres, brakes; Steering; Air-ground sensing; Skids, floats.		
12.15 Lights (ATA 33)	2	3
External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.		
12.16 Pneumatic/Vacuum (ATA 36)	1	3
System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.		
12.17 Integrated Modular Avionics (ATA 42)	1	2
Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others:		

Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc.		
Core System; Network Components.		
12.18 On Board Maintenance Systems (ATA 45)	1	2
Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).		
12.19 Information Systems (ATA 46)	1	2
The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display.		
Typical examples include Air Traffic and Information Management Systems and Network Server Systems		
Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.		

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS

		Level
		B2
13.1	**Theory of Flight**	
(a)	Aeroplane Aerodynamics and Flight Controls Operation and effect of: — roll control: ailerons and spoilers; — pitch control: elevators, stabilators, variable incidence stabilisers and canards; — yaw control, rudder limiters; Control using elevons, ruddervators; High lift devices: slots, slats, flaps; Drag inducing devices: spoilers, lift dumpers, speed brakes; Operation and effect of trim tabs, servo tabs, control surface bias.	1
(b)	High Speed Flight Speed of sound, subsonic flight, transonic flight, supersonic flight, Mach number, critical Mach number.	1
(c)	Rotary Wing Aerodynamics Terminology; Operation and effect of cyclic, collective and anti-torque controls.	1
13.2	**Structures — General Concepts**	
(a)	Fundamentals of structural systems.	1
(b)	Zonal and station identification systems; Electrical bonding; Lightning strike protection provision.	2
13.3	**Autoflight (ATA 22)** Fundamentals of automatic flight control including working principles and current terminology; Command signal processing; Modes of operation: roll, pitch and yaw channels; Yaw dampers; Stability Augmentation System in helicopters; Automatic trim control; Autopilot navigation aids interface; Autothrottle systems. Automatic Landing Systems: principles and categories, modes of operation, approach, glideslope, land, go-around, system monitors and failure conditions.	3

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13.4	**Communication/Navigation (ATA 23/34)**	3
	Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter; Working principles of following systems: — Very High Frequency (VHF) communication; — High Frequency (HF) communication; — Audio; — Emergency Locator Transmitters; — Cockpit Voice Recorder; — Very High Frequency omnidirectional range (VOR); — Automatic Direction Finding (ADF); — Instrument Landing System (ILS); — Microwave Landing System (MLS); — Flight Director systems; Distance Measuring Equipment (DME); — Very Low Frequency and hyperbolic navigation (VLF/ Omega); — Doppler navigation; — Area navigation, RNAV systems; — Flight Management Systems; — Global Positioning System (GPS), Global Navigation Satellite Systems (GNSS); — Inertial Navigation System; — Air Traffic Control transponder, secondary surveillance radar; — Traffic Alert and Collision Avoidance System (TCAS); — Weather avoidance radar; — Radio altimeter; — ARINC communication and reporting;	
13.5	**Electrical Power (ATA 24)**	3
	Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection; External/Ground power	
13.6	**Equipment and Furnishings (ATA 25)**	3
	Electronic emergency equipment requirements; Cabin entertainment equipment.	
13.7	**Flight Controls (ATA 27)**	
(a)	Primary controls: aileron, elevator, rudder, spoiler; Trim control;	2

	Active load control; High lift devices; Lift dump, speed brakes; System operation: manual, hydraulic, pneumatic; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks. Stall protection systems.	
(b)	System operation: electrical, fly by wire.	3
13.8	**Instrument Systems (ATA 31)**	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; Fuel quantity indicating systems; Gyroscopic principles; Artificial horizons; Slip indicators; Directional gyros; Ground Proximity Warning Systems; Compass systems; Flight Data Recording systems; Electronic Flight Instrument Systems; Instrument warning systems including master warning systems and centralised warning panels; Stall warning systems and angle of attack indicating systems; Vibration measurement and indication; Glass cockpit.	
13.9	**Lights (ATA 33)**	3
	External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	
13.10	**On board Maintenance Systems (ATA 45)**	3
	Central maintenance computers;	

	Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	
	13.11 Air Conditioning and Cabin Pressurisation (ATA 21)	
	13.11.1 Air supply	
	Sources of air supply including engine bleed, APU and ground cart;	2
	13.11.2 Air Conditioning	
	Air conditioning systems;	2
	Air cycle and vapour cycle machines;	3
	Distribution systems;	1
	Flow, temperature and humidity control system;	3
	13.11.3 Pressurisation	3
	Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers;	
	13.11.4 Safety and warning devices	3
	Protection and warning devices.	
	13.12 Fire Protection (ATA 26)	
(a)	Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.	3
(b)	Portable fire extinguisher	1
	13.13 Fuel Systems (ATA 28)	
	System lay-out;	1
	Fuel tanks;	1
	Supply systems;	1
	Dumping, venting and draining;	1
	Cross-feed and transfer;	2
	Indications and warnings;	3
	Refuelling and defuelling;	2
	Longitudinal balance fuel systems.	3
	13.14 Hydraulic Power (ATA 29)	

System lay-out;	1
Hydraulic fluids;	1
Hydraulic reservoirs and accumulators;	1
Pressure generation: electric, mechanical, pneumatic;	3
Emergency pressure generation;	3
Filters;	1
Pressure Control;	3
Power distribution;	1
Indication and warning systems;	3
Interface with other systems.	3
13.15 Ice and Rain Protection (ATA 30)	
Ice formation, classification and detection;	2
Anti-icing systems: electrical, hot air and chemical;	2
De-icing systems: electrical, hot air, pneumatic and chemical;	3
Rain repellant;	1
Probe and drain heating.	3
Wiper systems	1
13.16 Landing Gear (ATA 32)	
Construction, shock absorbing;	1
Extension and retraction systems: normal and emergency;	3
Indications and warning;	3
Wheels, brakes, antiskid and autobraking;	3
Tyres;	1
Steering;	3
Air-ground sensing.	3
13.17 Oxygen (ATA 35)	3
System lay-out: cockpit, cabin;	
Sources, storage, charging and distribution;	
Supply regulation;	
Indications and warnings;	
13.18 Pneumatic/Vacuum (ATA 36)	
System lay-out;	2
Sources: engine/APU, compressors, reservoirs, ground supply;	2
Pressure control;	3
Distribution;	1
Indications and warnings;	3
Interfaces with other systems.	3
13.19 Water/Waste (ATA 38)	2
Water system lay-out, supply, distribution, servicing and draining;	

Toilet system lay-out, flushing and servicing;

13.20 Integrated Modular Avionics (ATA 42) 3

Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others:

Bleed Management, Air Pressure Control, Air Ventilation and Control, 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;

13.21 Cabin Systems (ATA 44) 3

The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service). Includes voice, data, music and video transmissions.

The Cabin Intercommunication Data System provides an interface between cockpit/cabin crew and cabin systems. These systems support data exchange of the different related LRU's and they are typically operated via Flight Attendant Panels.

The Cabin Network Service typically consists on a server, typically interfacing with, among others, the following systems:
- Data/Radio Communication, In-Flight Entertainment System.

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The Cabin Network Service may host functions such as:
- Access to pre-departure/departure reports,
- E-mail/intranet/internet access,
- Passenger database.

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Cabin Core System;
In-flight Entertainment System;
External Communication System;
Cabin Mass Memory System;
Cabin Monitoring System;
Miscellaneous Cabin System.

13.22 Information Systems (ATA 46) 3

The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display. Typical examples include Air Traffic and Information Management Systems and Network Server Systems. Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.	

MODULE 14 PROPULSION

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

MODULE 15. GAS TURBINE ENGINE

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

	Blade to disk attachment; Nozzle guide vanes; Causes and effects of turbine blade stress and creep.		
15.7	**Exhaust** Constructional features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers.	1	2
15.8	**Bearings and Seals** Constructional features and principles of operation.	—	2
15.9	**Lubricants and Fuels** Properties and specifications; Fuel additives; Safety precautions.	1	2
15.10	**Lubrication Systems** System operation/lay-out and components.	1	2
15.11	**Fuel Systems** Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components.	1	2
15.12	**Air Systems** Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.	1	2
15.13	**Starting and Ignition Systems** Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements.	1	2
15.14	**Engine Indication Systems** Exhaust Gas Temperature/Interstage Turbine Temperature; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure and flow;	1	2

Engine speed; Vibration measurement and indication; Torque; Power.		
15.15 Power Augmentation Systems	—	1
Operation and applications; Water injection, water methanol; Afterburner systems.		
15.16 Turbo-prop Engines	1	2
Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Overspeed safety devices.		
15.17 Turbo-shaft engines	1	2
Arrangements, drive systems, reduction gearing, couplings, control systems.		
15.18 Auxiliary Power Units (APUs)	1	2
Purpose, operation, protective systems.		
15.19 Powerplant Installation	1	2
Configuration of 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	1	2
Operation of detection and extinguishing systems.		
15.21 Engine Monitoring and Ground Operation	1	3
Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Trend (including oil analysis, vibration and boroscope) monitoring; Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer; Compressor washing/cleaning; Foreign Object Damage.		
15.22 Engine Storage and Preservation	—	2

Preservation and depreservation for the engine and accessories /systems.		

MODULE 16. PISTON ENGINE

	Level		
	A	B1	B3
16.1 Fundamentals	1	2	2
Mechanical, thermal and volumetric efficiencies; Operating principles — 2 stroke, 4 stroke, Otto and Diesel; Piston displacement and compression ratio; Engine configuration and firing order.			
16.2 Engine Performance	1	2	2
Power calculation and measurement; Factors affecting engine power; Mixtures/leaning, pre-ignition.			
16.3 Engine Construction	1	2	2
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	1	2	2
Types, construction and principles of operation; Icing and heating.			
16.4.2 Fuel injection systems	1	2	2
Types, construction and principles of operation.			
16.4.3 Electronic engine control	1	2	2
Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components.			
16.5 Starting and Ignition Systems	1	2	2
Starting systems, pre-heat systems; Magneto types, construction and principles of operation;			

	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; Exhaust systems, engine cooling systems — air and liquid.	1	2	2
16.7	**Supercharging/Turbocharging** Principles and purpose of supercharging and its effects on engine parameters; Construction and operation of supercharging/turbocharging systems; System terminology; Control systems; System protection	1	2	2
16.8	**Lubricants and Fuels** Properties and specifications; Fuel additives; Safety precautions.	1	2	2
16.9	**Lubrication Systems** System operation/lay-out and components.	1	2	2
16.10	**Engine Indication Systems** Engine speed; Cylinder head temperature; Coolant temperature; Oil pressure and temperature; Exhaust Gas Temperature; Fuel pressure and flow; Manifold pressure.	1	2	2
16.11	**Powerplant Installation** Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.	1	2	2
16.12	**Engine Monitoring and Ground Operation** Procedures for starting and ground run-up; Interpretation of engine power output and parameters;	1	3	2

Inspection of engine and components: criteria, tolerances, and data specified by engine manufacturer.			
16.13 Engine Storage and Preservation Preservation and depreservation for the engine and accessories / systems.	—	2	I

MODULE 17A. PROPELLER

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

	Level	
	A	B1
17.1 Fundamentals Blade element theory; High/low blade angle, reverse angle, angle of attack, rotational speed; Propeller slip; Aerodynamic, centrifugal, and thrust forces; Torque; Relative airflow on blade angle of attack; Vibration and resonance.	1	2
17.2 Propeller Construction Construction methods and materials used in wooden, composite and metal propellers; Blade station, blade face, blade shank, blade back and hub assembly; Fixed pitch, controllable pitch, constant speeding propeller; Propeller/spinner installation.	1	2
17.3 Propeller Pitch Control Speed control and pitch change methods, mechanical and electrical/electronic; Feathering and reverse pitch; Overspeed protection.	1	2
17.4 Propeller Synchronising Synchronising and synchrophasing equipment.	—	2
17.5 Propeller Ice Protection Fluid and electrical de-icing equipment.	1	2

17.6	**Propeller Maintenance** Static and dynamic balancing; Blade tracking; Assessment of blade damage, erosion, corrosion, impact damage, delamination; Propeller treatment/repair schemes; Propeller engine running.	1	3
17.7	**Propeller Storage and Preservation** Propeller preservation and depreservation	1	2

MODULE 17B. PROPELLER

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

	Level B3
17.1 Fundamentals	2
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	2
Construction methods and materials used in wooden, composite and metal propellers; Blade station, blade face, blade shank, blade back and hub assembly; Fixed pitch, controllable pitch, constant speeding propeller; Propeller/spinner installation.	
17.3 Propeller Pitch Control	2
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
Fluid and electrical de-icing equipment.	
17.6 Propeller Maintenance	2
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
Propeller preservation and depreservation	

Appendix II Basic Examination Standard

1. General ~~Standardisation Basis for Examinations~~

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

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

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

1.4. Suitable essay questions shall ~~must~~ be drafted and evaluated using the knowledge syllabus in MCAR-66 Appendix I Modules 7A, 7B, 9A, 9B and 10.

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

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

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

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

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

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

1.11. ~~All MCAR-66 modules that make up a complete MCAR-66 aircraft maintenance licence category or subcategory must be passed within a 5 year time period of passing the first module except in the case specified in paragraph 1.12.~~ A failed module may not be retaken for at least 90 days following the date of the failed module examination, except in the case of a ~~MCAR-147~~ ~~approved~~ maintenance training organisation approved in accordance with MCAR-147 which conducts a course of retraining tailored to the failed subjects in the particular module when the failed module may be retaken after 30 days.

1.12. ~~The 5 year time period specified in paragraph 1.11 does not apply to those modules which are common to more than one MCAR-66 aircraft maintenance licence category or subcategory and which were previously passed as part of another such category or subcategory examination~~. The time periods required by point 66.A.25 apply to each individual module examination, with the exception of those module examinations which were passed as part of another category licence, where the licence has already been issued.

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

The applicant shall confirm in writing to the approved maintenance training organisation or the CAA to which they apply for an examination, the number and dates of attempts during the last year and the organisation or the CAA where these attempts took place. The maintenance training organisation or the CAA is responsible for checking the number of attempts within the applicable timeframes.

2. Question Numbers for the MCAR-66 Appendix I Modules

2.1. MODULE 1 – MATHEMATICS:
Category A: 16 multi-choice and 0 essay questions. Time allowed 20 minutes.
Category B1: 32 multi-choice and 0 essay questions. Time allowed 40 minutes.
Category B2: 32 multi-choice and 0 essay questions. Time allowed 40 minutes.
Category B3: 28 multi-choice and 0 essay questions. Time allowed 35 minutes.

2.2. MODULE 2 – PHYSICS:
Category A: 32 multi-choice and 0 essay questions. Time allowed 40 minutes.
Category B1: 52 multi-choice and 0 essay questions. Time allowed 65 minutes.
Category B2: 52 multi-choice and 0 essay questions. Time allowed 65 minutes.
Category B3: 28 multi-choice and 0 essay questions. Time allowed 35 minutes.

2.3. MODULE 3 – ELECTRICAL FUNDAMENTALS:
Category A: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B1: 52 multi-choice and 0 essay questions. Time allowed 65 minutes.
Category B2: 52 multi-choice and 0 essay questions. Time allowed 65 minutes.
Category B3: 24 multi-choice and 0 essay questions. Time allowed 30 minutes.

2.4. MODULE 4 – ELECTRONIC FUNDAMENTALS:
~~Category A: None~~
Category B1: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B2: 40 multi-choice and 0 essay questions. Time allowed 50 minutes.
Category B3: 08 multi-choice and 0 essay questions. Time allowed 10 minutes.

2.5. MODULE 5 – DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS:
Category A: 16 multi-choice and 0 essay questions. Time allowed 20 minutes.
Category B1.1 & B1.3: 40 multi-choice and 0 essay questions. Time allowed 50 minutes.
Category B1.2 & B1.4: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B2: 72 multi-choice and 0 essay questions. Time allowed 90 minutes.
Category B3: 16 multi-choice and 0 essay questions. Time allowed 20 minutes.

2.6. MODULE 6 – MATERIALS AND HARDWARE:
Category A: 52 multi-choice and 0 essay questions. Time allowed 65 minutes.
Category B1: 72 multi-choice and 0 essay questions. Time allowed 90 minutes.
Category B2: 60 multi-choice and 0 essay questions. Time allowed 75 minutes.
Category B3: 60 multi-choice and 0 essay questions. Time allowed 75 minutes.

2.7. MODULE 7A – MAINTENANCE PRACTICES:
Category A: 72 multi-choice and 2 essay questions. Time allowed 90 minutes plus 40 minutes.
Category B1: 80 multi-choice and 2 essay questions. Time allowed 100 minutes plus 40 minutes.
Category B2: 60 multi-choice and 2 essay questions. Time allowed 75 minutes plus 40 minutes.

MODULE 7B – MAINTENANCE PRACTICES:
Category B3: 60 multi-choice and 2 essay questions. Time allowed 75 minutes plus 40 minutes.

2.8. MODULE 8 – BASIC AERODYNAMICS:
Category A: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B1: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B2: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B3: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.

2.9. MODULE 9A – HUMAN FACTORS:
Category A: 20 multi-choice and 1 essay question. Time allowed 25 minutes plus 20 minutes.
Category B1: 20 multi-choice and 1 essay question. Time allowed 25 minutes plus 20 minutes.
Category B2: 20 multi-choice and 1 essay question. Time allowed 25 minutes plus 20 minutes.

MODULE 9B – HUMAN FACTORS:
Category B3: 16 multi-choice and 1 essay questions. Time allowed 20 minutes plus 20 minutes.

2.10. MODULE 10 – AVIATION LEGISLATION:
Category A: 32 multi-choice and 1 essay question. Time allowed 40 minutes plus 20 minutes.
Category B1: 40 multi-choice and 1 essay question. Time allowed 50 minutes plus 20 minutes.
Category B2: 40 multi-choice and 1 essay question. Time allowed 50 minutes plus 20 minutes.
Category B3: 32 multi-choice and 1 essay questions. Time allowed 40 minutes plus 20 minutes.

2.11. MODULE 11A – TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS:
Category A: 108 multi-choice and 0 essay questions. Time allowed 135 minutes.

Category B1: 140 multi-choice and 0 essay questions. Time allowed 175 minutes.
~~Category B2: None.~~

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.
~~Category B2: None.~~

MODULE 11C – PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS:
Category B3: 60 multi-choice and 0 essay questions. Time allowed 75 minutes.

2.12. MODULE 12 – HELICOPTER AERODYNAMICS, STRUCTURES AND SYSTEMS:
Category A: 100 multi-choice and 0 essay questions. Time allowed 125 minutes.
Category B1: 128 multi-choice and 0 essay questions. Time allowed 160 minutes. ~~Category B2: None.~~

2.13. MODULE 13 – AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS:
~~Category A: None.~~
~~Category B1: None.~~
Category B2: 180 multi-choice and 0 essay questions. Time allowed 225 minutes. Questions and time allowed may be split into two examinations as appropriate.

2.14. MODULE 14 – PROPULSION:
~~Category A: None.~~
~~Category B1: None.~~
Category B2: 24 multi-choice and 0 essay questions. Time allowed 30 minutes.

2.15. MODULE 15 – GAS TURBINE ENGINE:
Category A: 60 multi-choice and 0 essay questions. Time allowed 75 minutes.
Category B1: 92 multi-choice and 0 essay questions. Time allowed 115 minutes.
~~Category B2: None.~~

2.16. MODULE 16 – PISTON ENGINE:
Category A: 52 multi-choice and 0 essay questions. Time allowed 65 minutes.
Category B1: 72 multi-choice and 0 essay questions. Time allowed 90 minutes.
~~Category B2: None.~~
Category B3: 68 multi-choice and 0 essay questions. Time allowed 85 minutes.

Commented [AM34]: Correcting a typo. Same as SARI and EASA

2.17. MODULE 17A – PROPELLER:
Category A: 20 multi-choice and 0 essay questions. Time allowed 25 minutes.
Category B1: 32 multi-choice and 0 essay questions. Time allowed 40 minutes.
~~Category B2: None.~~

MODULE 17B – PROPELLER:
Category B3: 28 multi-choice and 0 essay questions. Time allowed 35 minutes.

Appendix III Aircraft Type Training and Examination Standard - On-the-Job Training

1. General ~~Type training levels~~

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

(a) Theoretical training and examination shall comply with the following requirements:
- (i) Shall be conducted by a maintenance training organisation appropriately approved in accordance with Annex IV (Part-147) or, when conducted by other organisations, as directly approved by the competent authority.
- (ii) Shall comply with the standard described in paragraph 3.1 and 4 of this Appendix III, except as permitted by the differences training described below.
- (iii) In the case of a category C person qualified by holding an academic degree as specified in point 66.A.30(a)(5), the first relevant aircraft type theoretical training shall be at the category B1 or B2 level.
- (iv) Shall have been started and completed within the three years preceding the application for a type rating endorsement.

(b) Practical training and assessment shall comply with the following requirements:
- (i) Shall be conducted by a maintenance training organisation appropriately approved in accordance with Annex IV (Part-147) or, when conducted by other organisations, as directly approved by the competent authority.
- (ii) Shall comply with the standard described in paragraph 3.2 and 4 of this Appendix III, except as permitted by the differences training described below.
- (iii) Shall include a representative cross section of maintenance activities relevant to the aircraft type.
- (iv) Shall include demonstrations using equipment, components, simulators, other training devices or aircraft.
- (v) Shall have been started and completed within the three years preceding the application for a type rating endorsement.

(c) Differences training
- (i) Differences training is the training required in order to cover the differences between two different aircraft type ratings of the same manufacturer as determined by the CAA.
- (ii) Differences training has to be defined on a case to case basis taking into account the requirements contained in this Appendix III in respect of both theoretical and practical elements of type rating training.
- (iii) A type rating shall only be endorsed on a licence after differences training when the applicant also complies with one of the following conditions:
  - having already endorsed on the licence the aircraft type rating from which the differences are being identified, or
  - having completed the type training requirements for the aircraft from which the differences are being identified.

2. Aircraft type training levels

The three levels listed below define the objectives, the depth of training and the level of knowledge that the ~~that a particular level of~~ training is intended to achieve.

- *Level 1 ~~General Familiarisation~~: A brief overview of the airframe, systems and powerplant as outlined in the Systems Description Section of the Aircraft Maintenance Manual/Instructions for Continued Airworthiness.*

  Course objectives: Upon completion of Level 1 training, the student will be able to:

  (a) ~~A brief overview of the airframe, systems and powerplants as outlined in the Systems description Section of the Aircraft Maintenance Manual.~~ provide a simple description of the whole subject, using common words and examples, using typical terms and identify safety precautions related to the airframe, its systems and powerplant;

  ~~(b) Course objectives: Upon completion of the course, the student will be able to identify safety precautions related to the airframe, its systems and powerplant~~

  (c) ~~Identify maintenance practices important to the airframe, its systems and powerplant.~~ identify aircraft manuals, maintenance practices important to the airframe, its systems and powerplant;

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

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

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

- *Level 2 ~~Ramp and transit~~ Basic system overview of controls, indicators, principal components including their location and purpose, servicing and minor troubleshooting. General knowledge of the theoretical and practical aspects of the subject.*

  Course objectives: In addition to the information contained in the Level 1 ~~General Familiarisation course~~ training, at the completion of ~~this~~ Level 2 ~~Ramp and Transit~~ training, the student will be able to:

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

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

  ~~(c) Demonstrate knowledge of the main ramp and transit (through-flight) activities of the following:~~

~~(a) Doors, windows and hatches.~~
~~(b) Electrical power supplies.~~
~~(c) Fuel.~~
~~(d) Auxiliary power unit.~~
~~(e) Powerplant.~~
~~(f) Fire protection.~~
~~(g) Environmental Control Systems.~~
~~(h) Hydraulic power.~~
~~(i) Landing gear.~~
~~(j) Flight controls.~~
~~(k) Water/waste.~~
~~(l) Oxygen.~~
~~(m) Flight and service interphone.~~
~~(n) Avionics.~~
~~(o) Cabin equipment/furnishings.~~

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

(e) identify the locations of the principal components;

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

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

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

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

~~(j) Locate those procedures for replacement of components for ramp and transit activities identified in objective 2.~~

- *Level 3 ~~Line and Base Maintenance Training~~ Detailed description, operation, component location, removal/installation and bite and troubleshooting procedures to maintenance manual level.*

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

Course objectives: In addition to the information contained in Level 1 and Level 2 training, at the completion of Level ~~III~~3 ~~Line and Base Maintenance~~ training, the student will be able to:

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

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

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

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

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

3. Aircraft type training standard

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

3.1 Theoretical element

(a) Objective

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

(b) Level of training

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

Training levels are those levels defined in point ~~paragraph 1~~ 2 above.

After the first type course for category C certifying staff all subsequent courses need only be to level 1.

During a level 3 theoretical training, level 1 and 2 training material may be used to teach the full scope of the chapter if required. However, during the training the majority of the course material and training time shall be at the higher level.

(c) Duration

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

Category	Hours
Aeroplanes with a maximum take-off mass above 30000kg:	
B1.1	150
B1.2	120
B2	100
C	30
Aeroplanes with a maximum take-off mass equal or less than 30000kg and above 5700kg:	
B1.1	120
B1.2	100
B2	100

C	25
Aeroplanes with a maximum take-off mass of 5700kg and below*	
B1.1	80
B1.2	60
B2	60
C	15
Helicopters**	
B1.3	120
B1.4	100
B2	100
C	25

* For non-pressurised piston engine aeroplanes below 2000kg MTOM the minimum duration can be reduced by 50%.
** For helicopters in group 2 (as defined in point 66.A.5) the minimum duration can be reduced by 30%.

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

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

(d) Justification of course duration:

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

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

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

Similarly, tuition hours of differences courses or other training course combinations (such as combined B1/B2 courses), and in cases of theoretical type training courses below the figures given in point 3.1(c) above, these shall be justified to the CAA by the training needs analysis as described above.

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

- The minimum attendance required to the trainee, in order to meet the objectives of the course.
- The maximum number of hours of training per day, taking into account pedagogical and human factors principles.

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

(e) Content:

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

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

Chapters / Level		Aeroplanes turbine		Aeroplanes piston		Helicopters turbine		Helicopters piston		Avionics
License Category		B1	C	B1	C	B1	C	B1	C	B2
	Introduction Module:									
05	Time limits/maintenance checks	1	1	1	1	1	1	1	1	1
06	Dimensions/Areas (MTOM, etc)	1	1	1	1	1	1	1	1	1
07	Lifting and Shoring	1	1	1	1	1	1	1	1	1
08	Levelling and weighing	1	1	1	1	1	1	1	1	1
09	Towing and taxiing	1	1	1	1	1	1	1	1	1
10	Parking/mooring, Storing & Return to Service	1	1	1	1	1	1	1	1	1
11	Placards and Markings	1	1	1	1	1	1	1	1	1
12	Servicing	1	1	1	1	1	1	1	1	1
20	Standard practices – only type particular	1	1	1	1	1	1	1	1	1
	Helicopters									
18	Vibration and Noise Analysis (Blade tracking)	-	-	-	-	3	1	3	1	-
60	Standard Practices Rotor	-	-	-	-	3	1	3	1	-
62	Rotors	-	-	-	-	3	1	3	1	1
62A	Rotors – Monitoring and indicating	-	-	-	-	3	1	3	1	3
63	Rotor Drives	-	-	-	-	3	1	3	1	1
63A	Rotor Drives – Monitoring and indicating	-	-	-	-	3	1	3	1	3
64	Tail Rotor	-	-	-	-	3	1	3	1	1
64A	Tail rotor - Monitoring and indicating	-	-	-	-	3	1	3	1	3
65	Tail Rotor Drive	-	-	-	-	3	1	3	1	1

Commented [A35]: Table substantially changed so changes not tracked and whole table should be coloured green

Chapters / Level		Aeroplanes turbine		Aeroplanes piston		Helicopters turbine		Helicopters piston		Avionics
65A	Tail Rotor Drive - Monitoring and indicating	-	-	-	-	3	1	3	1	3
66	Folding Blades/Pylon	-	-	-	-	3	1	3	1	-
67	Rotors Flight Control	-	-	-	-	3	1	3	1	-
53	Airframe Structure (Helicopter)	-	-	-	-	3	1	3	1	-
25	Emergency Flotation Equipment	-	-	-	-	3	1	3	1	1
	Airframe Structures									
51	Standard practices and structures (damage classification, assessment and repair)	3	1	3	1	-	-	-	-	1
53	Fuselage	3	1	3	1	-	-	-	-	1
54	Nacelles/Pylons	3	1	3	1	-	-	-	-	1
55	Stabilisers	3	1	3	1	-	-	-	-	1
56	Windows	3	1	3	1	-	-	-	-	1
57	Wings	3	1	3	1	-	-	-	-	1
27A	Flight Control Surfaces (All)	3	1	3	1	-	-	-	-	1
52	Doors	3	1	3	1	-	-	-	-	1
	Zonal & Station Identification Systems	1	1	1	1	1	1	1	1	1
	Airframe systems:									
21	Air Conditioning	3	1	3	1	3	1	3	1	3
21A	Air Supply	3	1	3	1	1	3	3	1	2
21B	Pressurisation	3	1	3	1	3	1	3	1	3
21C	Safety and Warning Devices	3	1	3	1	3	1	3	1	3
22	Autoflight	2	1	2	1	2	1	2	1	3
23	Communications	2	1	2	1	2	1	2	1	3
24	Electrical Power	3	1	3	1	3	1	3	1	3
25	Equipment & Furnishings	3	1	3	1	3	1	3	1	1
25A	Electronic Equipment including emergency equipment	1	1	1	1	1	1	1	1	3
26	Fire Protection	3	1	3	1	3	1	3	1	3
27	Flight Controls	3	1	3	1	3	1	3	1	2
27A	Sys. Operation: Electrical/Fly-by-Wire	3	1	-	-	-	-	-	-	3
28	Fuel Systems	3	1	3	1	3	1	3	1	2
28A	Fuel Systems - Monitoring and indicating	3	1	3	1	3	1	3	1	3

Chapters / Level		Aeroplanes turbine		Aeroplanes piston		Helicopters turbine		Helicopters piston		Avionics
29	Hydraulic Power	3	1	3	1	3	1	3	1	2
29A	Hydraulic Power - Monitoring and indicating	3	1	3	1	3	1	3	1	3
30	Ice & Rain Protection	3	1	3	1	3	1	3	1	3
31	Indicating/Recording Systems	3	1	3	1	3	1	3	1	3
31A	Instrument Systems	3	1	3	1	3	1	1	3	3
32	Landing Gear	3	1	3	1	3	1	3	1	2
32A	Landing Gear - Monitoring and indicating	3	1	3	1	3	1	3	1	3
33	Lights	3	1	3	1	3	1	3	1	3
34	Navigation	2	1	2	1	2	1	2	1	3
35	Oxygen	3	1	3	1	-	-	-	-	2
36	Pneumatic	3	1	3	1	3	1	3	1	2
36A	Pneumatic - Monitoring and indicating	3	1	3	1	3	1	3	1	3
37	Vacuum	3	1	3	1	3	1	3	1	2
38	Water/Waste	3	1	3	1	-	-	-	-	2
41	Water Ballast	3	1	3	1	-	-	-	-	1
42	Integrated modular avionics	2	1	2	1	2	1	2	1	3
44	Cabin Systems	2	1	2	1	2	1	2	1	3
45	On-Board Maintenance System (or covered in 31)	3	1	3	1	3	1	-	-	3
46	Information Systems	2	1	2	1	2	1	2	1	3
50	Cargo and Accessory Compartments	3	1	3	1	3	1	3	1	1
	Turbine Engines									
70	Standard Practices – Engines,	3	1	-	-	3	1	-	-	1
70A	Constructional arrangement and operation (Installation Inlet, Compressors, Combustion Section, Turbine Section, Bearings and Seals, Lubrication Systems).	3	1	-	-	3	1	-	-	1
70B	Engine Performance	3	1	-	-	3	1	-	-	1
71	Powerplant	3	1	-	-	3	1	-	-	1
72	Engine Turbine/Turbo Prop/Ducted Fan/Unducted fan	3	1	-	-	3	1	-	-	1
73	Engine Fuel and Control	3	1	-	-	3	1	-	-	1
75	Air	3	1	-	-	3	1	-	-	1
76	Engine controls	3	1	-	-	3	1	-	-	1

Chapters / Level		Aeroplanes turbine		Aeroplanes piston		Helicopters turbine		Helicopters piston		Avionics
78	Exhaust	3	1	-	-	3	1	-	-	1
79	Oil	3	1	-	-	3	1	-	-	1
80	Starting	3	1	-	-	3	1	-	-	1
82	Water Injections	3	1	-	-	3	1	-	-	1
83	Accessory Gear Boxes	3	1	-	-	3	1	-	-	1
84	Propulsion Augmentation	3	1	-	-	3	1	-	-	1
73A	FADEC	3	1	-	-	3	1	-	-	3
74	Ignition	3	1	-	-	3	1	-	-	3
77	Engine Indicating Systems	3	1	-	-	3	1	-	-	3
49	Auxiliary Power Units (APUs)	3	1	-	-	-	-	-	-	2
	Piston Engine									
70	Standard Practices – Engines	-	-	3	1	-	-	3	1	1
70A	Constructional arrangement and operation (Installation, Carburettors, Fuel injection systems, Induction, Exhaust and Cooling Systems, Supercharging/Turbocharging, Lubrication Systems).	-	-	3	1	-	-	3	1	1
70B	Engine Performance	-	-	3	1	-	-	3	1	1
71	Powerplant	-	-	3	1	-	-	3	1	1
73	Engine Fuel and Control	-	-	3	1	-	-	3	1	1
76	Engine Control	-	-	3	1	-	-	3	1	1
79	Oil	-	-	3	1	-	-	3	1	1
80	Starting	-	-	3	1	-	-	3	1	1
81	Turbines	-	-	3	1	-	-	3	1	1
82	Water Injections	-	-	3	1	-	-	3	1	1
83	Accessory Gear Boxes	-	-	3	1	-	-	3	1	1
84	Propulsion Augmentation	-	-	3	1	-	-	3	1	1
73A	FADEC	-	-	3	1	-	-	3	1	3
74	Ignition	-	-	3	1	-	-	3	1	3
77	Engine Indication Systems	-	-	3	1	-	-	3	1	3
	Propellers									
60A	Standard Practices - Propeller	3	1	3	1	-	-	-	-	1

Chapters / Level		Aeroplanes turbine		Aeroplanes piston		Helicopters turbine		Helicopters piston		Avionics
61	Propellers/Propulsion	3	1	3	1	-	-	-	-	1
61A	Propeller Construction	3	1	3	1	-	-	-	-	-
61B	Propeller Pitch Control	3	1	3	1	-	-	-	-	-
61C	Propeller Synchronising	3	1	3	1	-	-	-	-	1
61D	Propeller Electronic control	2	1	2	1	-	-	-	-	3
61E	Propeller Ice Protection	3	1	3	1	-	-	-	-	-
61F	Propeller Maintenance	3	1	3	1	-	-	-	-	1

(f) Multimedia Based Training (MBT) methods may be used to satisfy the theoretical training element either in the classroom or in a virtual controlled environment subject to the acceptance of the competent authority approving the training course.

3.2 Practical element

(a) Objective:

The objective of practical training is to gain the required competence in performing safe maintenance, inspections and routine work according to the maintenance manual and other relevant instructions and tasks as appropriate for the type of aircraft, for example troubleshooting, repairs, adjustments, replacements, rigging and functional checks. It includes the awareness of the use of all technical literature and documentation for the aircraft, the use of specialist/special tooling and test equipment for performing removal and replacement of components and modules unique to type, including any on-wing maintenance activity.

(b) Content:

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

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

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

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

~~*1.1. Practical element*~~

~~The practical training element must consist of the performance of representative maintenance tasks and their assessment, in order to meet the following objectives:~~

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

~~(b) Correctly use all technical literature and documentation for the aircraft.~~

~~(c) 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.~~

Chapters		B1/B2	B1					B2				
		LOC	FOT	SGH	R/I	MEL	TS	FOT	SGH	R/I	MEL	TS
	Introduction Module:											
05	Time limits/maintenance checks	X/X	-	-	-	-	-	-	-	-	-	-
06	Dimensions/Areas (MTOM, etc)	X/X	-	-	-	-	-	-	-	-	-	-
07	Lifting and Shoring	X/X	-	-	-	-	-	-	-	-	-	-
08	Levelling and weighing	X/X	-	X	-	-	-	-	X	-	-	-
09	Towing and taxiing	X/X	-	X	-	-	-	-	X	-	-	-
10	Parking/mooring, Storing & Return to Service	X/X	-	X	-	-	-	-	X	-	-	-
11	Placards and Markings	X/X	-	-	-	-	-	-	-	-	-	-
12	Servicing	X/X	-	X	-	-	-	-	X	-	-	-
20	Standard practices – only type particular	X/X	-	X	-	-	-	-	X	-	-	-
	Helicopters											
18	Vibration and Noise Analysis (Blade tracking)	X/-	-	-	-	-	X	-	-	-	-	-
60	Standard Practices Rotor – only type particular	X/X	-	X	-	-	-	-	X	-	-	-
62	Rotors	X/-	-	X	X	-	X	-	-	-	-	-

Chapters		B1/B2	B1					B2				
		LOC	FOT	SGH	R/I	MEL	TS	FOT	SGH	R/I	MEL	TS
62A	Rotors – Monitoring and indicating	X/X	X	X	X	X	X	-	-	X	-	X
63	Rotor Drives	X/-	X	-	-	-	X	-	-	-	-	-
63A	Rotor Drives – Monitoring and indicating	X/X	X	-	X	X	X	-	-	X	-	X
64	Tail Rotor	X/-	-	X	-	-	X	-	-	-	-	-
64A	Tail rotor - Monitoring and indicating	X/X	X	-	X	X	X	-	-	X	-	X
65	Tail Rotor Drive	X/-	X	-	-	-	X	-	-	-	-	-
65A	Tail Rotor Drive - Monitoring and indicating	X/X	X	-	X	X	X	-	-	X	-	X
66	Folding Blades/Pylon	X/-	X	X	-	-	X	-	-	-	-	-
67	Rotors Flight Control	X/-	X	X	-	X	X	-	-	-	-	-
53	Airframe Structure (Helicopter)	Note: Covered under Airframe structures										
25	Emergency Flotation Equipment	X/X	X	X	X	X	X	X	X	-	-	-
	Airframe Structures											
51	Standard practices and structures (damage classification, assessment and repair)	????										
53	Fuselage	X/-	-	-	-	-	X	-	-	-	-	-
54	Nacelles/Pylons	X/-	-	-	-	-	-	-	-	-	-	-
55	Stabilisers	X/-	-	-	-	-	-	-	-	-	-	-
56	Windows	X/-	-	-	-	-	X	-	-	-	-	-
57	Wings	X/-	-	-	-	-	-	-	-	-	-	-
27A	Flight Control Surfaces (All)	X/-	-	-	-	-	X	-	-	-	-	-
52	Doors	X/X	X	X	-	-	-	-	X	-	-	-
	Airframe systems:											
21	Air Conditioning	X/X	X	X	-	X	X	X	X	-	X	X
21A	Air Supply	X/X	X	-	-	-	-	X	-	-	-	-
21B	Pressurisation	X/X	X	-	-	X	X	X	-	-	X	X
21C	Safety and Warning Devices	X/X	-	X	-	-	-	-	X	-	-	-
22	Autoflight	X/X	-	-	-	X	-	X	X	X	X	X
23	Communications	X/X	-	X	-	X	-	X	X	X	X	X
24	Electrical Power	X/X	X	X	X	X	X	X	X	X	X	X
25	Equipment & Furnishings	X/X	X	X	X	-	-	X	X	X	-	-

Chapters		B1/B2	B1					B2				
		LOC	FOT	SGH	R/I	MEL	TS	FOT	SGH	R/I	MEL	TS
25A	Electronic Equipment including emergency equipment	X/X	X	X	X	-	-	X	X	X	-	-
26	Fire Protection	X/X	X	X	X	X	X	X	X	X	X	X
27	Flight Controls	X/X	X	X	X	X	X	X	-	-	-	-
27A	Sys. Operation: Electrical/Fly-by-Wire	X/X	X	X	X	X	-	X	-	X	-	X
28	Fuel Systems	X/X	X	X	X	X	X	X	X	-	X	-
28A	Fuel Systems - Monitoring and indicating	X/X	X	-	-	-	-	X	-	X	-	X
29	Hydraulic Power	X/X	X	X	X	X	X	X	X	-	X	-
29A	Hydraulic Power - Monitoring and indicating	X/X	X	-	X	X	X	X	-	X	X	X
30	Ice & Rain Protection	X/X	X	X	-	X	X	X	X	-	X	X
31	Indicating/Recording Systems	X/X	X	X	X	X	X	X	X	X	X	X
31A	Instrument Systems	X/X	X	X	X	X	X	X	X	X	X	X
32	Landing Gear	X/X	X	X	X	X	X	X	X	X	X	-
32A	Landing Gear - Monitoring and indicating	X/X	X	-	X	X	X	X	-	X	X	X
33	Lights	X/X	X	X	-	X	-	X	X	X	X	-
34	Navigation	X/X	-	X	-	X	-	X	X	X	X	X
35	Oxygen	X/-	X	X	X	-	-	X	X	-	-	-
36	Pneumatic	X/-	X	-	X	X	X	X	-	X	X	X
36A	Pneumatic - Monitoring and indicating	X/X	X	X	X	X	X	X	X	X	X	X
37	Vacuum	X/-	X	-	X	X	X	-	-	-	-	-
38	Water/Waste	X/-	X	X	-	-	-	X	X	-	-	-
41	Water Ballast	X/-	-	-	-	-	-	-	-	-	-	-
42	Integrated modular avionics	X/X	-	-	-	-	-	X	X	X	X	X
44	Cabin Systems	X/X	-	-	-	-	-	X	X	X	X	X
45	On-Board Maintenance System (or covered in 31)	X/X	X	X	X	X	X	X	X	X	X	X
46	Information Systems	X/X	-	-	-	-	-	X	-	X	X	X
50	Cargo and Accessory Compartments	X/X	-	X	-	-	-	-	-	-	-	-
	Turbine / Piston Engine Modules											
70	Standard Practices – Engines – only type particular	-	-	X	-	-	-	-	X	-	-	-
70A	Constructional arrangement and operation (Installation	X/X	-	-	-	-	-	-	-	-	-	-

Chapters		B1/B2	B1					B2				
		LOC	FOT	SGH	R/I	MEL	TS	FOT	SGH	R/I	MEL	TS
	Inlet, Compressors, Combustion Section, Turbine Section, Bearings and Seals, Lubrication Systems).											
	Turbine Engines											
70B	Engine Performance	-	-	-	-	-	X	-	-	-	-	-
71	Powerplant	X/-	X	X	-	-	-	-	X	-	-	-
72	Engine Turbine/Turbo Prop/Ducted Fan/Unducted fan	X/-	-	-	-	-	-	-	-	-	-	-
73	Engine Fuel and Control	X/X	X	-	-	-	-	-	-	-	-	-
73A	FADEC Systems	X/X	X	-	X	X	X	X	-	X	X	X
74	Ignition	X/X	X	-	-	-	-	X	-	-	-	-
75	Air	X/-	-	-	X	-	X	-	-	-	-	-
76	Engine controls	X/-	X	-	-	-	X	-	-	-	-	-
77	Engine Indicating	X/X	X	-	-	X	X	X	-	-	X	X
78	Exhaust	X/-	X	-	-	X	-	-	-	-	-	-
79	Oil	X/-	-	X	X	-	-	-	-	-	-	-
80	Starting	X/-	X	-	-	X	X	-	-	-	-	-
82	Water Injections	X/-	X	-	-	-	-	-	-	-	-	-
83	Accessory Gear Boxes	X/-	-	X	-	-	-	-	-	-	-	-
84	Propulsion Augmentation	X/-	X	-	-	-	-	-	-	-	-	-
	Auxiliary Power Units (APUs)											
49	Auxiliary Power Units (APUs)	X/-	X	X	-	-	X	-	-	-	-	-
	Piston Engine											
70	Standard Practices – Engines – only type particular	-	-	X	-	-	-	-	X	-	-	-
70A	Constructional arrangement and operation (Installation, Carburettors, Fuel injection systems, Induction, Exhaust and Cooling Systems, Supercharging/Turbocharging, Lubrication Systems).	X/X	-	-	-	-	-	-	-	-	-	-
70B	Engine Performance	-	-	-	-	-	X	-	-	-	-	-
71	Powerplant	X/-	X	X	-	-	-	-	X	-	-	-
73	Engine Fuel and Control	X/X	X	-	-	-	-	-	-	-	-	-

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

4. Type training examination and assessment standard

4.1 Theoretical element examination standard

~~Where aircraft type training is required, the examination must be written and~~ After the theoretical portion of the aircraft type training has been completed, a written examination shall be performed, which shall comply with the following:

(a) Format of the examination is of the multiple-choice type. Each multiple-choice question must have 3 alternative answers of which only one must be the correct answer. The total time is based on the total number of questions and the time for answering is based upon a nominal average of ~~120~~ 90 seconds per ~~level 3 question and 75 seconds per level 1 or 2~~ question.

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

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

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

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

(f) The number of questions ~~must~~ shall be at least ~~one~~ 1 question per hour of instruction, ~~subject to a minimum of two questions per Syllabus subject~~. 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 CAA will assess the number and level of questions ~~on a sampling basis~~ when approving the course.

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

(h) Penalty marking (negative points for failed questions) is not to be used. ~~to determine whether a candidate has passed.~~

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

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

4.2 Practical element assessment standard

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

(a) The assessment shall be performed by designated assessors appropriately qualified.
(b) The assessment shall evaluate the knowledge and skills of the trainee.

5. Type examination standard

Type examination shall be conducted by training organisations appropriately approved under MCAR-147 or by the CAA.

~~Where type training is not required,~~ The examination ~~must~~ shall be oral, written or practical assessment based, or a combination thereof and it shall comply with the following requirements:

(a) Oral examination questions must be open.

(b) Written examination questions must be essay type or multiple-choice questions.

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

(d) Examination ~~subjects must~~ shall be on a sample of ~~subjects~~ chapters (**) drawn from paragraph 3 type training/examination syllabus, at the indicated level.

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

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

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

1. Properly discuss with confidence the aircraft and its systems.

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

3. Correctly use all technical literature and documentation for the aircraft.

4. Correctly use specialist/special tooling and test equipment, perform removal and replacement of components and modules unique to type, including any on-wing maintenance activity.

(h) The following conditions apply to the examination:

1. The maximum number of consecutive attempts is three. Further sets of three attempts are allowed with a one 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.

   The applicant shall confirm in writing to the maintenance training organisation or the competent authority to which they apply for an examination, the number and dates of attempts during the last year and the maintenance training 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 timeframes.

2. The type examination shall be passed and the required practical experience shall be completed within the three years preceding the application for the rating endorsement on the aircraft maintenance licence.

3. Type examination shall be performed with at least one examiner present. The examiner(s) shall not have been involved in the applicant's training.

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

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

6. On-the-Job Training

On-the-Job Training (OJT) shall be approved by the CAA.

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 three 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 CAA. 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 CAA, 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 MCAR.

AMC to Section 1 of Appendix III to MCAR-66 "Aircraft Type Training and Examination Standard. On-the-Job Training"

Aircraft Type Training

1. Aircraft type training may be sub-divided in airframe and/or powerplant and/or avionics/electrical systems type training courses.

   - Airframe type training course means a type training course including all relevant aircraft structure and electrical and mechanical systems excluding the powerplant.

   - Powerplant type training course means a type training course on the bare engine, including the build-up to a quick engine change unit.

   - The interface of the engine/airframe systems should be addressed by either airframe or powerplant type training course. In some cases, such as for general aviation, it may be more appropriate to cover the interface during the airframe course due to the large variety of aircraft that can have the same engine type installed.

   - Avionics/electrical systems type training course means type training on avionics and electrical systems covered by but not necessarily limited to ATA (Air Transport Association) Chapters 22, 23, 24, 25, 27, 31, 33, 34, 42, 44, 45, 46, 73 and 77 or equivalent.

2. Practical training may be performed either following or integrated with the theoretical elements. However, it should not be performed before theoretical training.

3. The content of the theoretical and practical training should:

   - address the different parts of the aircraft which are representative of the structure, the systems/components installed and the cabin; and

   - include training on the use of technical manuals, maintenance procedures and the interface with the operation of the aircraft.

   Therefore it should be based on the following elements:

   - Type design including relevant type design variants, new technology and techniques;
   - Feedback from in-service difficulties, occurrence reporting, etc;
   - Significant applicable airworthiness directives and service bulletins;
   - Known human factor issues associated with the particular aircraft type;
   - Use of common and specific documentation, (when applicable, such as MMEL, AMM, MPD, TSM, SRM, WD, AFM, tool handbook), philosophy of the troubleshooting, etc.;
   - Knowledge of the maintenance on-board reporting systems and ETOPS maintenance conditions where applicable;
   - Use of special tooling and test equipment and specific maintenance practises including critical safety items and safety precautions;
   - Significant and critical tasks/aspects from the MMEL, CDL, Fuel Tank Safety (FTS), airworthiness limitation items (ALI) including Critical Design Configuration Control

Limitations (CDCCL), CMR and all ICA documentation such as MRB, MPD, SRM, AMM, etc., when applicable.

- Maintenance actions and procedures to be followed as a consequence of specific certification requirements, such as, but not limited to, RVSM (Reduced Vertical Separation
- Minimum) and NVIS (Night Vision Imaging Systems);
- Knowledge of relevant inspections and limitations as applicable to the effects of environ - mental factors or operational procedures such as cold and hot climates, wind, moisture, sand, de-icing / anti-icing, etc.

The type training does not necessarily need to include all possible customer options corresponding to the type rating described in the Appendix I to AMC to MCAR-66.

4. Limited avionic system training should be included in the category B1 type training as the B1 privileges include work on avionics systems requiring simple tests to prove their serviceability.

5. Electrical systems should be included in both categories of B1 and B2 type training.

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

- Integrated or split

- Supported by the use of training aids, such as trainers, virtual aircraft, aircraft components, synthetic training devices (STD), computer based training devices (CBT), etc.

AMC to Paragraph 3.1(d) of Appendix III to MCAR-66 "Aircraft Type Training and Examination Standard. On-the-Job Training"

Training Needs Analysis for the Theoretical Element of the Aircraft Type Training

1. The minimum duration for the theoretical element of the type rating training course, as described in Appendix III to MCAR-66, has been determined based on:

- generic categories of aircraft and minimum standard equipment fit
- the estimated average duration of standard courses imparted in the world

2. The purpose of the Training Needs Analysis (TNA) is to adapt and justify the duration of the course for a specific aircraft type. This means that the TNA is the main driver for determining the duration of the course, regardless of whether it is above or below the minimum duration described in Appendix III to MCAR-66.

In the particular case of type training courses approved on the basis of the requirements valid before this issue of MCAR-66 is applicable (insert effective date) and having a duration for the theoretical element equal to or above the minimum duration contained in paragraph 3.1(c) of Appendix III to MCAR-66, it is acceptable that the TNA only covers the differences introduced by this issue of MCAR-66 in paragraph 3.1(e) "Content" and the criteria introduced in paragraph 3.1(d) "Justification of course duration" related to the minimum attendance and the maximum

number of training hours per day. This TNA may result in a change in the duration of the theoretical element.

3. The content and the duration deriving from this TNA may be supported by an analysis from the Type Certificate holder.

4. In order to approve a reduction of such minimum duration, the evaluation done by the CAA 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 large transport category 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 requirements.

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

(a) The TNA should include an analysis identifying all the areas and elements where there is a need for training as well as the associated learning objectives, considering the design philosophy of the aircraft type, the operational environment, the type of operations and the operational experience. This analysis should be written in a manner which provides a reasonable understanding of which areas and elements constitute the course in order to meet the learning objectives.

(b) As a minimum, the Training Need Analysis (TNA) should take into account all the applicable elements contained in paragraph 3.1 of MCAR-66 Appendix III and associated AMCs.

(c) The TNA should set-up the course content considering the Appendix III objectives for each level of training and the prescribed topics in the theoretical element table contained in paragraph 3.1 of MCAR-66 Appendix III.

(d) For each chapter described in the theoretical element table contained in paragraph 3.1 of MCAR-66 Appendix III, the corresponding training time should be recorded.

(e) Typical documents to be used in order to identify the areas and elements where there is a need for training typically include, among others, the Aircraft Maintenance Manual, MRB report, CMRs, airworthiness limitations, Troubleshooting Manual, Structural Repair Manual, Illustrated Parts Catalogue, Airworthiness Directives and Service Bulletins.

(f) During the analysis of these documents:

- Consideration should be given to the following typical activities:
  - Activation/reactivation;
  - Removal/Installation;
  - Testing;
  - Servicing;
  - Inspection, check and repairs;
  - Troubleshooting / diagnosis.

- For the purpose of identifying the specific elements constituting the training course, it is acceptable to use a filtering method based on criteria such as:
  - Frequency of the task;
  - Human factor issues associated to the task;
  - Difficulty of the task;
  - Criticality and safety impact of the task;
  - In-service experience;
  - Novel or unusual design features (not covered by MCAR-66 Appendix I);
  - Similarities with other aircraft types;
  - Special tests and tools/equipment.

- It is acceptable to follow an approach based on:
  - Tasks or groups of tasks, or
  - Systems or subsystems or components

(g) The TNA should:

- Identify the learning objectives for each task, group of tasks, system, subsystem or component;
- Associate the identified tasks to be trained to the regulatory requirements (table in
- Paragraph 3.1 of Appendix III to MCAR-66);
- Organise the training into modules in a logical sequence (adequate combination of chapters as defined in Appendix III of MCAR-66);
- Determine the sequence of learning (within a lesson and for the whole syllabus);
- Identify the scope of information and level of detail with regard the minimum standard to which the topics of the TNA should be taught according to the set-up objectives.

- Address the following:
  - Description of each system/component including the structure (where applicable);
  - System/component operation taking into account:
    a. Complexity of the system (e.g. the need of further break down into subsystems, etc.);
    b. Design specifics which may require more detailed presentation or may contribute to maintenance errors;
    c. Normal and emergency functioning;
    d. Troubleshooting;
    e. Interpretation of indications and malfunctions;
    f. Use of maintenance publications;
    g. Identification of special tools and equipment required for servicing and maintaining the aircraft;
    h. Maintenance Practices;
    i. Routine inspections, functional or operational tests, rigging/adjustment, etc.

- Describe the following:
  - The instructional methods and equipment, 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 practiced-oriented training, etc.;

- The homework, if developed;
- The training provider's resources available to the learner.

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

(i) The maximum number of training hours per day for the theoretical element of type training should not be more than 6 hours. A training hour means 60 minutes of tuition excluding any breaks, examination, revision, preparation and aircraft visit. In exceptional cases, the CAA may allow deviation from this standard when it is properly justified that the proposed number of hours follows pedagogical and human factors principles. These principles are especially important in those cases where:

- Theoretical and practical training are performed at the same time;
- Training and normal maintenance duty / apprenticeship are performed at the same time.

(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 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) The TNA is a living process and should be reviewed/updated based on operation feedback, maintenance occurrences, airworthiness directives, major service bulletins impacting maintenance activities or requiring new competencies for mechanics, alert service bulletins, feedback from trainees or customer satisfaction, evolution of the maintenance documentation such as MRBs, MPDs, MMs, etc. The frequency at which the TNA should be reviewed/updated is left to the discretion of the organisation conducting the course.

NOTE: The examination is not part of the TNA. However, it should be prepared in accordance with the learning objectives described in the TNA.

AMC to Paragraphs 1(b), 3.2 and 4.2 of Appendix III to MCAR-66 "Aircraft Type Training and Examination Standard. On-the-Job Training"

Practical Element of the Aircraft Type Training

1. The practical training may include instruction in a classroom or in simulators but part of the practical training should be conducted in a real maintenance or manufacturer environment.

2. The tasks should be selected because of their frequency, complexity, variety, safety, criticality, novelty, etc. The selected tasks should cover all the chapters described in the table contained in paragraph 3.2 of Appendix III to MCAR-66.

3. The duration of the practical training should ensure that the content of training required by paragraph 3.2 of Appendix III to MCAR-66 is completed.

Nevertheless, for aeroplanes with a MTOM equal or above 30000kg, the duration for the practical element of a type rating training course should not be less than two weeks unless a shorter duration meeting the objectives of the training and taking into account pedagogical aspects (maximum duration per day) is justified to the competent authority.

4. The organisation providing the practical element of the type training should provide trainees a schedule or plan indicating the list of tasks to be performed under instruction or 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 may be countersigned by the designated assessor. The logbook format and its use should be clearly defined.

5. In paragraph 4.2 of Appendix III to MCAR-66, the term "designated assessors appropriately qualified" means that the assessors should demonstrate training and experience on the assessment process being undertaken and 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 MCAR-66.

6. The practical element (for powerplant and avionic systems) of the Type Rating Training may be subcontracted by the approved MCAR-147 organisation under its quality system according to the provisions of 147.A.145(d)3 and the corresponding Guidance Material.

AMC to Paragraph 1(c) of Appendix III to MCAR-66 "Aircraft Type Training and Examination Standard. On-the-Job Training"

Differences Training

Approved difference training is not required for different variants within the same aircraft type rating (as specified in Appendix I to AMC to MCAR-66) for the purpose of type rating endorsement on the aircraft maintenance licence.

However, this does not necessarily mean that no training is required before a certifying staff authorisation can be issued by the maintenance organisation (refer to AMC 66.A.20(b)3).

AMC to Section 5 of Appendix III to MCAR-66 "Aircraft Type Training and Examination Standard. On-the-Job Training"

Type Examination Standard

This Section 5 "Type Examination Standard" does not apply to the examination performed as part of type training. This Section only applies to those cases where type examination is performed as a substitute for type training.

AMC to Section 6 of Appendix III to MCAR-66 "Aircraft Type Training and Examination Standard. On-the-Job Training"

On-the-Job Training (OJT)

1. "*A maintenance organisation appropriately approved for the maintenance of the particular aircraft type*" means an MCAR-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 MCAR-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 MCAR-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 MCAR-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 MCAR-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).~~

Commented [A36]: Not applicable in the Maldivian context.

AMC to Appendix III to Part-66 "Aircraft Type Training and Examination Standard. On-the-Job Training"

Aircraft Type Training and On-the-Job Training

The theoretical and practical training providers, as well as the OJT provider, may contract the services of a language translator in the case where training is imparted to students not conversant in the language of the training material. Nevertheless, it remains essential that the students understand all the relevant maintenance documentation.

During the performance of examinations and assessments, the assistance of the translator should be limited to the translation of the questions, but should not provide clarifications or help in relation to those questions.

Appendix IV Experience requirements for extending a MCAR-66 Aircraft Maintenance Licence

The table below shows the experience requirements for adding a new category or subcategory to an existing MCAR-66 licence.

The experience must be practical maintenance experience 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 MCAR-147 course relevant to the subcategory.

To: / From:	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2	B3
A1		6 Months	6 Months	6 Months	2 Years	6 Months	2 Years	1 Year	2 Years	6 Months
A2	6 Months		6 Months	6 Months	2 Years	6 Months	2 Years	1 Year	2 Years	6 Months
A3	6 Months	6 Months		6 Months	2 Years	1 Year	2 Years	6 Months	2 Years	1 Year
A4	6 Months	6 Months	6 Months		2 Years	1 Year	2 Years	6 Months	2 Years	1 Year
B1.1	None	6 Months	6 Months	6 Months		6 Months	6 Months	6 Months	1 Year	6 Months
B1.2	6 Months	None	6 Months	6 Months	2 Years		2 Years	6 Months	2 Years	None
B1.3	6 Months	6 Months	None	6 Months	6 Months	6 Months		6 Months	1 Year	6 Months
B1.4	6 Months	6 Months	6 Months	None	2 Years	6 Months	2 Years		2 Years	6 Months
B2	6 Months	6 Months	6 Months	6 Months	1 Year	1 Year	1 Year	1 Year	-	1 Year
B3	6 Months	None	6 Months	6 Months	2 Years	6 Months	2 Years	1 Year	2 Years	-

Appendix V (Reserved)

Appendix VI (Reserved)

APPENDICES TO THE AMC

Appendix I Aircraft Type Ratings for MCAR-66 Aircraft Maintenance Licence (*)

Commented [A37]: This list includes only aircraft type accepted in the Maldives.

~~The following aircraft type ratings should be used to ensure a common standard throughout the Member States.~~

~~The inclusion of an aircraft type in the list does not indicate that the aircraft type has been already granted a type certificate under the Basic Regulation and its Implementing Rules.~~

~~In order to keep this list current and type ratings consistent, any relevant information should be first passed on to the Agency via the following link:~~

~~http://easa.europa.eu/webgate/rulemaking-enquiry/~~

Notes on when the licences should be modified:

- When a modification is introduced by this issue of MCAR-66 to an aircraft type rating or to an engine designation in the rating which affects licences already issued, the ratings on the AML licences may be modified in the next renewal or when the licence is re-issued, unless there is an urgent reason to modify the licence.

Notes on aircraft modified by STC:

Commented [AM38]: These two points from Decision 2013-024-R

- It is not the intention of this document to include all aircraft modified by STCs. ~~because a great number of STCs were approved before 2003 and are unknown to the Agency.~~
- When an aircraft has been modified by an STC for installation of another engine, the MCAR-66 type rating of this aircraft may change i.e. from Group 2 to Group 1. This is not reflected in this document. In case the applicant to a licence faces such a case, he/she ~~or his/her competent authority~~ can inform the CAA and a new type rating will be defined by the CAA.

In the following tables:

- The column "TC Holder" includes the TC holder as defined in the TCDS (EASA, FAA or other) or the Specific Airworthiness Specifications (SAS).

Commented [AM39]: Decision 2013-024-R

- Some TC holders' designations may include ~~have been corrected to add the information~~: 'Aircraft with an SAS', this means that the aircraft listed under this TC holder designation is considered an 'orphan aircraft'.
- In Group 3, a third column has been added which is called 'Type of structure' and which intends to assist ~~the competent authorities~~ in identifying the experience required for this type with a view on removing existing limitations on the licence.

Commented [AM40]: Decision 2013-024-R

- Wooden structure covered with fabric is considered to fall under wooden structure. For Aeroplanes with a combination of structures; e.g. metal tubing fuselage and wooden wings, both experience 'metal tube covered with fabric' and 'wooden structure' are required.

Commented [AM41]: Decision 2013-024-R

- Only the designations of ratings included in the column "MCAR-66 Type rating endorsement" should be used for endorsing individual type ratings on MCAR-66 licences.

Commented [AM42]: This is included in previous version of Part 66 and not included in Decision 2013-024-R. Why?

GROUP I AEROPLANES

TC Holder	Model	Commercial Designation	MCAR-66 Type rating endorsement
AIRBUS	A300 B4-601 A300 B4-603 A300 B4-605 R A300 C4-605 R Variant F A300 F4-605 R		Airbus A300-600 (GE CF6)
	A310-204 A310-222 A310-322		Airbus A310 (PW JT9D)
	A318-110 series A319-110 series A320-111 A320-210 series A321-110 series		Airbus A318/A319/A320/A321 (CFM56)
	A319-130 series A320-230 series A321-130 series A321-230 series		Airbus A319/A320/A321 (IAE V2500)
ATR-GIE Avions de Transport Régional	ATR 42-200 ATR 42-300 ATR 42-320		ATR 42-200/300 series (PWC PW120)
	ATR 42-400 ATR 42-500 ATR 42-500	 42-500 42-600	ATR 42-400/500/72-212A (PWC PW120)

Commented [A43]: Includes Airbus A300-600 and Airbus A310 type ratings grandfathered from D02.

TC Holder	Model	Commercial Designation	MCAR-66 Type rating endorsement
	ATR 72-212 A ATR 72-212 A	72-500 72-600	
	ATR 72-101 ATR 72-102 ATR 72-201 ATR 72-202 ATR 72-211 ATR 72-212		ATR 72-100/200 series (PWC PW120)
BOEING COMPANY	B757-200 B757-200PF B757-300		Boeing 757-200/300 (PW 2000)
	B757-200 B757-200PF B757-300		Boeing 757-200/300 (RR RB211)
	B767-200 B767-300 B767-300BCF		Boeing 767-200/300 (PW 4000)
	B767-200 B767-300 B767-300BCF		Boeing 767-200/300 (PW JT9D)
	B767-200 B767-300 B767-300F		Boeing 767-200/300/400 (GE CF6)

Commented [AM44]: Decision 2013-024-R

Commented [AM45]: Decision 2013-024-R

TC Holder	Model	Commercial Designation	MCAR-66 Type rating endorsement
	B767-300BCF		
	B767-400ER		
BOMBARDIER	DHC-8-101	DHC-8 Series 100	Bombardier DHC-8-100/200/300 (PWC PW 120)
	DHC-8-102	DHC-8 Series 100	
	DHC-8-103	DHC-8 Series 100	
	DHC-8-106	DHC-8 Series 100	
	DHC-8-201	DHC-8 Series 200	
	DHC-8-202	DHC-8 Series 200	
	DHC-8-301	DHC-8 Series 300	
	DHC-8-311	DHC-8 Series 300	
	DHC-8-304	DHC-8 Series 300	
	DHC-8-305	DHC-8 Series 300	
RUAG Aerospace Services GmbH	228-100 series		Dornier 228 (Honeywell TPE331)
	228-200 series		
VIKING AIR (Bombardier) (De Havilland)	DHC-6-1	Twin Otter	De Havilland DHC-6 (PWC PT6)
	DHC-6-100/110		
	DHC-6-200/210		
	DHC-6 300/310/320 DHC-6-400		

Commented [AM46]: Decision 2013-024-R

SUB-GROUP 2a: SINGLE TURBO-PROPELLER ENGINE AEROPLANES (Other than those in Group 1)

TC Holder	MCAR-66 Type rating endorsement
CESSNA AIRCRAFT Company	Cessna 208 Series (PWC PT6)

GROUP 3: PISTON-ENGINE AEROPLANES (Other than those in Group 1)

TC Holder	MCAR-66 Type rating endorsement	
CESSNA AIRCRAFT Company	Cessna 150 Series (Rotax)	Metal
	Cessna/Reims-Cessna 150/F150 Series (Continental)	Metal
	Cessna/Reims-Cessna 152/F152 Series (Lycoming)	Metal
	Cessna/Reims-Cessna 172/F172 Series (Continental)	Metal
	Cessna/Reims-Cessna 172/F172 Series (Lycoming)	Metal
	~~Cessna/Reims-Cessna 172/F172 Series (Thielert)~~	~~Metal~~
PIPER AIRCRAFT	Piper PA-34 Series (Continental)	Metal
	Piper PA-34 Series (Lycoming)	Metal

Commented [AM47]: Deleted in ED 2013-024-R

APPENDIX II Aircraft Type Practical Experience List of Tasks

Time limits/Maintenance checks

100 hour check (general aviation aircraft).
"B" or "C" check (transport category aircraft).
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 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

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.
Service toilet/water system
Perform pre-flight/daily check

Vibration and Noise Analysis

Analyse helicopter vibration problem.
Analyse noise spectrum

Air Conditioning

Replace combustion heater.
Replace outflow valve.
Replace vapour cycle unit.
Replace air cycle unit.
Replace cabin blower.

Replace heat exchanger.
Replace pressurisation controller.
Clean outflow valves.
Check operation of air conditioning/heating system
Check operation of pressurization system
Troubleshoot faulty system

Auto flight

Install servos.
Rig bridle cables
Replace controller.
Replace amplifier.
Check operation of auto-pilot.
Check operation of auto-throttle.
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.

Defuel aircraft.
Check tire pressures.
Check oil level.
Check hydraulic fluid level.
Check accumulator pressure.
Charge pneumatic system.
Grease aircraft.
Connect ground power.

Electrical Power

Charge lead/acid battery.
Charge ni-cad battery.
Check battery capacity.
Deep-cycle ni-cad battery.
Replace generator/alternator.
Replace switches.
Replace circuit breakers.
Adjust voltage regulator.
Amend electrical load analysis report.
Repair/replace electrical feeder cable.
Troubleshoot faulty 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.
Repair upholstery.
Change cabin configuration.

Fire protection

Check fire bottle contents.
Check operation of warning system.
Check cabin fire extinguisher contents.
Check lavatory smoke detector system.
Install new fire bottle.
Replace fire bottle squib.
Troubleshoot faulty system.
Inspect engine fire wire detection systems

Flight Controls

Replace horizontal stabiliser.
Replace elevator.
Replace aileron.

Perform antenna VSWR check.
Perform Selcal operational check.
Perform operational check of passenger address system.
Functionally check audio integrating system.
Repair co-axial cable.
Troubleshoot faulty system.

Fuel

Replace booster pump.
Replace fuel selector.
Replace fuel tank cells.
Check filters.
Flow check system.
Check calibration of fuel quantity gauges.
Check operation feed/selectors
Troubleshoot faulty system.

Hydraulics

Replace engine driven pump.
Replace standby pump.
Replace accumulator.
Check operation of shut off valve.
Check filters.
Check indicating systems.
Perform functional checks.
Troubleshoot faulty system

Ice and rain protection

Replace pump.
Replace timer.
Install wiper motor.
Check operation of systems.
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

Landing Gear

Build up wheel.
Replace main wheel.

Replace rudder.
Replace trim tabs.
Install control cable and fittings.
Replace flaps.
Replace powered flying control unit
Replace flat actuator
Adjust trim tab.
Adjust control cable tension.
Check control range and sense of movement.
Check for correct assembly and locking.
Troubleshoot faulty system.

Lights

Repair/replace rotating beacon.
Repair/replace landing lights.
Repair/replace navigation lights.
Repair/replace interior lights.
Repair/replace emergency lighting system.
Perform emergency lighting system checks.
Troubleshoot faulty system

Navigation

Calibrate magnetic direction indicator.
Replace airspeed indicator
Replace altimeter.
Replace air data computer.
Replace VOR unit.
Replace ADI.
Replace HSI.
Check pitot static system for leaks.
Check operation of directional gyro.
Functional check weather radar.
Functional check doppler.
Functional check TCAS.
Functional check DME
Functional check ATC Transponder
Functional check flight director system.
Functional check inertial nav system.
Complete quadrantal error correction of ADF system.
Update flight management system database.
Troubleshoot faulty system
Check marker systems
Compass replacement direct/indirect
Check Satcom

Replace nose wheel.
Replace shimmy damper.
Rig nose wheel steering.
Replace shock strut seals.
Replace brake unit.
Replace brake control valve.
Bleed brakes.
Test anti skid unit.
Test gear retraction.
Change bungees.
Adjust micro switches.
Charge struts.
Troubleshoot faulty system.
Test outbrake system

Vacuum systems

Replace vacuum pump.
Check/replace filters.
Adjust regulator.
Troubleshoot faulty system.

Water/Waste

Replace water pump.
Replace tap.
Replace toilet pump.
Troubleshoot faulty system.

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

Sheet metal repair.
Fibre glass repair.
Wooden repair.
Fabric repair.
Recover fabric control surface.
Treat corrosion.
Apply protective treatment.

Doors

Check GPS
Test AVM

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 compressor.
Recharge dessicator.
Adjust regulator.
Check for leaks.
Troubleshoot faulty system.

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.
Dress out blade damage.
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.
Rig/adjust locking mechanism.

Adjust air stair system
Check operation of emergency exits.
Test door warning system.
Troubleshoot faulty system.

Windows

Replace windshield.
Replace window.
Repair transparency.

Wings

Skin repair.
Recover fabric wing.
Replace tip.
Replace rib.
Check incidence/rig.

Power Plant

Build up ECU.
Replace engine.
Repair cooling baffles.
Repair cowling. Adjust cowl flaps.
Repair faulty wiring.
Troubleshoot.

Piston Engines

Remove/install reduction gear.
Check crankshaft run-out.
Check tappet clearance.
Extract broken stud.
Install helicoil.
Perform ground run.
Establish/check reference RPM.
Troubleshoot.

Turbine Engines

Replace module.
Hot section inspection.
Engine ground run.
Establish reference power.
Trend monitoring/gas path analysis.
Troubleshoot.

Fuel and control, piston

Replace engine driven pump.

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.
Check chip detectors.

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.

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.

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 sense of operation.
Adjust pedestal micro-switches.
Troubleshoot faulty system.

Adjust AMC.
Adjust ABC.
Install carburetor/injector.
Adjust carburetor/injector.
Clean injector nozzles.
Replace primer line.
Check carburetor float setting.
Troubleshoot faulty system

Fuel and control, turbine

Replace FCU.
Replace engine driven pump.
Clean/test fuel nozzles.
Clean/replace filters
Adjust FCU.
Troubleshoot faulty system.

Ignition systems, turbine

Check glow plugs/igniters.
Check H.T. leads.
Check ignition unit.
Replace ignition unit.
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

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.

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.
Troubleshoot faulty system.

Accessory gear boxes

Replace gearbox.
Replace drive shaft.
Check chip detector.

Appendix III Evaluation of the competence: assessment and assessors

This Appendix applies to the competence assessment performed by the designated assessors (and their qualifications).

1) What does "competence" mean and areas of focus for assessment

The assessment should aim at measuring the competence by evaluating three major factors associated to the learning objectives:

- Knowledge;
- Skills;
- Attitude;

Generally, knowledge is evaluated by examination. The purpose of this document is not to describe the examination process: this material mainly addresses the evaluation of "skills" and "attitude" after training containing practical elements. Nevertheless, the trainee needs to demonstrate to have sufficient knowledge to perform the required tasks.

"Attitude" is indivisible from the "skill" as this greatly contributes to the safe performance of the tasks.

The evaluation of the competence should be based on the learning objectives of the training, in particular:

- the (observable) desired performance. This covers what the trainee is expected to be able to do and how the trainee is expected to behave at the end of the training;
- the (measurable) performance standard that must be attained to confirm the trainee's level of competence in the form of tolerances, constraints, limits, performance rates or qualitative statements; and
- the conditions under which the trainee will demonstrate competence. Conditions consist of the training methods, the environmental, situational and regulatory factors.

The assessment should focus on the competencies relevant to the aircraft type and its maintenance such as, but not limited to:

- Environment awareness (act safely, apply safety precautions and prevent dangerous situations);
- Systems integration (demonstrate understanding of aircraft systems interaction – identify, describe, explain, plan, execute);
- Knowledge and understanding of areas requiring special emphasis or novelty (areas peculiar to the aircraft type, domains not covered by Part 66 Appendix I, practical training elements that cannot be imparted through simulation devices, etc.);
- Using reports and indications (the ability to read and interpret);
- Aircraft documentation finding and handling (identify the appropriate aircraft documentation, navigate, execute and obey the prescribed maintenance procedures);
- Perform maintenance actions (demonstrate safe handling of aircraft, engines, components and tools);

- Aircraft final/close-up and report (apply close up, initiate appropriate actions/follow-up/records of testing, establish and sign maintenance records/logbooks).

2) How to assess

As far as feasible, the objectives of the assessment should be associated with the learning objectives and the passing level; it means that observable criteria should be set in order to measure the performance and should remain as objective as possible.

The general characteristics of effective assessment are: objective, flexible, acceptable, comprehensive, constructive, organised and thoughtful. At the conclusion, the trainee should have no doubt about what he/she did well, what he/she did poorly and how he/she can improve.

The following is a non-exhaustive list of questions that may be posed to assist assessment:

- What are the success factors for the job?
- What are typical characteristics of a correct behaviour for the task?
- What criteria should be observed?
- What level of expertise is expected?
- Is there any standard available?
- What is the pass mark? For example:
  - "Go-no go" situation;
  - How to allocate points? Minimum amount to succeed;
  - "Must know or execute" versus "Good to know or execute" versus "Don't expect the candidate to be an expert".
- Minimum or maximum time to achieve? Use time effectively and efficiently.
- What if the trainee fails? How many times is the trainee allowed to fail?
- When and how should the trainee be prepared for the assessment?
- What proportion of judgment by the instructor out of collaboration with the trainee is needed during the evaluation stage?

The assessment may be:

- diagnostic (prior to a course), formative (re-orientate the course on areas where there is a need to reinforce) or summative (partial or final evaluation);
- performed task-by-task, as a group of tasks or as a final assessment;

One method might be an initial assessment to be performed by the trainee himself, then discussing areas where the perceptions of the trainee's performance by the assessors differ in order to:

- develop the self-assessment habits;
- make the assessment more acceptable and understandable to both parties.

A "box-ticking" exercise would be pointless. Experience has shown that assessment sheets have largely evolved over time into assessment of groups of "skills" because in practice such things eventually detracted from the training and assessment that it was intended to serve: evaluate at a point of time, encourage and orientate the training needs, improve safety and ultimately qualify people for their duties.

In addition, many other aspects should be appropriately considered during the assessment process such as stress and environmental conditions, difficulty of the test, history of evaluation (such as tangible progresses or sudden and unexpected poor performance made by the trainee), amount of time necessary to build competence, etc.

All these reasons place more emphasis on the assessor and highlight the function of the organisation's approval.

3) Who should assess

In order to qualify, the assessor should:

- Be proficient and have sufficient experience or knowledge in:
  - human performance and safety culture;
  - the aircraft type (necessary to have the certifying staff privileges in case of CRS issuances);
  - training/coaching/testing skills;
  - instructional tools to use;
- Understand the objective and the content of the practical elements of the training that is being assessed;
- Have interpersonal skills to manage the assessment process (professionalism, sincerity, objectivity and neutrality, analysis skills, sense of judgement, flexibility, capability of evaluating the supervisor's or instructor's reports, handling of trainee's reactions to failing assessment with the cultural environment, being constructive, etc.);
- Be ultimately designated by the organisation to carry out the assessment.

The roles may be combined for:

- the assessor and the instructor for the practical elements of the Type Rating Training; or
- the assessor and the supervisor for the On-the-Job Training.

provided that the objectives associated to each role are clearly understood and that the competence and qualification criteria according to the company's procedures are met for both functions. Whenever possible (depending on the size of the organisation), it is recommended to split the roles (two different persons) in order to avoid any conflicts of interests.

When the functions are not combined, the role of each function should be clearly understood.