Tillämpningsbestämmelse

SE-EMAR 66
Military Aircraft Maintenance Licensing

Särskilda bestämmelser - SE-EMAR 66

SE-EMAR 66 – Certifikat för militärt luftfartygsunderhåll (Military Aircraft Maintenance Licensing)

1 March 2022

()

Särskilda bestämmelser - SE-EMAR 66

SE-EMAR 66
Central stock-keeping: The Swedish Armed Forces intranet – emilia

Preface

This SE-EMAR 66 edition is issued in accordance with regulation FFS 2019:10. SE-EMAR 66 is applicable for the Military Aircraft Maintenance Licensing.

This SE-EMAR 66 edition (Requirements, Acceptable Means of Compliance (AMC) and Guidance Material (GM)) is based on the EMAR 66.

The content of this SE-EMAR 66 is arranged as follows:

- Requirements appear first.

  The requirements are the special provisions in accordance with FFS 2019:10 chapter 1, paragraph 6.
- Followed by the related Acceptable Means of Compliance (AMC) and Guidance Material (GM) paragraphs.

All elements are also color-coded and can be identified according to the table below:

Requirements

Acceptable Means of Compliance (AMC)

Guidance Material (GM)

Identification of the tailoring

- The tailoring from EMAR are identified by grey background and a frame.
- If completely new requirement, AMC or GM has been created, this is identified by inclusion of "(**SE**)" after the title.

Note: When reference to "EMAR" in this document, it shall be read as a reference to SE-EMAR (21, M, 145, 66 or 147).

Document change record

Edition number	Edition date	Section or pages affected	Reason for change (Detailed)
1.2	2022-03-01	*66.A.25 Basic knowledge requirements (sida 0)66.A.25 Basic knowledge requirements (sida 22)*	Clarification
		66.A.30 Basic experience requirements (sida 0)66.A.30 Basic experience requirements (sida 23)	Clarification
1.1	2021-03-01	No change	Updated
1.0	2020-03-01	All	Initial issue

EMAR Status

This SE-EMAR 66 edition is based on:

	Version	Date
Requirements	1.0	2014-09-23
Acceptable Means of Compliance (AMC) and Guidance Material (GM)	1.0	2014-09-23

This edition of SE-EMAR 66 includes the Swedish tailored objects:

Section A - Technical Requirements		
Paragraph/ Section	**Content**	**Description**
66.A.10(g)	Application	An application for MAML shall only be submitted by a EMAR 145 AMO.
Appendix I Item 2. Modularisation	Basic Knowledge Requirements	It is not mandatory with module 17 (propeller) for a B1.1 MAML.
Appendix III Item 1. General	Military Aircraft Type Training and Examination Standard, and On-the-Job Training (OJT)	The requirement to have the prerequisite relevant 50-series series modules (or sub-modules) is not mandatory. “Shall” is changed to “should”.
Appendix III Item 3.1(e)	Military Aircraft Type Training and Examination Standard, and On-the-Job Training (OJT)	Possibility to use different system for the elements (chapters).
Appendix III Item 3.2(b)	Military Aircraft Type Training and Examination Standard, and On-the-Job Training (OJT)	Possibility to use different system for the elements (chapters).
66.A.25	Basic knowledge requirements	Acceptance of an EASA CoR and validation of old training courses.
66.A.30	Basic experience requirements	Clarification of a relevant course, training hours requirement and acceptance of experience/training in a EASA 145 workshop

Section B - Procedures for the Authorities		
Paragraph/ Section	**Content**	**Description**
-	-	-

Table of content

REQUIREMENTS, ACCEPTABLE MEANS OF COMPLIANCE AND GUIDANCE MATERIAL

SECTION A TECHNICAL REQUIREMENTS

66.A.1 Scope

This section defines the Military Aircraft Maintenance Licence (MAML) and establishes the requirements for application, issue and continuation of its validity.

66.A.3 MAML categories

(a) Military Aircraft Maintenance Licences 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. These subcategories are:

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

(c) NOT APPLICABLE.

GM 66.A.3 MAML categories

Individual Military Aircraft Maintenance Licence (MAML) holders need not be restricted to a single category. Provided that each qualification requirement is satisfied, any combination of categories may be granted.

66.A.5 Aircraft groups

All military aircraft shall be considered as complex motor-powered aircraft.

66.A.10 Application

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

(b) NOT APPLICABLE.

(c) In addition to the documents required in EMAR 66.A.10(a) and EMAR 66.B.105, as appropriate, the applicant for additional basic categories or subcategories to a MAML shall submit his/her current MAML to the NMAA together with the EMAR Form 19.

(d) NOT APPLICABLE.

(e) NOT APPLICABLE.

(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.

(g) SE-MAA only accepts applications in accordance with EMAR 66.A.10(a) submitted by an EMAR 145 Aircraft Maintenance Organisation.

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 logbook of maintenance experience is desirable and some NMAAs may require such a logbook to be kept. It is acceptable to cross-refer in the EMAR Form 19 to other documents containing information on maintenance.
2. Applicants claiming the maximum reduction in EMAR 66.A.30(a) total experience based upon successful completion of EMAR 147.A.200 approved basic training should include the EMAR 147 Certificate of Recognition for approved basic training.
3. Applicants claiming reduction in EMAR 66.A.30(a) total experience based upon successful completion of technical training in an organisation or entity recognised by the NMAA as an Approved Maintenance Training Organisation should include the relevant certificate of successful completion of training. Where the technical training was completed in another organisation (for example a CAA or EASA approved Maintenance Training Organisation), then advice should be sought from the NMAA to ensure the training received is acceptable to the NMAA.

66.A.15 Eligibility

An applicant for a MAML shall be at least 18 years of age.

66.A.20 Privileges

(a) The following privileges shall apply:

1. A Category A MAML permits the holder to issue certificates of release to service following minor scheduled line maintenance and simple defect rectification within the limits of tasks specifically endorsed on the certification authorisation referred to in EMAR 145.A.35. The certification privileges shall be restricted to work that the licence holder has personally performed in the EMAR 145 AMO that issued the certification authorisation.

2. A Category B1 MAML shall permit the holder to issue certificates of release to service and to act as B1 support staff for the following:

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

Category B1 includes the corresponding A subcategory.

3. A Category B2 MAML shall permit the holder:

(i) to issue certificates of release to service and to act as B2 support staff for the 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) to issue certificates of release to service following minor scheduled line maintenance and simple defect rectification within the limits of tasks specifically endorsed on the certification authorisation referred to in EMAR 145.A.35. This certification privilege shall be restricted to work that the MAML holder has personally performed in the AMO which issued the certification authorisation and limited to the Military Aircraft Type Ratings already endorsed in the B2 MAML.

Category B2 does not include any A subcategory.

4. NOT APPLICABLE.

5. A Category C MAML shall permit the holder to issue certificates of release to service for aircraft following base maintenance on aircraft. The privileges apply to the aircraft in its entirety.

6. Categories A, B1 and B2 MAMLs can have extensions (*66.A.52 Extensions (sida 0)66.A.52 Extensions (sida 30)*) to address one or more of the military-specific topics included in Appendix I (Modules 50 - 55). These shall permit the holder to issue certificates of release to service and act as support staff appropriate to the basic knowledge gained from all modules and as approved by the NMAA for maintenance performed on armament, rescue and escape systems and other military-specific systems.

(b) The holder of a MAML shall not exercise its privileges unless[2]:

1. in compliance with the applicable requirements of EMAR M and EMAR 145; and

2. in the preceding 2-year period he/she has, either had 6 months of maintenance experience in accordance with the privileges granted by the MAML 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

2. The holder of a Category A MAML 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 organisation appropriately approved in accordance with EMAR 145 or EMAR 147. This 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 or by workplace assessment carried out by the EMAR 145 AMO or EMAR 147 MTO. The holder of a Category B2 MAML may only exercise the certification privileges described in EMAR 66.A.20(a)(3)(ii) following the satisfactory completion of: (i) the relevant Category A aircraft task training; and (ii) 6 months of documented practical experience covering the scope of the authorisation that will be issued. The task 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 or by workplace assessment. Task training and examination/assessment shall be carried out by the EMAR 145 AMO issuing the certifying staff authorization or EMAR 147 MTO. The practical experience shall be obtained within the same EMAR 145 AMO.

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

GM 66.A.20(a) Privileges

1. The following definitions 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);
- Integrated Modular Avionics (IMA);
- On-Board Maintenance Systems;
- Information Systems;
- Fly-by-Wire Systems (related to S1000D“Flight Controls”);
- Fibre Optic Control Systems.

> NOTE: Instruments are formally included in the privileges of the B2 MAML holders. However, maintenance on electro-mechanical and pitot-static components may also be released by a B1 MAML holder.

Armament, rescue and escape systems and other military-specific systems means systems associated with the carriage, targeting and release of weapons; reconnaissance and surveillance equipment; self-protection, electronic warfare and aircrew escape systems. Examples of armament, rescue and escape systems and other military-specific systems include the following:

- weapons;
- weapons release/launch mechanisms;
- Ejection seats.

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 to identify the root cause of a defect or malfunction using approved maintenance data. It may include the use of BITE or external test equipment.

Line maintenance means 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 the 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 powerplant 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.

Base Maintenance means any task falling outside the criteria that are given above for *Line Maintenance*.

2. NOT APPLICABLE.

3. The Category C MAML permits certification of scheduled base maintenance by the issue of a single “certificate of release to service for 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 support staff, as appropriate, who 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 support staff, as appropriate, before issue of the “certificate of release to service for

aircraft". Only Category C personnel who also hold the appropriate Category B1 or B2 endorsement 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. See also EMAR 145.A.35(c) regarding experience requirements and EMAR AMC 145.A.35(c) regarding military exigencies.

1. Duration:

Within an Approved Maintenance Organisation:

- 6 months working within the same organisation; or
- 6 months split up into different blocks, working within the same or in different organisations.

2. Nature of the experience:

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

- Servicing;
- Inspection;
- Operational and functional testing;
- Troubleshooting;
- Repairing;
- Modifying;
- Changing components;
- Supervising these activities;
- Releasing aircraft to service.

For Category A MAML holders, the experience should include exercising the privileges, by means of performing tasks related to the authorisation. This means tasks as mentioned in EMAR AMC 145.A.30(g), including servicing, component changes and simple defect rectifications.

For Category B1 and B2, for every Military Aircraft Type Rating included in the authorisation the experience should be on that particular aircraft or on a similar aircraft within the same series. Two aircraft within the same series can be considered as similar when they have similar technology, construction and comparable systems, which means equally equipped, for example, with the following (as applicable to the MAML category):

- Propulsion systems (piston, turboprop, turbofan, turboshaft, jet-engine or pushpropellers); and
- Flight control systems (mechanical controls, hydromechanically powered controls or electromechanically powered controls); and

- Avionic systems (analogue systems or digital systems); and
- Weapon systems (including aircrew assisted escape systems and weapons carried); and
- Structure (manufactured of metal or composite).

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

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 logbook or in any other recording system approved by the NMAA (which may be an automated / computerised one) containing the following data:

- Date;
- Aircraft type;
- Aircraft identification, i.e. registration;
- S1000D Chapter (optional);
- Operation performed e.g. 100 flight hours check, main landing gear wheel change, engine oil check and complement, Service Bulletin (or national equivalent) embodiment, troubleshooting, structural repair, ejection seat change…;
- Type of maintenance, i.e. base, line;
- Type of activity, i.e. perform, supervise, release;
- Category used: A, B1, B2 or C;
- Duration in days or partial-days.

GM 66.A.20(b)2 Privileges

The sentence "*met the provision for the issue of the appropriate privileges*" included in EMAR 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 Military Aircraft Type Rating. 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 MAML holder and, if applicable, the Approved Maintenance 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 MAML and ratings. This is typically the case, among others, in the following situations:

- 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 Military Aircraft Type Training/On-the-Job Training.
- Specific technology, options and configurations which may not have been covered by the Military Aircraft Type Training/On-the-Job Training.
- Changes in the basic knowledge requirements of Appendix I to EMAR 66 not requiring re-examination of existing MAML holders (grandfathered privileges).
- Persons meeting the requirements of 6 months of experience every 2 years only on certain similar aircraft types as allowed by EMAR AMC 66.A.20(b)2.
- Persons holding a MAML with limitations obtained through conversion of national qualifications (EMAR 66.A.70), where such limitations are going to be lifted after performing the corresponding basic knowledge examinations. In this case, the Military Aircraft Type Ratings endorsed in the MAML 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 EMAR AMC 145.A.35(a).

GM 66.A.20(b)4 Privileges

1. Holders of a MAML may only exercise certification privileges when 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 MAML holder is able to:
    - read and understand the instructions and technical manuals used for the performance of maintenance;
    - 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 AMO procedures;
- communicate at such a level so 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.

66.A.25 Basic knowledge requirements

(a) An applicant for a MAML, the extension to a MAML or the addition of a category or subcategory to such a MAML, shall demonstrate by examination a level of knowledge in the appropriate subject modules in accordance with Appendix I. The examination shall be conducted either by an MTO appropriately approved in accordance with EMAR 147 or by the NMAA.

(b) The training courses and examinations shall be passed within 10 years prior to the application for a MAML, the extension to a MAML or the addition of a category or subcategory to such a MAML. Should this not be the case, examination credits may however be obtained in accordance with point (c).

(c) The applicant may apply to the NMAA for full or partial examination credit to the basic knowledge requirements 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 NMAA to be equivalent to the knowledge standard of this EMAR. If the applicant holds an EASA Part 66 licence, the NMAA may accept the EASA licence as a basis, only requiring additional training to cover the differences between the EASA licence and the MAML requirements.

Credits shall be granted in accordance with Subpart E of Section B of this EMAR.

(d) Credits expire 10 years after they were granted to the applicant by the NMAA. The applicant may apply for new credits after expiration.

(e) Modules 50-55 shall be used to provide extensions to a MAML for military-specific systems. Module 53 includes sub-modules that can also be used to provide extensions to a MAML for military-specific systems.

(3) EASA part 147 basic training CoR /EASA part 66 AML is accepted for issuing SE-EMAR 66 MAML if additional training is performed in module 3, 7, 11 and 15 to cover the differences between the EASA part 66 and SE-EMAR requirement.

(4) Training courses and examinations performed before 2022-03-01 are valid to 2032-03-01.

(5) EASA part 66 AML does not need to be valid by EASA for conversion to SE-EMAR 66 MAML.

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 depends upon the course taken in relation to Appendix I to EMAR 66.

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

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

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

GM 66.A.25(d) Basic knowledge requirements

Where the relevant basic knowledge requirements remain unchanged, no additional training is required for credit renewal.

66.A.30 Basic experience requirements

(a) An applicant for a MAML shall have acquired:

1A. for Category A:

(i) 3 years of practical maintenance experience on operating military aircraft, if the applicant has no previous relevant technical training; or

(ii) 2 years of practical maintenance experience on operating military aircraft and completion of training considered relevant by the NMAA as a skilled worker, in a technical trade; or

(iii) 6 months of practical maintenance experience on operating military aircraft and completion of a basic training course providing the minimum practical training (as detailed in Column 4 of EMAR 147 Appendix I) approved in accordance with EMAR 147; or

(iv) 1 years of practical maintenance experience on operating military aircraft and completion of a basic training course that does not provide the recommended minimum practical training (as defined in Column 4 of EMAR 147 Appendix I) approved in accordance with EMAR-147.

1B. for Subcategories B1.2 and B1.4:

(i) 3 years of practical maintenance experience on operating military aircraft, if the applicant has no previous relevant technical training; or

(ii) 2 years of practical maintenance experience on operating military aircraft and completion of training considered relevant by the NMAA as a skilled worker, in a technical trade; or

(iii) 1 year of practical maintenance experience on operating military aircraft and completion of a basic training course providing the minimum practical training (as detailed in Column 4 of EMAR 147 Appendix I) approved in accordance with EMAR 147; or

(iv) 2 years of practical maintenance experience on operating military aircraft and completion of a basic training course that does not provide the recommended minimum practical training (as defined in Column 4 of EMAR 147 Appendix I) approved in accordance with EMAR-147.

The 2 years of practical maintenance experience can be reduced by the duration of the practical training given during the basic training course with a maximum reduction of 1 year. (Note: as a reference 20 hours of practical training will be considered as being equivalent to a duration of 1 week.)

2. for Categories B2 and Subcategories B1.1 and B1.3:

(i) 5 years of practical maintenance experience on operating military aircraft if the applicant has no previous relevant technical training; or

(ii) 3 years of practical maintenance experience on operating military aircraft and completion of training considered relevant by the NMAA as a skilled worker, in a technical trade; or

(iii) 2 years of practical maintenance experience on operating military aircraft and completion of a basic training course providing the minimum practical training (as detailed in Column 4 of EMAR 147 Appendix I) approved in accordance with EMAR 147; or

(iv) 3 years of practical maintenance experience on operating military aircraft and completion of a basic training course that does not provide the recommended minimum practical training (as defined in Column 4 of EMAR 147 Appendix I) approved in accordance with EMAR 147.

The 3 years of practical maintenance experience can be reduced by the duration of the practical training given during the basic training course with a maximum reduction of 1 year. (Note: as a reference 20 hours of practical training will be considered as being equivalent to a duration of 1 week.)

3. for Category C:

(i) 3 years of experience exercising Category B1.1, B1.3 or B2 privileges or as support staff according to EMAR 145.A.35, or a combination of both; or

(ii) 5 years of experience exercising Category B1.2 or B1.4 privileges or as support staff according to EMAR 145.A.35, or a combination of both.

4. NOT APPLICABLE.

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 NMAA, plus:

(i) 3 years of experience working in a military aircraft maintenance environment on a representative selection of tasks directly associated with military aircraft maintenance including 6 months of observation of base maintenance tasks; or

(ii) experience as detailed by the NMAA but not less than 6 months of observation of base maintenance tasks.

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

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

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

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

(f) Experience shall have been acquired within the 10 years preceding the application for a MAML or the addition of a category or subcategory to such a MAML.

(6) Regarding 66.A.30.2 (ii): A basic training course with modules examined after course examination is considered to be a relevant course.

(7) Regarding 66.A.30.2 (iii): An EASA part 147 basic training course that meets SE-EMAR 147 training hours requirements according to Column 4 of EMAR 147 Appendix I is considered to be a complete basic training course regarding experience requirement.

(8) Regarding 66.A.30.2 (iv): One (1) year is considered to be calculated as 52 weeks.

(9) Regarding 66.A.30.5 (e): Experience gained in an EASA part 145 workshop is accepted by SE-MAA as adequate to understand the military aircraft maintenance environment.

(10) SE-MAA accepts training performed by an EASA 147 school in an SE-EMAR 145 workshop regarding experience requirement.

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. Where an NMAA requires further experience or a specific training syllabus, this should be clearly detailed.

2. Moved to EMAR GM 66.A.30(a)1.

3. Moved to EMAR GM 66.A.30(a)2.

4. Moved to EMAR GM 66.A.30(a)3.

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

1. While an applicant for a Category C MAML may be qualified by having 3 years' experience as a Category B1 or B2 certifying staff only in line maintenance, it is however recommended that any applicant for a Category C holding a B1 or B2 MAML demonstrate at least 12 months experience as a B1 or B2 support staff.
2. A 'skilled worker' is a person who has successfully completed training acceptable to the NMAA and involving the manufacture, repair, overhaul or inspection of mechanical, electrical, electronic or, where applicable, military-specific equipment. The training would include the use of tools and measuring devices.
3. Maintenance experience on operating military aircraft:
   - Means the experience of being involved in maintenance tasks on aircraft which are being operated by the military and state aircraft;
   - Should cover a wide range of tasks in length, complexity and variety;
   - Aims at gaining sufficient experience in the real environment of military aircraft maintenance as opposed to only the training school environment;
   - May be combined with EMAR 147 approved training so that periods of training can be intermixed with periods of experience, similar to an apprenticeship.
4. Within the meaning of EMAR AMC 66.A.30(a) paragraph 1, the term “engineering” refers to activities performed within an EMAR 145 organisation or within a CAMO that are associated with repairs and modifications (which may or may not need to be further processed for approval) in accordance with the MOE.
5. Where the practical element of the Military Aircraft Type Training is performed concurrently with the OJT element and both are performed on the same military aircraft type and in a real maintenance environment, this can count towards the experience requirements detailed in EMAR 66.A.30.

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

To be considered as 'recent maintenance experience', at least 50% of the required one year 'recent maintenance experience' should be gained within the 12-month period prior to the date of application for the MAML. The remainder of the 'recent maintenance 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 EMAR 66.A.30 must be obtained within the 10 years prior to the application as required by EMAR 66.A.30(f).

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

1. For Category A the additional experience of military aircraft maintenance should be a minimum of 6 months. For Category B1 or B2 the additional experience of military aircraft maintenance should be a minimum of 12 months.

2. Aircraft maintenance experience gained outside a military aircraft maintenance environment may include aircraft maintenance experience gained in the civil environment, other nation's armed forces, coast guards, police, etc., or in aircraft manufacturing.

66.A.40 Continued validity of the Military Aircraft Maintenance Licence

(a) The MAML shall be issued for an unlimited duration. It shall remain valid subject to the holder remaining in compliance with the requirements in this EMAR and the MAML not being suspended, surrendered or revoked.

(b) Upon suspension, surrendering or revocation the MAML shall be returned to the NMAA.

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

(d) The MAML is only valid:

(1) when issued and/or changed by the NMAA; and

(2) when the holder has signed the document.

(e) If the MAML holder's name, service number or state ID number change, the MAML shall be resubmitted to the NMAA within 30 days.

GM 66.A.40 Continued validity of the Military Aircraft Maintenance Licence

The validity of the MAML is not affected by recency of maintenance experience whereas the validity of the EMAR 66.A.20 privileges is affected by maintenance experience as specified in EMAR 66.A.20(b).

66.A.45 Military Aircraft Type Ratings

(a) In order to be entitled to exercise certification privileges on a specific aircraft type, the holder of a MAML shall have his/her MAML endorsed with the relevant Military Aircraft Type Ratings, following satisfactory completion of the relevant Military Aircraft Type Training within an EMAR 147 approved MTO.

For Category A, no Military Aircraft Type Rating is required, subject to compliance with the task training requirements of EMAR 145.A.35.

(b) The issuing of a Military Aircraft Type Rating requires the satisfactory completion of the relevant Category B1, B2 or C Military Aircraft Type Training. Where relevant, the NMAA may accept an appropriate EASA aircraft type rating as evidence of having undertaken a partial or full equivalent to Military Aircraft Type Training.

(c) In addition to the requirement of point (b), the issuing of the first Military 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 EMAR 66. Any subsequent Military Aircraft Type Rating within a given category/sub-category may require further On the Job Training as defined by the NMAA.

(d) NOT APPLICABLE.

(e) NOT APPLICABLE.

(f) NOT APPLICABLE.

(g) NOT APPLICABLE.

AMC 66.A.45(e) Military Aircraft Type Ratings

NOT APPLICABLE.

AMC 66.A.45(d), (e)3, (f)1 and (g)1 Military Aircraft Type Ratings

NOT APPLICABLE.

AMC 66.A.45 Military Aircraft Type Ratings

The following table summarises the Military Aircraft Type Rating requirements contained in EMAR 66.A.45, EMAR 66.A.50 and Appendix III to EMAR 66.

Note: OJT means "On-the-Job Training" (see Appendix III to EMAR 66, Section 6).

Military Aircraft Type Rating requirements		
Aircraft Group	**B1/ B2 MAML**	**C MAML**
All military aircraft are considered to be complex motorpowered aircraft	**MILITARY AIRCRAFT TYPE RATING** Military Aircraft Type Training: • Theory + examination • Practical + assessment **PLUS** OJT (for first aircraft in licence subcategory. For subsequent Military Aircraft Type Rating within the same category/sub-category, further OJT only if required by the NMAA)	*MILITARY* **AIRCRAFT TYPE RATING** Military Aircraft Type Training: • Theory + examination

GM 66.A.45 Military Aircraft Type Ratings

Moved to EMAR AMC 66.A.45.

66.A.50 Limitations

(a) Limitations introduced on a MAML are exclusions from the certification privileges. If a new Military Aircraft Type Rating is gained, the MAML limitation(s) shall continue to apply to the new Military Aircraft Type Rating.

(b) NOT APPLICABLE.

(c) Any limitation shall be removed upon satisfactory completion of the relevant requirements of EMAR 66 or as defined in the applicable conversion report referred to in EMAR 66.B.300.

AMC 66.A.50(a) Limitations

In case of partial qualification resulting from missing modules, the MAML should incorporate the relevant limitations in accordance with EMAR 66.A.50.

AMC 66.A.50(b) Limitations

NOT APPLICABLE.

66.A.52 Extensions

Extensions introduced on a MAML may allow additional certification privileges.

AMC 66.A.52 Extensions

In case of extended qualification resulting from additional modules or sub-modules, the MAML should incorporate the relevant extensions in accordance with EMAR 66.A.52 and EMAR 66.B.116.

66.A.55 Evidence of qualification

Personnel exercising certification privileges as well as support staff shall produce their MAML, as evidence of qualification, within 72 hours upon request by an official of the NMAA.

66.A.70 Conversion provisions

The holder of a licence or other qualification for the maintenance of aircraft gained prior to, or an individual undergoing a process to gain such a licence or other qualification prior to, a date established in national regulation shall follow the procedures for conversion into a MAML established by the NMAA according to EMAR 66 Section B Subpart D.

(a) NOT APPLICABLE.

(b) NOT APPLICABLE.

(c) NOT APPLICABLE.

(d) NOT APPLICABLE.

GM 66.A.70 Conversion provisions

1. As described in point EMAR 66.A.70, the conversion provisions apply to the holder of a valid certifying staff qualification prior to the date of entry into force of EMAR 66. 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.
2. The conversion applies to "certifying staff qualifications" such as, for example:
   - Holding a pre-existing national licence or equivalent (or completed the process to obtain such a national licence);
   - Having completed a qualification process defined by the NMAA to become certifying staff;
   - Having completed the qualification requirements for certifying staff within an AMO, as defined in its 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 were considered) since the person is working in a line station where the scope of tasks is very limited;
   - The person holds a licence or national equivalent with a wider scope than the scope of the organisation where he/she is employed;
   - The person is working outside the military aviation environment 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. NOT APPLICABLE.
4. Although only those "certifying staff qualifications" gained prior to the introduction of EMAR 66 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. NOT APPLICABLE.
6. A limitation may be needed where a person holds a pre-existing licence or other qualification for the maintenance of aircraft which covered, to the standard of EMAR 66 Appendix I and II, all the modules/subjects corresponding to the B1 MAML except for electrical power systems. This person would receive an EMAR 66 MAML in the B1 Category with a limitation (exclusion) on electrical power systems.

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

GM 66.A.70(c) Conversion provisions

NOT APPLICABLE.

GM 66.A.70(d) Conversion provisions

NOT APPLICABLE.

SECTION B PROCEDURES FOR NATIONAL MILITARY AIRWORTHINESS AUTHORITIES

SUBPART A - GENERAL

66.B.1 Scope

This section establishes the procedures including the administrative requirements to be followed by the NMAA in charge of the implementation and the enforcement of Section A of EMAR 66.

66.B.10 National Military Airworthiness Authority

(a) General

The pMS shall designate their NMAA with allocated responsibilities for the issuance, continuation, change, suspension or revocation of MAMLs.

This NMAA shall establish an adequate organisational structure to ensure compliance with EMAR 66.

(b) Resources

The NMAA shall be appropriately staffed to ensure the implementation of the requirements of EMAR 66.

(c) Procedures

The NMAA shall establish documented procedures detailing how compliance with EMAR 66 is accomplished. These procedures shall be reviewed and amended to ensure continued compliance.

66.B.15 Delegation of licensing activities to another organisation

(a) The NMAA may delegate licensing activities to a suitable alternative entity to act on its behalf.

(b) Such an entity may carry out all the functions as described in this Section on behalf of the NMAA, subject to adequate assurance and oversight by the NMAA.

(c) The NMAA remains responsible for assuring that all the requirements of this Section are met.

66.B.20 Record-keeping

(a) The NMAA shall establish a system of record-keeping that allows adequate traceability of the process to issue, change, suspend or revoke each MAML.

(b) These records shall include for each MAML:

1. the application for a MAML or change to that MAML, including all supporting documentation;
2. a copy of the MAML including any changes;
3. copies of all relevant correspondence;
4. details of any exemption and enforcement actions;
5. any relevant report from other NMAAs or authorities relating to the MAML holder;
6. the records of examinations conducted by the NMAA;
7. the applicable conversion report used for conversion;
8. the applicable credit report used for crediting.

(c) NOT APPLICABLE.

(d) Records referred to in points 1 through 8 of point (b) shall be kept for a minimum period of 50 years.

AMC 66.B.20 Record-keeping

1. The record-keeping system should ensure that all records are accessible whenever needed within a reasonable time. These records should be organised in a consistent way throughout the NMAA (chronological, alphabetical order, etc.).

2. All records containing sensitive data regarding applicants or organisations should be stored in a secure manner with controlled access to ensure confidentiality of this kind of data.

3. All computer hardware used to ensure data backup should be stored in a different location from that containing the working data in an environment that ensures they remain in good condition. When hardware or software changes take place, special care should be taken that all necessary data continues to be accessible at least through the full period specified in EMAR 66.B.20.

66.B.25 Mutual exchange of information

Mutual exchange of information shall follow the provisions of EMAD R.

(a) NOT APPLICABLE.

(b) NOT APPLICABLE.

66.B.30 Exemptions

All exemptions granted by the NMAA shall be recorded and retained by the NMAA.

SUBPART B - ISSUE OF A MILITARY AIRCRAFT MAINTENANCE LICENCE

This Subpart provides the procedures to be followed by the NMAA to issue or change a MAML.

66.B.100 Procedure for the issue of a MAML by the NMAA

(a) On receipt of an EMAR Form 19 and any supporting documentation, the NMAA shall verify it for completeness and ensure that the experience claimed meets the requirement of EMAR 66.

(b) The NMAA shall verify an applicant's examination status and/or confirm the validity of any credits to ensure that all required modules of Appendix I have been met as required by EMAR 66.

(c) When having verified the identity and date of birth of the applicant and being satisfied that the applicant meets the standards of knowledge and experience required by EMAR 66, the NMAA shall issue the relevant MAML to the applicant. The same information shall be kept on NMAA records.

(d) In the case where aircraft types are endorsed at the time of the issuance of the first MAML, the NMAA shall verify compliance with EMAR 66.B.115.

AMC 66.B.100 Procedure for the issue of a MAML by the NMAA

1. Applicants claiming the maximum reduction in EMAR 66.A.30(a) total experience based upon successful completion of an EMAR 147.A.200 approved basic training course should include the EMAR 147 certificate of recognition for approved basic training.

2. Applicants claiming reduction in EMAR 66.A.30(a) total experience based upon successful completion of training considered relevant by the NMAA and considered as a skilled worker in a technical trade should include the relevant certificate of successful completion of training.

3. Applicants claiming credit against the EMAR 66.A.30(a) total experience requirement by virtue of EMAR 66.A.30(e) non-military aircraft maintenance experience may only be granted such credit where the NMAA has recognised such non-military aircraft maintenance experience. The NMAA recognising non-military aircraft maintenance experience should have specified the person within the non-military environment who may make a statement that the applicant has met the relevant maintenance experience requirements. The applicant should include a detailed statement of such maintenance experience signed by that NMAA specified person in accordance with the conditions specified by the NMAA.

4. The NMAA should check that the experience record satisfies the above paragraphs in terms of content and the countersigning signature.

66.B.105 Preparation for the issue of a MAML via a Maintenance Organisation approved in accordance with EMAR 145

(a) A Maintenance Organisation approved in accordance with EMAR 145, when authorised to carry out this activity by the NMAA, may

(1) prepare the MAML on behalf of the NMAA; or

(2) make recommendations to the NMAA regarding the application from an individual for a MAML so that the NMAA may prepare and issue such MAML.

(b) Maintenance Organisations referred to in point (a) shall ensure compliance with EMAR 66.B.100 (a) and (b).

(c) In all cases, the MAML can only be issued to the applicant by the NMAA.

AMC 66.B.105 Preparation for the issue of a MAML via a Maintenance Organisation approved in accordance with EMAR 145

1. The maintenance organisation approved under EMAR 145 should include the procedure in the MOE and this procedure should be audited by the NMAA at least once in each 24-month period. This procedure should include a limitation stating that it is only applicable to the case where the NMAA for the EMAR 145 approval and for the EMAR 66 MAML is the same.

2. The AMO should check that the experience records have been properly countersigned.

3. The AMO may keep the experience record of applicants in a different form from that of the EMAR Form 19 application but such different form or manner should be acceptable to the NMAA.

66.B.110 Procedure for the change of a MAML to include an additional basic category or subcategory

(a) At the completion of the procedures specified in EMAR 66.B.100 or EMAR 66.B.105, the NMAA shall endorse the additional basic category or subcategory by stamp and signature or reissue the licence.

(b) The NMAA record system shall be changed accordingly.

AMC 66.B.110 Procedure for the change of a MAML to include an additional basic category or subcategory

In the case of computer-generated MAMLs, the MAML should be reissued.

66.B.115 Procedure for the change of a MAML to include a Military Aircraft Type Rating or to remove limitations

(a) On receipt of a satisfactory EMAR Form 19 and any supporting documentation demonstrating compliance with the requirements of the applica-

ble Military Aircraft Type Rating together with the accompanying MAML, the NMAA shall either:

1. endorse the applicant's MAML with the applicable Military Aircraft Type Rating; or

2. reissue the MAML to include the applicable Military Aircraft Type Rating; or

3. remove the applicable limitations in accordance with EMAR 66.A.50.

The NMAA's corresponding records shall be changed accordingly.

(b) NOT APPLICABLE.

(c) NOT APPLICABLE.

(d) In the case where the Military Aircraft Type Training is not covered by a single course, the NMAA shall be satisfied prior to the Military Aircraft Type Rating endorsement that the content and length of the courses fully satisfy the scope of the MAML category and that the interface areas have been appropriately addressed.

(e) In the case of differences training, the NMAA shall be satisfied that the applicant's previous qualification, supplemented by a course approved in accordance with EMAR 147, is acceptable for Military Aircraft Type Rating endorsement.

(f) Compliance with the practical elements shall be demonstrated by the provision of detailed practical training records or a logbook provided by an EMAR 145 AMO or, where available, by a training certificate covering the practical training element issued by an EMAR 147 MTO.

(g) Military Aircraft Type Rating endorsement shall use the Military Aircraft Type Ratings specified by the NMAA. The NMAA shall provide details of all the aircraft types/variants that are covered by each Military Aircraft Type Rating.

AMC 66.B.115 Procedure for the change of a MAML to include a Military Aircraft Type Rating or to remove limitations

(a). Where the Military Aircraft Type Training has been conducted by an EASA Part-147 organisation recognized by the NMAA (EMAR 66.B.130 refers), there should be supporting documents confirming to the NMAA that:

- the Military Aircraft Type Training has been approved by the appropriate civilian competent authority; and
- the applicant has completed the elements of the approved Military Aircraft Type Training; and
- the trainee has been successfully examined/assessed.

(b). Military Aircraft Type Training will usually be subdivided into airframe and/or powerplant and/or avionics/electrical systems and/or military specific/weapons type training courses. The NMAA is responsible for ap-

proving the scope of the type training courses as they are applicable to each military aircraft type for which it has responsibility.

(c). The NMAA should develop adequate procedures for the acceptance of the OJT programme described in Section 6 of Appendix III to EMAR 66.

AMC 66.B.100 to 115

NOT APPLICABLE.

66.B.116 Procedure for the change of a MAML to include extensions

(a) When granting an extension, the NMAA shall ensure that the extension on a MAML results in a level of safety equal to that of the full MAML category. In particular, the NMAA shall define and document which education and training is required for any extension.

(b) On receipt of a satisfactory EMAR Form 19 and any supporting documentation, the NMAA shall endorse the extension by stamp and signature or reissue the licence.

(c) The NMAA record system shall be changed accordingly.

66.B.120 Procedure for the renewal of a MAML validity

NOT APPLICABLE.

AMC 66.B.120 Procedure for the renewal of a MAML validity

NOT APPLICABLE.

66.B.125 Procedure for the conversion of MAMLs including group ratings

NOT APPLICABLE.

66.B.130 Procedure for the direct approval of Military Aircraft Type Training

The NMAA may accept Military Aircraft Type Training conducted by a Maintenance Training Organisation approved in accordance with EASA Part 147, following comparison of relevant syllabi against EMAR 66 App III knowledge requirements.

AMC 66.B.130 Procedure for the direct approval of Military Aircraft Type Training

NOT APPLICABLE.

SUBPART C - EXAMINATIONS

This Subpart provides the procedures to be followed for the conduct of examinations.

66.B.200 Examination Standard

(a) All examination questions shall be kept in a secure manner prior to an examination, to ensure that candidates will not know which particular questions will form the basis of the examination.

(b) The NMAA shall nominate:

1. persons who control the questions to be used for each examination;

2. examiners who shall be present during all examinations to ensure the integrity of the examination.

(c) Basic examinations shall follow the standard specified in Appendix I and II.

(d) Military Aircraft Type Training examinations shall follow the standard specified in Appendix III.

(e) New essay questions shall be raised at least every 6 months and questions already used withdrawn or rested from use. A record of the questions used shall be retained in the records for reference.

(f) All examination papers shall be handed out at the start of the examination to the candidate and handed back to the examiner at the end of the allotted examination time period. No examination paper may be removed from the examination room during the allotted examination time period.

(g) Only the examination paper may be available to the candidate during the examination.

(h) Examination candidates shall be separated from each other so that they cannot read each other's examination papers. They may not speak to any person other than the examiner.

(i) Candidates who are proven to be cheating shall be banned from taking any further examination within 12 months of the date of the examination in which they were found cheating, unless the NMAA approves otherwise.

AMC 66.B.200 Examination Standard

1. Questions should be prepared in the national language but the use of aviation English is recommended wherever possible.

2. The primary purpose of essay questions is to determine that the candidates can express themselves in a clear and concise manner and can prepare a concise technical report, which is why only a few essay questions are required.

3. Retained in EMAR GM 66.B.200.

4. For pass mark purposes, the essay questions should be considered as separate from the multiple choice questions.

5. Multiple Choice Question (MCQ) generation.

The following principles should be observed when developing MCQs:

(a) The examination should measure clearly formulated goals. Therefore the field and depth of knowledge to be measured by each question should be fully identified.

(b) All the questions should have a minimum of three alternative answers.

(c) Questions that require specialised knowledge of specific military aircraft types should not be asked in a basic training examination.

(d) The use of abbreviations and acronyms should generally be avoided. However, where needed, only internationally recognised abbreviations and acronyms should be used. In case of doubt use the full form, e.g. angle of attack = 12° instead of a = 12°.

(e) Questions and answers should be formulated as simply as possible: the examination is not a test of language. Complex sentences, unusual grammar and double negatives should be avoided.

(f) A question should comprise one complete positive proposition. No more than 3 different statements should appear among the suggested responses otherwise the candidate may be able to deduce the correct answer by eliminating the unlikely combinations of statements.

(g) Questions should have only one true answer.

(h) The correct answer should be absolutely correct and complete or, without doubt, the most preferable. Responses that are so essentially similar that the choice is a matter of opinion rather than a matter of fact should be avoided. The main interest in MCQs is that they can be quickly performed: this is not achieved if doubt exists about the correct answer.

(i) The incorrect alternatives should seem equally plausible to anyone ignorant of the subject. All alternatives should be clearly related to the question and be of similar vocabulary, grammatical structure and length. In numerical questions, the incorrect answers should correspond to procedural errors such as corrections applied in the wrong sense or incorrect unit conversions: they should not be mere random numbers.

(j) Calculators are not allowed during examination. Therefore all calculations should be feasible without a calculator. Where a question involves calculations not feasible without a calculator, such as v10 then the question should specify the approximate value of v10 .

(k) Questions should refer to the EMAR 66 Appendix I (for Basic Training) or to EMAR 66 Appendix III (for Military Aircraft Type Training) examination syllabus.

6. Essay question generation:

(a) The purpose of the essay is to allow the knowledge examiner to determine if candidates can express themselves in a clear and concise manner in the form of a written response, in a technical report format using the technical language of the military aviation environment. The essay examination also allows the knowledge examiner to assess, in part, the technical knowledge retained by the individual and with a practical application relevant to a maintenance scenario.

(b) Questions should be written so as to be broad enough to be answered by candidates for all MAML categories or sub-categories (Categories A, B1 and B2) and comply with the following general guidelines:

- the question topic selected should be generic, applicable to all MAML categories and have a common technical difficulty level as indicated in EMAR 66, Appendix I;
- cover technology applicable to most areas of military aircraft maintenance;
- reflect common working practices;
- not be type specific and avoid subjects which are rarely found in practice;
- when drafting a question there is a need to ensure that consideration is given to the limited practical experience that most candidates will have.

(c) To make the questions and the marking procedures as consistent as possible, each question and model answer, with the key areas required (see below), should be reviewed independently by at least 2 persons with appropriate technical knowledge.

(d) When raising questions the following should be complied with:

- Each essay question should have a time allowance of 20 minutes.
- A complete A4 side is provided for each question and answer, if required the answer can be extended onto the reverse side of the page.
- The question should be such that the answer expected will be at the level shown for that subject in the module syllabus.
- The question should not be ambiguous but should seek a broad reply rather than be limited in scope for answer.
- The question should lend itself to be written in a technical report style, in a logical sequence (beginning, middle and end), containing the applicable and relevant technical words needed in the answer.
- The question should be relevant to the category and level of difficulty listed in the syllabus, e.g. a description of a typical light aircraft system may not be acceptable for a typical fighter aircraft.
- As far as possible, questions should have a strong bias towards the practical maintenance of a system/component and the answer should show an understanding of normal and deteriorated conditions of an aircraft and its systems.
- The security classification of any military system must be considered when scoping a question.

Variations on alternative possible answers which have not been thought of may have to be taken into account to aid the knowledge examiner when marking. If considered relevant, the model answer should be amended to include these new points.

(e) Because of the difficulty in marking an essay answer using key points only, there is a need for the way in which the answer was written to be assessed and taken into consideration.

(f) The total points for each question should add up to 100 and will need to reflect both the combination of the technical (key point) element and the essay style element.

(g) Each key point should be graded upon its importance and have point weighting allocated to it. The total weight should represent 60% of the mark.

(h) Key points are the 'important elements' that may be either knowledge or experience-based and will include other maintenance-orientated factors such as relevant safety precautions or military regulations if applicable. Excessive reference to the need for Aircraft Maintenance Manual referral or safety checks may be considered wasteful.

(i) The answer should be analysed for the clarity and manner in which it is presented and have a weighting allocated to it which should represent 40% of the mark.

(j) The answer should show the candidate's ability to express himself/herself in technical language. This includes readability of the language, basic grammar and use of terminology.

(k) The essay should start in the beginning and contain logical process steps to reach a conclusion.

(l) Supporting diagrams should not be encouraged but, if used, should supplement the answer and not replace the need for a broad 'text-based' answer.

(m) The essay should not be indexed, itemised or listed.

(n) Within reason the candidate should not be penalised for incorrect spelling.

(o) A zero mark should only be given in exceptional circumstances. Even if the student misunderstands the question and gives an answer to a different question, a sympathetic mark (even if only for the essay style) should be given. This could be up to the maximum percentage allowed in sub-paragraph (i) above.

(p) The two allocated marks should be added together and written into the answer paper.

(q) If an answer resulting in a borderline failure is principally due to “written essay errors”, the paper should be discussed and the mark agreed, if possible, with another knowledge examiner.

(r) Calculators may be used for designated sections of an examination where more complex calculations are required in order to assess deeper understanding of relevant engineering processes. Where calculators are allowed, these are to be either issued by the invigilator, or specifically approved for use in the examination.

GM 66.B.200 Examination Standard

Paragraphs 1,2, 4 - 6 moved to EMAR AMC 66.B.200

3. The reason that oral type questions may not be used as the primary means of examination is because of the difficulty in establishing consistency of standards between knowledge examiners or from one day to another. However, nothing prevents knowledge examiners from meeting potential certifying staff for the purpose of ensuring those potential certifying staff understand their obligations and responsibilities in the application of the EMARs.

SUBPART D - CONVERSION OF LICENCES OR OTHER QUALIFICATIONS INTO A MILITARY AIRCRAFT MAINTENANCE LICENCE

This Subpart provides the procedures for the conversion of military certifying staff qualifications referred to in EMAR 66.A.70 into MAMLs.

66.B.300 General

(a) The NMAA may only convert its own national licences or other military qualifications, without prejudice to bilateral agreements, considered valid prior to the entry into national regulation of the applicable requirements of EMAR 66.

(b) The NMAA may only perform the conversion in accordance with a conversion report established pursuant to EMAR 66.B.305 or EMAR 66.B.310, as applicable.

(c) Conversion reports shall be either developed by the NMAA or approved by the NMAA to ensure compliance with EMAR 66.

(d) Conversion reports together with any change of these shall be kept on record by the NMAA in accordance with EMAR 66.B.20.

GM 66.B.300 General

NOT APPLICABLE.

66.B.305 Conversion report for licences or other qualifications

a) The conversion report for licences or other qualifications into a MAML shall describe the scope of each type of qualification, including the associated national licence, if any, the associated privileges and include a copy of the relevant national regulations defining these.

(b) The conversion report shall show for each type of qualification referred to in point (a):

1. to which MAML it will be converted; and

2. which limitations/extensions shall be added; and

3. the conditions to remove the limitations, specifying the Appendix I module/subjects on which examination is needed to remove the limitations and obtain a full MAML, or to include an additional (sub-) category. This shall

include the modules defined in Appendix III not covered by the national qualification.

AMC 66.B.305(a) Conversion report for licences or other qualifications

1. Conversion reports prepared on the basis of EMAR 66.A.70 should include a comparison between the scope of the national qualification (i.e., the national qualification requirements) and the scope of the EMAR 66 MAML qualification (i.e. the EMAR 66 qualification requirements), which should be performed on the basis of a detailed analysis of the national and EMAR 66 basic qualification standards. The report should identify where a difference between the two standards exists and where such a difference would lead to a limitation or extension on the EMAR 66 MAML (see EMAR 66.A.50 and EMAR 66.A.52).

2. NOT APPLICABLE.

GM 66.B.305(b)3 Conversion report for licences or other qualifications

In order to remove any limitation, full compliance with the missing modules of EMAR 66 needs to be demonstrated.

66.B.310 Conversion report for Approved Maintenance Organisations authorisations

This paragraph applies to the issuance of a MAML to maintenance personnel who hold an AMO authorisation allowing them to certify aircraft work but who do not hold a formal national qualification as described in EMAR 66.B.305.

(a) For each AMO concerned, the conversion report shall describe the scope of each type of authorisation issued and include a copy of the relevant AMO's procedures for the qualification and the authorisation of certifying staff on which the conversion process is based.

(b) The conversion report shall show for each type of qualification referred to in point (a):

1. to which MAML it will be converted; and

2. which limitations/extensions shall be added; and

3. the conditions to remove the limitations, specifying the Appendix I module/subjects on which examination is needed to remove the limitations and obtain a full MAML, or to include an additional (sub-) category. This shall include the modules defined in Appendix III not covered by the national qualification.

AMC 66.B.310 (a) Conversion report for Approved Maintenance Organisations authorisations

1. Conversion reports prepared on the basis of EMAR 66.A.70 should include a comparison between the qualification required for each type of

organisation authorisation and the scope of the EMAR 66 MAML qualification, which should be performed on the basis of a detailed analysis of the organisation and EMAR 66 basic qualification standards. The report should identify where a difference between the two standards exists and where such a difference would lead to a limitation or extension on the EMAR 66 MAML (EMAR 66.A.50 and EMAR 66.A.52 refer).

2. NOT APPLICABLE.

GM 66.B.310(b)3 Conversion report for Approved Maintenance Organisations authorisations

As conversions performed on the basis of EMAR 66.A.70 are aimed to maintain the privileges of the pre-existing authorisations, the limitations or extensions introduced on the EMAR 66 MAML are not linked to possible differences between the qualification required for the authorisation and the EMAR 66 MAML qualification. This conversion does not include such comparison.

In order to remove any limitation, full compliance with the missing modules of EMAR 66 needs to be demonstrated.

SUBPART E - EXAMINATION CREDITS

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

66.B.400 General

(a) The NMAA may only grant credit on the basis of a credit report prepared in accordance with EMAR 66.B.405.

(b) The credit report shall be either developed by the NMAA or approved by the NMAA to ensure compliance with EMAR 66.

(c) Credit reports together with any change of these shall be dated and kept on record by the NMAA in accordance with EMAR 66.B.20.

66.B.405 Examination credit report

(a) The credit report shall include a comparison between:

(1) the modules, sub-modules, subjects and knowledge levels contained in Appendix I, as applicable; and

(2) the syllabus of the technical qualification concerned relevant to the particular category being sought.

This comparison shall state if compliance is demonstrated and contain the justifications for each statement.

(b) Credit for examinations, other than basic knowledge examinations carried out in Maintenance Training Organisations approved in accordance with EMAR 147, can only be granted by the NMAA.

(c) No credit can be granted unless there is a statement of compliance against each module and sub-module, stating where, in the technical qualification, the equivalent standard can be found.

(d) The NMAA shall check on a regular basis if changes to the credit report are required due to changes to the national qualification standard or Appendix I. Such changes shall be documented, dated and recorded.

AMC 66.B.405(d) Examination credit report

In this context, 'on a regular basis' should be taken to mean annually.

66.B.410 Examination credit validity

(a) The NMAA shall notify the applicant in writing of any credits granted together with the reference to the credit report used.

(b) Credits shall expire 10 years after they are granted.

(c) Upon expiration of the credits, the applicant may apply for new credits. The NMAA shall continue the validity of the credits for an additional period of 10 years without further consideration if basic knowledge requirements defined in Appendix I have not been changed.

GM 66.B.410 Examination credit validity

In the case of credits expired in accordance with EMAR 66.A.25(d) and EMAR 66.B.410(b), the new application for credits will lead to a reassessment in accordance with EMAR 66.B.405 and EMAR 66.B.410 only in those cases where the requirements contained in Appendix I to EMAR 66 have changed. This may lead to a requirement for further examinations on particular modules/sub-modules/subjects.

SUBPART F - CONTINUING OVERSIGHT

This Subpart describes the procedures for the continuing oversight of the MAML and in particular for the revocation, suspension or limitation of the MAML.

66.B.500 Revocation, suspension or limitation of the MAML

The NMAA shall suspend, limit or revoke the MAML where it has identified a safety issue or if it has clear evidence that the person has carried out or been involved in one or more of the following activities:

(a) obtaining the MAML and/or the certification privileges by falsification of documentary evidence;

(b) failing to carry out requested maintenance combined with failure to report such fact to the organisation or person who requested the maintenance;

(c) failing to carry out required maintenance resulting from own inspection combined with failure to report such fact to the organisation for which the maintenance was intended to be carried out;

(d) negligent maintenance;

(e) falsification of the maintenance record;

(f) issuing a certificate of release to service for aircraft / components knowing that the maintenance specified on the certificate of release to service for aircraft / components has not been carried out or without verifying that such maintenance has been carried out;

(g) carrying out maintenance or issuing a certificate of release to service for aircraft / components when adversely affected by alcohol or drugs;

(h) issuing a certificate of release to service for aircraft / components while not in compliance with EMAR M, EMAR145 or EMAR 66.

GM 66.B.500 Revocation, suspension or limitation of the MAML

The NMAA may define the term 'negligent maintenance'.

Appendix I - Basic Knowledge Requirements

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

Basic knowledge for Categories A, B1 and B2 are indicated by knowledge levels (1, 2 or 3) against each applicable subject. Except for the Category C obtained by the academic route (EMAR 66.A.30(a)5 refers), Category C applicants shall meet either the Category B1 or the Category B2 basic knowledge levels.

The knowledge level indicators are defined on 3 levels as follows:

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

  Objectives:

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

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

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

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

  Objectives:

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

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

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

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

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

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

  Objectives:

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

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

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

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

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

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

2. Modularisation

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

Subject module	A or B1 aeroplane with:		A or B1 helicopter with:		B2
	Turbine engine(s)	Piston engine(s)	Turbine engine(s)	Piston engine(s)	Avionics
1 Mathematics	X	X	X	X	X
2 Physics	X	X	X	X	X
3 Electrical Fundamentals	X	X	X	X	X
4 Electronic Fundamentals	X	X	X	X	X
5 Digital Techniques/Electronic Instrument Systems	X	X	X	X	X
6 Materials and Hardware	X	X	X	X	X
7 Maintenance Practices	X	X	X	X	X
8 Basic Aerodynamics	X	X	X	X	X
9 Human Factors	X	X	X	X	X
10 Aviation Legislation	X	X	X	X	X
11a Turbine Aeroplane Aerodynamics, Structures and Systems	X				
11b Piston Aeroplane Aerodynamics, Structures and Systems		X			
12 Helicopter Aerodynamics, Structures and Systems			X	X	
13 Aircraft Aerodynamics, Structures and Systems					X
14 Propulsion					X
15 Gas Turbine Engine	X		X		
16 Piston Engine		X		X	
17 Propeller	(X) 1)	X			
50 Essential Principles of Armament	*	*	*	*	*
51 Weapon Stores System	*	*	*	*	*

Subject module	A or B1 aeroplane with:		A or B1 helicopter with:		B2
	Turbine engine(s)	Piston engine(s)	Turbine engine(s)	Piston engine(s)	Avionics
52 Operational Attack Systems	*	*	*	*	*
53 Surveillance and Electronic Warfare	*	*	*	*	*
54 Crew Safety	*	*	*	*	*
55 Military Communication Systems					*

* - see EMAR 66.A.25(e) for qualification requirements on Modules 50-55 (military-specific systems)

(X) - The module is not mandatory in this category.
1) - Absence from examination implies limitations in the MAML.

MODULE 1. MATHEMATICS

	Level		
	A	B1	B2
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
1.2 Algebra (a) Evaluating simple algebraic expressions, addition, subtraction, multiplication and division, use of brackets, simple algebraic fractions;	1	2	2
(b) Linear equations and their solutions; Indices and powers, negative and fractional indices; Binary and other applicable numbering systems; Simultaneous equations and second degree equations with one unknown; logarithms.	-	1	1
1.3 Geometry (a) Simple geometrical constructions;	-	1	1
(b) Graphical representation; nature and uses of graphs, graphs of equations/functions;	2	2	2
(c) Simple trigonometry; trigonometrical relationships, use of tables and rectangular and polar coordinates.	-	2	2

MODULE 2. PHYSICS

	Level		
	A	B1	B2
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
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
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
2.2.3 Dynamics (a) Mass; Force, inertia, work, power, energy (potential, kinetic and total energy), heat, efficiency;	1	2	1
(b) Momentum, conservation of momentum; Impulse; Gyroscopic principles; Friction: nature and effects, coefficient of friction (rolling resistance).	1	2	2
2.2.4 Fluid dynamics (a) Specific gravity and density;	2	2	2
(b) Viscosity, fluid resistance, effects of streamlining; Effects of compressibility on fluids; Static, dynamic and total pressure: Bernoulli's Theorem, Venturi effect.	1	2	1
2.3 Thermodynamics (a) Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin; Heat definition;	2	2	2

	Level		
	A	B1	B2
(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
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
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
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
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
3.4 Generation of Electricity Production of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.	1	1	1

	Level		
	A	B1	B2
3.5 DC Sources of Electricity Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, Li-ion 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
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.	1	2	2
3.7 Resistance/Resistor (a) Resistance and affecting factors; Specific resistance; Resistor colour code, values and tolerances, preferred values, wattage ratings; Resistors in series and parallel; Calculation of total resistance using series, parallel and series parallel combinations; Operation and use of potentiometers and rheostats; Operation of Wheatstone Bridge;	-	2	2
(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
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

	Level		
	A	B1	B2
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
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
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
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
3.13 ACTheory Sinusoidal waveform: phase, period, frequency, cycle; Instantaneous, average, root mean square, peak, peak to peak current values and calculations of these values, in relation to voltage, current and power; Triangular/Square waves; Single/3 phase principles.	1	2	2

	Level		
	A	B1	B2
3.14 Resistive(R),Capacitive(C)andInductive (L)Circuits Phase relationship of voltage and current in L, C and R circuits, parallel, series and series parallel; Power dissipation in L, C and R circuits; Impedance, phase angle, power factor and current calculations; True power, apparent power and reactive power calculations.	-	2	2
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
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
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

MODULE 4. ELECTRONIC FUNDAMENTALS

	Level		
	A	B1	B2
4.1 Semiconductors *4.1.1 Diodes* (a) Diode symbols; Diode characteristics and properties; Diodes in series and parallel; Main characteristics and use of silicon controlled rectifiers (thyristors), light emitting diode, photo conductive diode, varistor, rectifier diodes; Functional testing of diodes;	-	2	2
(b) Materials, electron configuration, electrical properties; P and N type materials: effects of impurities on conduction, majority and minority characters; PN junction in a semiconductor, development of a potential across a PN junction in unbiased, forward biased and reverse biased conditions; Diode parameters: peak inverse voltage, maximum forward current, temperature, frequency, leakage current, power dissipation; Operation and function of diodes in the following circuits: clippers, clampers, full and half wave rectifiers, bridge 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
(b) Construction and operation of PNP and NPN transistors; Base, collector and emitter configurations; Testing of transistors; Basic appreciation of other transistor types and their uses; Application of transistors: classes of amplifier (A, B, C); Simple circuits including: bias, decoupling, feedback and stabilisation; Multistage circuit principles: cascades, push-pull, oscillators, multivibrators, flip-flop circuits.	-	-	2
4.1.3 Integrated Circuits (a) Description and operation of logic circuits and linear circuits/operational amplifiers;	-	1	-
(b) Description and operation of logic circuits and linear circuits; Introduction to operation and function of an operational amplifier used as: integrator, differentiator, voltage follower, comparator; 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

	Level		
	A	B1	B2
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	B2
5.1 Electronic Instrument Systems Typical systems arrangements and cockpit layout of electronic instrument systems.	1	2	3
5.2 Numbering Systems Numbering systems: binary, octal and hexadecimal; Demonstration of conversions between the decimal and binary, octal and hexadecimal systems and vice versa.	-	1	2
5.3 Data Conversion Analogue Data, Digital Data; Operation and application of analogue to digital, and digital to analogue converters, inputs and outputs, limitations of various types.	-	1	2
5.4 Data Buses Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications; Aircraft Network/Ethernet.	-	2	2
5.5 Logic Circuits (a) Identification of common logic gate symbols, tables and equivalent circuits; Applications used for aircraft systems, schematic diagrams;	-	2	2
(b) Interpretation of logic diagrams.	-	-	2
5.6 Basic Computer Structure (a) Computer terminology (including bit, byte, software, hardware, CPU, IC, and various memory devices such as RAM, ROM, PROM); Computer technology (as applied in aircraft systems);	1	2	-

	Level		
	A	B1	B2
(b) Computer related terminology; Operation, layout and interface of the major components in a micro-computer including their associated bus systems; Information contained in single and multi-address instruction words; Memory associated terms; Operation of typical memory devices; Operation, advantages and disadvantages of the various data storage systems.	-	-	2
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	2
5.11 Electronic Displays Principles of operation of common types of displays used in modern aircraft, including Cathode Ray Tubes, Light Emitting Diodes and Liquid Crystal Display.	-	2	2
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
5.13 Software Management Control Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programmes.	-	2	2

	Level		
	A	B1	B2
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
5.15 Typical Electronic/Digital Aircraft Systems General arrangement of typical electronic/digital aircraft systems and associated BITE (Built In Test Equipment) such as: ACARS-ARINC Communication and Addressing and Reporting System EICAS-Engine Indication and Crew Alerting System FBW-Fly-by-Wire FMS-Flight Management System IRS-Inertial Reference System ECAM-Electronic Centralised Aircraft Monitoring EFIS-Electronic Flight Instrument System GPS-Global Positioning System TCAS-Traffic Alert Collision Avoidance System Integrated Modular Avionics Cabin Systems Information Systems.	-	2	2

MODULE 6. MATERIALS AND HARDWARE

	Level		
	A	B1	B2
6.1 Aircraft Materials - Ferrous (a) Characteristics, properties and identification of common alloy steels used in aircraft; Heat treatment and application of alloy steels;	1	2	1
(b) Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.	-	1	1
6.2 Aircraft Materials - Non-Ferrous (a) Characteristics, properties and identification of common non-ferrous materials used in aircraft; Heat treatment and application of non-ferrous materials;	1	2	1
(b) Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.	-	1	1
6.3 Aircraft Materials - Composite and Non-Metallic *6.3.1 Composite and non-metallic other than wood and fabric* (a) Characteristics, properties and identification of common composite and non-metallic materials, other than wood, used in aircraft; Sealant and bonding agents;	1	2	2

	Level		
	A	B1	B2
(b) The detection of defects/deterioration in composite and non-metallic material; Repair of composite and non-metallic material.	1	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.	-	-	-
6.3.3 Fabric covering Characteristics, properties and types of fabrics used in aeroplanes; Inspections methods for fabric; Types of defects in fabric; Repair of fabric covering.	-	-	-
6.4 Corrosion (a) Chemical fundamentals; Formation by, galvanic action process, microbiological, stress;	1	1	1
(b) Types of corrosion and their identification; Causes of corrosion; Material types, susceptibility to corrosion.	2	3	2
6.5 Fasteners *6.5.1 Screw threads* Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; Measuring screw threads.	2	2	2
6.5.2 Bolts, studs and screws 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
6.5.3 Locking devices Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick release fasteners, keys, circlips, cotter pins.	2	2	2
6.5.4 Aircraft rivets Types of solid and blind rivets: specifications and identification, heat treatment.	1	2	1
6.6 Pipes and Unions (a) Identification of, and types of rigid and flexible pipes and their connectors used in aircraft;	2	2	2
(b) Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes.	2	2	1
6.7 Springs Types of springs, materials, characteristics and applications.	1	2	1

	Level		
	A	B1	B2
6.8 Bearings Purpose of bearings, loads, material, construction; Types of bearings and their application.	1	2	2
6.9 Transmissions Gear types and their application; Gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns; Belts and pulleys, chains and sprockets.	1	2	2
6.10 Control Cables Types of cables; End fittings, turnbuckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems.	1	2	1
6.11 Electrical Cables and Connectors Cable types, construction and characteristics; High tension and co-axial cables; Crimping; Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes.	1	2	2

MODULE 7. 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

	Level		
	A	B1	B2
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; Specification S1000D; Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL; Wiring diagrams and schematic diagrams.	1	2	2
7.6 Fits and Clearances Drill sizes for bolt holes, classes of fits; Common system of fits and clearances; Schedule of fits and clearances for aircraft and engines; Limits for bow, twist and wear; Standard methods for checking shafts, bearings and other parts.	1	2	1
7.7 Electrical Wiring Interconnection System (EWIS) Continuity, insulation and bonding techniques and testing; Use of crimp tools: hand and hydraulic operated; Testing of crimp joints; 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	3	3
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	-

	Level		
	A	B1	B2
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	3
(b) General repair methods, Structural Repair Manual; Ageing, fatigue and corrosion control programmes;	-	2	-
(c) Non-destructive inspection techniques including, penetrant, radiographic, eddy current, ultrasonic and boroscope methods;	-	2	1
(d) Disassembly and re-assembly techniques;	2	2	2
(e) Trouble shooting techniques.	-	2	2
7.19 Abnormal Events (a) Inspections following lightning strikes and HIRF penetration;	2	2	2
(b) Inspections following abnormal events such as heavy landings and flight through turbulence.	2	2	-

	Level		
	A	B1	B2
7.20 Maintenance Procedures Maintenance planning; Modification procedures; Stores procedures; Certification/release procedures; Interface with aircraft operation; Maintenance Inspection/Quality Control/Quality Assurance; Additional maintenance procedures; Control of life limited components.	1	2	2
7.21 Armament Safety Safety principles and elements with armed aircraft, ammunitions; Safety aspects of canopy, ejection seat and other pyrotechnic devices.	2	2	2

MODULE 8. BASIC AERODYNAMICS

	Level		
	A	B1	B2
8.1 Physics of the Atmosphere International Standard Atmosphere (ISA), application to aerodynamics.	1	2	2
8.2 Aerodynamics Airflow around a body; Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, upwash and downwash, vortices, stagnation; The terms: 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
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
8.4 Flight Stability and Dynamics Longitudinal, lateral and directional stability (active and passive).	1	2	2

MODULE 9. HUMAN FACTORS

	Level		
	A	B1	B2
9.1 General The need to take human factors into account; Incidents attributable to human factors/human error; "Murphy's" law.	1	2	2
9.2 Human Performance and Limitations Vision; Hearing; Information processing; Attention and perception; Memory; Claustrophobia and physical access.	1	2	2
9.3 Social Psychology Responsibility: individual and group; Motivation and de-motivation; Peer pressure; "Culture" issues; Team working; Management, supervision and leadership; Military environment and other military factors.	1	1	1
9.4 Factors Affecting Performance Fitness/health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload and underload; Sleep and fatigue, shiftwork; Alcohol, medication, drug abuse.	2	2	2
9.5 Physical Environment Noise and fumes; Illumination; Climate and temperature; Motion and vibration; Military Working environments.	1	1	1
9.6 Tasks Physical work; Repetitive tasks; Visual inspection; Complex systems.	1	1	1
9.7 Communication Within and between teams; Work logging and recording; Keeping up to date, currency; Dissemination of information.	2	2	2

	Level		
	A	B1	B2
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.	2	2	2

MODULE 10. AVIATION LEGISLATION

	Level		
	A1	B1	B2
10.1 Regulatory Framework Military/State Organisation: Role of the National Military Airworthiness Authority; Introduction to the national military airworthiness regulations.	1	1	1
10.2 Certifying Staff - Maintenance Understanding of MAML and Certifying staff regulation.	2	2	2
10.3 Approved Maintenance Organisations Understanding of EMAR 145.	2	2	2
10.4 Air operations Operating Authority's responsibilities, in particular regarding continuing airworthiness and maintenance; Aircraft Maintenance Programme; MEL/CDL or National equivalent; Documents to be carried on board; Aircraft placarding (markings).	1	2	2
10.5 Certification of aircraft, parts and appliances (a) General; General understanding of EMAR 21 and airworthiness codes/criteria;	-	1	1
(b) Documents; Military Type-Certificates; Military Restricted Type-Certificates; Military Supplemental Type-Certificates; Military Certificates Of Airworthiness; Military Restricted Certificates Of Airworthiness; Military Permit To Fly; National Certificate of Registration; Weight & Balance;	-	1	1
National Noise Certificate if required.	-	1	1
10.6 Continuing airworthiness Understanding of EMAR 21 provisions related to continuing airworthiness;	1	1	1
Understanding of EMAR M.	2	2	2

	Level		
	A1	B1	B2
10.7 Applicable Requirements a) Maintenance Programmes, Maintenance checks and inspections; Airworthiness Directives; Service Bulletins, manufacturers' service information; Modifications and repairs; Maintenance documentation: maintenance manuals, structural repair manual, illustrated parts catalogue, etc; Master Minimum Equipment Lists, Minimum Equipment List and Dispatch Deviation Lists or National equivalent;	1	2	2
(b) Continuing airworthiness; Minimum equipment requirements - Test flights; Maintenance and dispatch requirements.	-	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* 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; Effects of external stores;	1	2
11.1.2. High Speed Flight Speed of sound, subsonic flight, transonic flight, supersonic flight; Mach number, critical Mach number, compressibility buffet, shock wave, aerodynamic heating, area rule; Factors affecting airflow in engine intakes of high speed aircraft; Effects of sweepback on critical Mach number; Effects of external stores.	1	2

	Level	
	A1	B1.1
11.2 Airframe Structures - General Concepts (a) Airworthiness requirements for structural strength/integrity; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision; Aircraft bonding;	2	2
(b) Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments; Structure assembly techniques: riveting, bolting, bonding; Methods of surface protection, such as chromating, anodising, painting; Surface cleaning; Airframe symmetry: methods of alignment and symmetry checks.	1	2
11.3 Airframe Structures - Aeroplanes *11.3.1 Fuselage (System 52/53/56)* 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; Canopy construction and mechanism;	1	2
11.3.2 Wings (System 57) Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments;	1	2
11.3.3 Stabilisers (System 55) Construction; Control surface attachment ;	1	2
11.3.4 Flight Control Surfaces (System 55/57) Construction and attachment; Balancing - mass and aerodynamic;	1	2
11.3.5 Nacelles/Pylons (System 54) Nacelles/Pylons: • Construction, • Firewalls, • Engine mounts.	1	2
11.4 Air Conditioning and Cabin Pressurisation (System 21) *11.4.1 Air supply* Sources of air supply including engine bleed, APU and ground cart;	1	2

	Level	
	A1	**B1.1**
11.4.2 Air Conditioning Air conditioning systems; Air cycle and vapour cycle machines; Distribution systems; Flow, temperature and humidity control system;	1	3
11.4.3 Pressurisation Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers;	1	3
Canopy seal, anti-g system;	1	2
11.4.4 Safety and warning devices Protection and warning devices.	1	3
11.5 Instruments/Avionic Systems *11.5.1 Instrument Systems (System 31)* Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Angle of attack indication, stall warning systems; Glass cockpit; Other aircraft system indication.	1	2
11.5.2 Avionic Systems Fundamentals of system lay-outs and operation of: • Auto Flight (System 22), • Communications (System 23), • Navigation Systems (System 34).	1	1
11.6 Electrical Power (System 24) Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection; External/Ground power.	1	3
11.7 Equipment and Furnishings (System 25) (a) Emergency equipment requirements; Seats, harnesses and belts;	2	2
(b) Cabin lay-out; Equipment lay-out; Cabin Furnishing installation; Cargo handling and retention equipment; Airstairs.	1	1

	Level	
	A1	B1.1
11.8 Fire Protection (System 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 (System 27) Primary controls: aileron, elevator, rudder, spoiler; Trim control; Active load control; High lift devices; Lift dump, speed brakes; System operation: manual, hydraulic, pneumatic, electrical, fly-by-wire; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust lock systems; Balancing and rigging; Stall protection/warning system.	1	3
11.10 Fuel Systems (System 28) System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refuelling and defueling including Air to Air Refueling (AAR); Longitudinal balance fuel systems including during AAR.	1	3
11.11 Hydraulic Power (System 29) System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation; Filters; Pressure Control; Power distribution; Indication and warning systems; Interface with other systems.	1	3
11.12 Ice and Rain Protection (System 30) Ice formation, classification and detection; Anti-icing systems: electrical, hot air and chemical; De-icing systems: electrical, hot air, pneumatic and chemical; Rain repellent; Probe and drain heating; Wiper systems.	1	3

	Level	
	A1	B1.1
11.13 Landing Gear (System 32) Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering; Air-ground sensing;	2	3
Drag-chute and Arresting hook/landing assistance equipment.	1	1
11.14 Lights (System 33) External: navigation, anti collision, landing, taxiing, ice, formation; Internal: cabin, cockpit, cargo, Night Vision Devices; Emergency.	2	3
11.15 Oxygen (System 35) System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	1	3
11.16 Pneumatic/Vacuum (System 36) System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	1	3
11.17 Water/Waste (System 38) Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing; Corrosion aspects.	-	-
11.18 On Board Maintenance Systems (System 45) Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	1	2
11.19 Integrated Modular Avionics (System 42) Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc; Core System; Network Components.	1	2

	Level	
	A1	B1.1
11.20 Cabin Systems (System 44) The units and components which provide a means of communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service). Includes voice, data, 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 Crew Panels. The Cabin Network Service typically consists of a server, typically interfacing with, among others, the Data/Radio Communication System; The Cabin Network Service may host functions such as access to pre-departure/departure reports; Cabin Core System; External Communication System; Cabin Monitoring System; Miscellaneous Cabin System.	1	2
11.21 Information Systems (System 46) The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display. Typical examples include Air Traffic and Information Management Systems and Network Server Systems; Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.	1	2

MODULE 11B. PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

	Level	
	A2	**B1.2**
11.1 Theory of Flight *11.1.1. Aeroplane Aerodynamics and Flight Controls* Operation and effect of: • roll control: ailerons and spoilers, • pitch control: elevators, stabilators, variable incidence stabilisers and canards, • yaw control, rudder limiters; Control using elevons, ruddervators; High lift devices, slots, slats, flaps, flaperons; Drag inducing devices, spoilers, lift dumpers, speed brakes; Effects of wing fences, saw tooth leading edges; Boundary layer control using, vortex generators, stall wedges or leading edge devices; Operation and effect of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels; Effects of external stores;	1	2
11.1.2. High Speed Flight - N/A	-	-
11.2 Airframe Structures - General Concepts (a) Airworthiness requirements for structural strength/integrity; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision; Aircraft bonding;	2	2
(b) Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments; Structure assembly techniques: riveting, bolting, bonding; Methods of surface protection, such as chromating, anodising, painting; Surface cleaning; Airframe symmetry: methods of alignment and symmetry checks.	1	2

	Level	
	A2	**B1.2**
11.3 Airframe Structures - Aeroplanes *11.3.1 Fuselage (System 52/53/56)* Construction and pressurisation sealing; Wing, tail-plane, pylon and undercarriage attachments; Seat installation; Doors and emergency exits: construction and operation; Windows and windscreen attachment; Canopy construction and mechanism.	1	2
11.3.2 Wings (System 57) Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.	1	2
11.3.3 Stabilisers (System 55) Construction; Control surface attachment.	1	2
11.3.4 Flight Control Surfaces (System 55/57) Construction and attachment; Balancing - mass and aerodynamic;	1	2
11.3.5 Nacelles/Pylons (System 54) Nacelles/Pylons: • Construction, • Firewalls, • Engine mounts.	1	2
11.4 Air Conditioning and Cabin Pressurisation (System 21) Pressurisation and air conditioning systems; Cabin pressure controllers, protection and warning devices; Heating systems.	1	3
11.5 Instruments/Avionic Systems *11.5.1 Instrument Systems (System 31)* Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Angle of attack indication, stall warning systems; Glass cockpit; Other aircraft system indication.	1	2
11.5.2 Avionic Systems Fundamentals of system lay-outs and operation of: • Auto Flight (*System* 22), • Communications (*System* 23), • Navigation Systems (*System* 34).	1	1

	Level	
	A2	B1.2
11.6 Electrical Power (System 24) Batteries Installation and Operation; DC power generation; Voltage regulation; Power distribution; Circuit protection; Inverters, transformers.	1	3
11.7 Equipment and Furnishings (System 25) (a) Emergency equipment requirements; Seats, harnesses and belts;	2	2
(b) Cargo handling and retention equipment; Airstairs.	1	1
11.8 Fire Protection (System 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 (System 27) Primary controls: aileron, elevator, rudder; Trim tabs; High lift devices; System operation: manual; Gust locks; Balancing and rigging; Stall warning system.	1	3
11.10 Fuel Systems (System 28) System lay-out; Fuel tanks; Supply systems; Cross-feed and transfer; Indications and warnings; Refuelling and defueling.	1	3
11.11 Hydraulic Power (System 29) System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical; Filters; Pressure Control; Power distribution; Indication and warning systems.	1	3
11.12 Ice and Rain Protection (System 30) Ice formation, classification and detection; De-icing systems: electrical, hot air, pneumatic and chemical; Probe and drain heating; Wiper systems.	1	3

	Level	
	A2	B1.2
11.13 Landing Gear (System 32) Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering; Air-ground sensing.	2	3
11.14 Lights (System 33) External: navigation, anti collision, landing, taxiing, ice, formation; Internal: cabin, cockpit, cargo; Emergency.	2	3
11.15 Oxygen (System 35) System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	1	3
11.16 Pneumatic/Vacuum (System 36) System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	1	3
11.17 Water/Waste (System 38) Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing; Corrosion aspects.	-	-

MODULE 12. HELICOPTER AERODYNAMICS, STRUCTURES AND SYSTEMS

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

	Level	
	A3 A4	B1.3 B1.4
12.5 Airframe Structures (a) Airworthiness requirements for structural strength/integrity; 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 (System 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 (System 31)* Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading; Vibration indicating systems; HUMS; Glass cockpit; Other aircraft system indication.	1	2

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

	Level	
	A3 A4	B1.3 B1.4
12.13 Ice and Rain Protection (System 30) Ice formation, classification and detection; Anti-icing and De-icing systems: electrical, hot air and chemical; Rain repellent and removal; Probe and drain heating; Wiper system.	1	3
12.14 Landing Gear (System 32) Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, Tyres, brakes; Steering; Air-ground sensing; Skids, floats.	2	3
12.15 Lights (System 33) External: navigation, landing, taxiing, ice, formation; Internal: cabin, cockpit, cargo, Night Vision Devices' Lighting; Emergency.	2	3
12.16 Pneumatic/Vacuum (System 36) System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	1	3
12.17 Integrated Modular Avionics (System 42) Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc; Core System; Network Components.	1	2

	Level	
	A3 A4	B1.3 B1.4
12.18 On Board Maintenance Systems (System 45) Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	1	2
12.19 Information Systems (System 46) The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display. Typical examples include Air Traffic and Information Management Systems and Network Server Systems; Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.	1	2

MODULE 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

	Level
	B2
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 (System 22) Fundamentals of automatic flight control including working principles and current terminology; Command signal processing; Modes of operation: roll, pitch and yaw channels; Yaw dampers; Stability Augmentation System in helicopters; Automatic trim control; Autopilot navigation aids interface; Autothrottle systems; Automatic Landing Systems: principles and categories, modes of operation, approach, glideslope, land, go-around, system monitors and failure conditions.	3
13.4 Communication/Navigation (System 23/34) (a) Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter;	3
(b) Working principles of following systems: • Very High Frequency (VHF) communication, • High Frequency (HF) communication, • Audio, • Emergency Locator Transmitters (ELT), • Cockpit Voice Recorder (CVR), • Very High Frequency omnidirectional range (VOR), • Tactical air navigation system (TACAN), • Automatic Direction Finding (ADF), • Instrument Landing System (ILS), • Flight Director systems, Distance Measuring Equipment (DME), • Doppler navigation, • Area navigation, RNAV systems, • Flight Management Systems(FMS), • Global Positioning System (GPS), Global Navigation Satellite Systems (GNSS), GNSS Landing System (GLS), Transponder Landing System (TLS), • Inertial Navigation System (INS), • Air Traffic Control transponder, secondary surveillance radar, • Traffic Alert and Collision Avoidance System (TCAS), • Weather avoidance radar, • Radio altimeter, • Data-link communication and reporting;	3
• Microwave Landing System (MLS), • Very Low Frequency and hyperbolic navigation (VLF/Omega).	-

	Level
	B2
13.5 Electrical Power (System 24) Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection; External/Ground power.	3
13.6 Equipment and Furnishings (System 25) (a) Electronic emergency equipment requirements;	3
(b) Cabin entertainment equipment.	-
13.7 Flight Controls (System 27) (a) Primary controls: aileron, elevator, rudder, spoiler; Trim control; Active load control; High lift devices; Lift dump, speed brakes; System operation: manual, hydraulic, pneumatic; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks; Stall protection systems;	2
(b) System operation: electrical, fly-by-wire.	3

	Level
	B2
13.8 Instruments (System 31) Classification; Atmosphere; Terminology; Pressure measuring devices and systems; Pitot static systems; Altimeters; Vertical speed indicators; Airspeed indicators; Machmeters; Altitude reporting/alerting systems; Air data computers; Instrument pneumatic systems; Direct reading pressure and temperature gauges; Temperature indicating systems; Fuel quantity indicating systems; Gyroscopic principles; Artificial horizons; Slip indicators; Directional gyros; Ground Proximity Warning Systems/Terrain Awareness Warning Systems; Compass systems; Flight Data Recording systems; Electronic Flight Instrument Systems; Instrument warning systems including master warning systems and centralised warning panels; Stall warning systems and angle of attack indicating systems; Vibration measurement and indication; Glass cockpit.	3
13.9 Lights (System 33) External: navigation, landing, taxiing, ice, formation; Internal: cabin, cockpit, cargo, Night Vision Devices' Lighting; Emergency.	3
13.10 On Board Maintenance Systems (System 45) Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	3
13.11 Air Conditioning and Cabin Pressurisation (System 21) *13.11.1. Air supply* Sources of air supply including engine bleed, APU and ground cart;	2
13.11.2. Air Conditioning Distribution systems;	1
Air conditioning systems;	2
Air cycle and vapour cycle machines; Flow, temperature and humidity control system;	3

	Level
	B2
13.11.3. Pressurisation Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers;	3
Canopy seal and anti-g system;	1
13.11.4. Safety and warning devices Protection and warning devices.	3
13.12 Fire Protection (System 26) (a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests;	3
(b) Portable fire extinguisher.	1
13.13 Fuel Systems (System 28) (a) System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining;	1
(b) Cross-feed and transfer; Refuelling and defuelling including AAR;	2
(c) Longitudinal balance fuel systems; Indications and warnings.	3
13.14 Hydraulic Power (System 29) (a) System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Filters; Power distribution;	1
(b) Pressure control; Pressure generation: electrical, mechanical, pneumatic; Emergency pressure generation; Indication and warning systems; Interface with other systems.	3
13.15 Ice and Rain Protection (System 30) (a) Rain repellent; Wiper Systems;	1
(b) Ice formation, classification and detection; Anti-icing systems: electrical, hot air and chemical;	2
(c) De-icing systems: electrical, hot air, pneumatic, chemical; Probe and drain heating.	3
13.16 Landing Gear (System 32) (a) Construction, shock absorbing; Tyres;	1

	Level
	B2
(b) Extension and retraction systems: normal and emergency; Indications and warnings; Wheels, brakes, antiskid and autobraking; Steering; Air-ground sensing.	3
13.17 Oxygen (System 35) System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	3
13.18 Pneumatic/Vacuum (System 36) (a) Distribution;	1
(b) System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply;	2
(c) Pressure control; Indications and warnings; Interfaces with other systems.	3
13.19 Water/Waste (System 38) Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing.	-
13.20 Integrated Modular Avionics (System 42) Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc.; Core System; Network Components.	3

	Level
	B2
13.21 Cabin Systems (System 44) The units and components which provide a means of communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service). Includes voice, data 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 Crew Panels. The Cabin Network Service typically consists of a server, typically interfacing with, among others, the Data/Radio Communication System; The Cabin Network Service may host functions such as access to pre-departure/departure reports; Cabin Core System; External Communication System; Cabin Monitoring System; Miscellaneous Cabin System.	3
13.22 Information Systems (System 46) The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display. Typical examples include Air Traffic and Information Management Systems and Network Server Systems; Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.	3

MODULE 14. PROPULSION

	Level
	B2
14.1 Turbine Engines (a) Constructional arrangement and operation of turbojet, turbofan, turboshaft and turbopropeller engines;	1
(b) Operation of engine control and fuel metering systems including Full Authority Digital Engine (or Electronics) Control (FADEC).	2

	Level
	B2
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	
	A1 A3	B1.1 B1.3
15.1 Fundamentals Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; The relationship between force, work, power, energy, velocity, 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

	Level	
	A1 A3	B1.1 B1.3
15.4 Compressors Axial and centrifugal types; Constructional features and operating principles and applications; Fan balancing; Operation: Causes and effects of compressor stall and surge; Methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades; Compressor ratio.	1	2
15.5 Combustion Section Constructional features and principles of operation.	1	2
15.6 Turbine Section Operation and characteristics of different turbine blade types; Blade to disk attachment; Nozzle guide vanes; Causes and effects of turbine blade stress and creep.	2	2
15.7 Exhaust Constructional features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers.	1	2
15.8 Bearings and Seals Constructional features and principles of operation.	1	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 Full Authority Digital Engine (or Electronics) 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

	Level	
	A1 A3	B1.1 B1.3
15.14 Engine Indication Systems Exhaust Gas Temperature/Interstage Turbine Temperature; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure and flow; Engine speed; Vibration measurement and indication; Torque; Power.	1	2
15.15 Power Augmentation Systems Operation and applications; Water injection, water methanol; Afterburner systems.	1	1
15.16 Turbo-prop Engines Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Overspeed safety devices.	1	2
15.17 Turbo-shaft Engines Arrangements, drive systems, reduction gearing, couplings, control systems.	1	2
15.18 Auxiliary Power Units (APUs) Purpose, operation, protective systems.	1	2
15.19 Powerplant Installation Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.	1	2
15.20 Fire Protection Systems Operation of detection and extinguishing systems.	1	2
15.21 Engine Monitoring and Ground Operation Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Trend (including oil analysis, vibration and boroscope) monitoring; Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer; Compressor washing/cleaning; Foreign Object Damage.	1	3
15.22 Engine Storage and Preservation Preservation and depreservation for the engine and accessories/systems.	-	2

MODULE 16. PISTON ENGINE

	Level	
	A2 A4	B1.2 B1.4
16.1 Fundamentals Mechanical, thermal and volumetric efficiencies; Operating principles - 2 stroke, 4 stroke, Otto and Diesel; Piston displacement and compression ratio; Engine configuration and firing order.	1	2
16.2 Engine Performance Power calculation and measurement; Factors affecting engine power; Mixtures/leaning, pre-ignition.	1	2
16.3 Engine Construction Crank case, crank shaft, cam shafts, sumps; Accessory gearbox; Cylinder and piston assemblies; Connecting rods, inlet and exhaust manifolds; Valve mechanisms; Propeller reduction gearboxes.	1	2
16.4 Engine Fuel Systems *16.4.1 Carburettors* Types, construction and principles of operation; Icing and heating.	1	2
16.4.2 Fuel injection systems Types, construction and principles of operation.	1	2
16.4.3 Electronic engine control Operation of engine control and fuel metering systems including Full Authority Digital Engine (or Electronics) Control (FADEC); Systems lay-out and components.	1	2
16.5 Starting and Ignition Systems Starting systems, pre-heat systems; Magneto types, construction and principles of operation; Ignition harnesses, spark plugs; Low and high tension systems.	1	2
16.6 Induction, Exhaust and Cooling Systems Construction and operation of: induction systems including alternate air systems; Exhaust systems, engine cooling systems - air and liquid.	1	2
16.7 Supercharging/Turbocharging Principles and purpose of supercharging and its effects on engine parameters; Construction and operation of supercharging/turbocharging systems; System terminology; Control systems; System protection.	1	2

	Level	
	A2 **A4**	**B1.2** **B1.4**
16.8 Lubricants and Fuels Properties and specifications; Fuel additives; Safety precautions.	1	2
16.9 Lubrication Systems System operation/lay-out and components.	1	2
16.10 Engine Indication Systems Engine speed; Cylinder head temperature; Coolant temperature; Oil pressure and temperature; Exhaust Gas Temperature; Fuel pressure and flow; Manifold pressure.	1	2
16.11 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
16.12 Engine Monitoring and Ground Operation Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Inspection of engine and components: criteria, tolerances, and data specified by engine manufacturer.	1	3
16.13 Engine Storage and Preservation Preservation and depreservation for the engine and accessories/systems.	-	2

MODULE 17. PROPELLER

	Level	
	A1 A2	B1.1 B1.2
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 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

MODULES 50 - 55 : MILITARY-SPECIFIC SYSTEMS

MODULE 50. PRINCIPLES OF ARMAMENT

	Level		
	A	B1	B2
50.1 Essential principles of Armament (a) Propellants and explosives; Pyrotechnics (including Flares); Stores loading / unloading (to include chaff and flares) including hang-up and misfire; Ammunitions transportation; Air-to-air missile; Air-to-ground missile; Air-to-sea missile; Aerial torpedo; Bombs (freefall and guided);	1	1	1
(b) Missile guidance methods: radar, infrared, electro-optical, passive anti-radiation; Missile warheads and detonation mechanisms; Guided weapon (missiles) aerodynamics and flight controls;	1	1	1
(c) Storage, de-stocking and ammunitions assembly; Documents for storage, release and transportation of explosive items and firearms and explosive regulations.	1	1	1

MODULE 51. WEAPONS SYSTEMS

	Level		
	A	B1	B2
51.1 Weapons stores system (System 94) (a) Weapon and stores release, fire and jettison stores; Weapon suspension system; Interconnecting equipment to transport and release/fire weapons; Gunnery;	2	3	3
(b) Weapon control, designating and acquiring a target.	1	2	3

MODULE 52. OPERATIONAL ATTACK SYSTEMS

	Level		
	A	B1	B2
52.1 Attack System Management (System 39) Architecture, management; Attack system functions; General rules of man-machine communication; Digital Networks, hardware and software, other information networks, network for video signals, network for blanking signals, MIL-STD-1553B (STANAG 3838 and STANAG 3910), MIL-STD-1773; Stores management hardware and software; Attack system resources, contributing resources; Role during mission phases.	-	2	3
52.2 Operational attack functions (System 40) Air-to-air functions: fire control functions, bullet gun firing, short range, medium range or beyond visual range missiles firing, air-to-air management after weapons launch, management of onboard guidance; Air-to-surface functions, Air-to-sea functions; Information exchange and cooperation; Navigational functions, localisation, flight management, approach and landing management; Nap of the earth flight: terrain following and obstacle avoidance management; Self protection: defensive manoeuvers and tactics elaboration against threats; Identification: aerial and surface objects identification based on autonomous and external identification means.	-	2	3
52.3 Cross-technical attack functions (System 42) Tactical situation awareness; Aircraft Mission preparation and restitution, hardware and software; Cautions and warnings management; Mission system control and management; Trajectory management; Attack system compatibilities management, electromagnetic compatibility between all the transmitters and receivers.	-	2	3

MODULE 53. SURVEILLANCE AND ELECTRONIC WARFARE

	Level		
	A	B1	B2
53.1 Surveillance (System 93) Data processing; Data display; Recording; Identification; Infra-red and laser sensors; Surveillance radar; Magnetic sensors; Sonar sensors (active and passive).	1	2	3
53.2 Image recording (System 97) (a) Optical systems;	1	2	2
(b) Specificities of aerial photography; Cameras.	1	1	1
53.3 Electronic warfare (System 99) Active electromagnetic; Passive electromagnetic; ELINT; Infrared and Laser systems; Electromagnetic countermeasures.	-	2	3

MODULE 54. CREW SAFETY

	Level		
	A	B1	B2
54.1 Crew escape and safety (System 95) Ejection seats; Escape hatches/canopy, Miniature Detonating Cord (MDC); Global survival kits; Impact protection.	2	3	2

MODULE 55. MILITARY COMMUNICATION SYSTEMS

	Level		
	A	B1	B2
55.1 Military communication systems Tactical Data Links: Link 11, Link 16, Link 22; Tactical communications systems.	-	-	3

Appendix II - Basic Examination Standard

1. General

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

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

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

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

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

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

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

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

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

1.10 Penalty marking systems shall not be used.

1.11 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 maintenance training organisation approved in accordance with EMAR 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, unless approved otherwise by the NMAA.

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

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

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

2. Number of questions per module

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.

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.

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.

MODULE 4 - ELECTRONIC FUNDAMENTALS

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.

MODULE 5 - DIGITAL TECHNIQUES/ ELECTRONIC INSTRUMENT SYSTEMS

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

Category B1: 40 multi-choice and 0 essay questions. Time allowed 50 minutes.

Category B2: 72 multi-choice and 0 essay questions. Time allowed 90 minutes.

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.

MODULE 7 - MAINTENANCE PRACTICES

Category A: 72 multi-choice and 2 essay questions. Time allowed 90 minutes plus 40 minutes.

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

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

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.

MODULE 9 - HUMAN FACTORS

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

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

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

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.

MODULE 11A - TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

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

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

MODULE 11B - PISTON AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

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

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

MODULE 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.

MODULE 13 - AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS

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

Questions and time allowed may be split into two examinations as appropriate.

MODULE 14 - PROPULSION

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

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.

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.

MODULE 17 - PROPELLER

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

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

MODULE 50 - PRINCIPLES OF ARMAMENT

Category A: 12 multi-choice and 0 essay question. Time allowed 15 minutes.

Category B1: 12 multi-choice and 0 essay question. Time allowed 15 minutes.

Category B2: 12 multi-choice and 0 essay question. Time allowed 15 minutes.

MODULE 51 - WEAPONS SYSTEMS

Category A: 24 multi-choice and 0 essay question. Time allowed 30 minutes.

Category B1: 28 multi-choice and 0 essay question. Time allowed 35 minutes.

Category B2: 32 multi-choice and 0 essay question. Time allowed 40 minutes.

MODULE 52 - OPERATIONAL ATTACK SYSTEMS

Category B1: 48 multi-choice and 0 essay question. Time allowed 60 minutes.

Category B2: 80 multi-choice and 0 essay question. Time allowed 100 minutes.

MODULE 53 - SURVEILLANCE AND ELECTRONIC WARFARE

Category A: 12 multi-choice and 0 essay question. Time allowed 15 minutes.

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

Category B2: 48 multi-choice and 0 essay question. Time allowed 60 minutes.

MODULE 54 - CREW SAFETY

Category A: 16 multi-choice and 0 essay question. Time allowed 20 minutes.

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

Category B2: 16 multi-choice and 0 essay question. Time allowed 20 minutes.

MODULE 55 - MILITARY COMMUNICATION SYSTEMS

Category B2: 16 multi-choice and 0 essay question. Time allowed 20 minutes.

Appendix III - Military Aircraft Type Training and Examination Standard, and On-the-Job Training (OJT)

1. General

Military Aircraft Type Training shall consist of theoretical training and examination, and, except for the Category C ratings, practical training and assessment. Where Military Aircraft Type Training includes military-specific systems, the prerequisite is that the student should have gained the relevant 50-series modules (or sub-modules) of EMAR 66 Appendix I.

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

(i) Shall be conducted by an MTO appropriately approved in accordance with EMAR 147 or an organisation recognised by the NMAA in accordance with EMAR 66.B.130.

(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 EMAR 66.A.30(a)(5), the first relevant aircraft type theoretical training shall be at the Category B1 or B2 level or at a level recognised by the NMAA.

(iv) Shall have been started and completed within the 3 years preceding the application for a Military Aircraft Type Rating endorsement.

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

(i) Shall be conducted by an MTO appropriately approved in accordance with EMAR 147 or an organisation recognised by the NMAA in accordance with EMAR 66.B.130.

(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 3 years preceding the application for a Military Aircraft Type Rating endorsement.

(c) Differences training

(i) Differences training is the training required in order to cover the differences between two different Military Aircraft Type Ratings of the same manufacturer as determined by the NMAA.

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

(iii) A Military Aircraft Type Rating shall only be endorsed on a MAML after differences training when the applicant also complies with one of the following conditions:

- having already endorsed on the MAML the Military Aircraft Type Rating from which the differences are being identified, or
- having completed the Military Aircraft Type Training requirements for the aircraft from which the differences are being identified.

2. Military Aircraft Type Training levels

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

Level 1: A brief overview of the airframe, systems and powerplant as outlined in the Systems Description Section of the Aircraft Maintenance Manual/Instructions for Continuing Airworthiness.

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

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

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

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

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

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

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

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

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

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

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

(d) identify the locations of the principal components;

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

(f) perform the procedures for servicing associated on aircraft systems;

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

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

Level 3: Detailed description, operation, component location, removal/installation and BITE and troubleshooting procedures to maintenance manual level.

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

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

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

(c) demonstrate the use, interpretation and application of 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 specific to aircraft type.

3. Military Aircraft Type Training standard

Although Military Aircraft Type Training includes both theoretical and practical elements, courses can be approved for the theoretical element, the practical element or for a combination of both.

3.1 Theoretical element

(a) Objective:

On completion of a theoretical training course the student shall be able to demonstrate, to the levels identified in the Appendix III syllabus, the detailed theoretical knowledge of the aircraft's applicable systems, structure, operations, maintenance, repair, and troubleshooting according to approved maintenance

data. The student shall be able to demonstrate the use of manuals and approved procedures, including the knowledge of relevant inspections and limitations.

(b) Level of training:

Training levels are those levels defined in point 2 above.

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

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

(c) Duration:

NOT APPLICABLE.

(d) Justification of course duration:

Training courses carried out in an MTO 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.

Course duration shall be approved by the NMAA.

Similarly, tuition hours of differences courses or other training course combinations (such as combined B1/B2 courses), and in cases of theoretical Military Aircraft Type Training courses, these shall be justified by the training needs analysis as described above.

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

- The minimum attendance required by the student, 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 MTO in order to meet the minimum attendance time.

(e) Content:

As a minimum, the elements in the Syllabus (see table 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.

> If the aircraft type has a different system for the elements (chapters), it may be accepted to use that system, after justification by the MTO and approval by the authority (SE-MAA).

Chapters	Aeroplanes turbine		Aeroplanes piston		Helicopters turbine		Helicopters piston		Avionics
	B1	C	B1	C	B1	C	B1	C	B2
Introduction module:									
05 Time limits/maintenance checks	1	1	1	1	1	1	1	1	1
06 Dimensions/Areas (MTOM, etc.)	1	1	1	1	1	1	1	1	1
07 Lifting and Shoring	1	1	1	1	1	1	1	1	1
08 Levelling and weighing	1	1	1	1	1	1	1	1	1
09 Towing and taxiing	1	1	1	1	1	1	1	1	1
10 Parking/mooring, Storing and Return to Service	1	1	1	1	1	1	1	1	1
11 Placards and Markings	1	1	1	1	1	1	1	1	1
12 Servicing	1	1	1	1	1	1	1	1	1
14 Product loading and off loading	1	1	1	1	1	1	1	1	1
20 Standard practices including armament safety - only type particular	1	1	1	1	1	1	1	1	1
Helicopters									
18 Vibration and Noise Analysis (Blade tracking)	-	-	-	-	3	1	3	1	-
25 Emergency Flotation Equipment	-	-	-	-	3	1	3	1	1
53 Airframe Structure (Helicopter)	-	-	-	-	3	1	3	1	-
60 Standard Practices Rotor	-	-	-	-	3	1	3	1	-
62 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
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	-
Airframe structures									
27A Flight Control Surfaces (All)	3	1	3	1	-	-	-	-	1

Chapters	Aeroplanes turbine		Aeroplanes piston		Helicopters turbine		Helicopters piston		Avionics
	B1	C	B1	C	B1	C	B1	C	B2
51 Standard practices and structures (damage classification, assessment and repair)	3	1	3	1	-	-	-	-	1
52 Doors	3	1	3	1	-	-	-	-	1
53 Fuselage	3	1	3	1	-	-	-	-	1
54 Nacelles/Pylons	3	1	3	1	-	-	-	-	1
55 Stabilisers	3	1	3	1	-	-	-	-	1
56 Windows and canopies	3	1	3	1	-	-	-	-	1
57 Wings	3	1	3	1	-	-	-	-	1
06 Zonal and Station Identification Systems.	1	1	1	1	1	1	1	1	1
Airframe systems:									
21 Air Conditioning	3	1	3	1	3	1	3	1	3
21A Air Supply	3	1	3	1	3	1	3	1	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 and Furnishings	3	1	3	1	3	1	3	1	1
25A Electronic Equipment including emergency equipment	1	1	1	1	1	1	1	1	3
26 Fire Protection	3	1	3	1	3	1	3	1	3
27 Flight Controls	3	1	3	1	3	1	3	1	2
27A Sys. Operation: Electrical/Fly-by-Wire	3	1	-	-	-	-	-	-	3
28 Fuel Systems	3	1	3	1	3	1	3	1	2
28A Fuel Systems - Monitoring and indicating	3	1	3	1	3	1	3	1	3
29 Hydraulic Power	3	1	3	1	3	1	3	1	2
29A Hydraulic Power - Monitoring and indicating	3	1	3	1	3	1	3	1	3
30 Ice and Rain Protection	3	1	3	1	3	1	3	1	3
31 Indicating/Recording Systems	3	1	3	1	3	1	3	1	3
31A Instrument Systems	3	1	3	1	3	1	3	1	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

Chapters	Aeroplanes turbine		Aeroplanes piston		Helicopters turbine		Helicopters piston		Avionics
	B1	C	B1	C	B1	C	B1	C	B2
40 Operational attack functions	2	1	2	1	2	1	-	-	3
42 Integrated modular avionics	2	1	2	1	2	1	2	1	3
42A Cross-technical attack functions	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
48 In-Flight refueling tanker	3	1	-	-	3	1	-	-	2
48A In-Flight refueling tanker - Monitoring and Indicating	3	1	-	-	3	1	-	-	3
50 Cargo and Accessory Compartments	3	1	3	1	3	1	3	1	1
Turbine Engine									
70 Standard Practices - Engines	3	1	-	-	3	1	-	-	1
70A Constructional arrangement and operation (Installation Inlet, Compressors, Combustion Section, Turbine Section, Bearings and Seals, Lubrication Systems).	3	1	-	-	3	1	-	-	1
70B Engine Performance	3	1	-	-	3	1	-	-	1
71 Powerplant	3	1	-	-	3	1	-	-	1
72 Engine Turbine/Turbo Prop/Ducted Fan/ Unducted fan	3	1	-	-	3	1	-	-	1
73 Engine Fuel and Control	3	1	-	-	3	1	-	-	1
73A FADEC	3	1	-	-	3	1	-	-	3
74 Ignition	3	1	-	-	3	1	-	-	3
75 Air	3	1	-	-	3	1	-	-	1
76 Engine controls	3	1	-	-	3	1	-	-	1
77 Engine Indicating Systems	3	1	-	-	3	1	-	-	3
78 Exhaust	3	1	-	-	3	1	-	-	1
79 Oil	3	1	-	-	3	1	-	-	1
80 Starting	3	1	-	-	3	1	-	-	1
82 Water Injections	3	1	-	-	3	1	-	-	1
83 Accessory Gear Boxes	3	1	-	-	3	1	-	-	1
84 Propulsion Augmentation	3	1	-	-	3	1	-	-	1
Auxiliary Power Units (APUs)									
49 Auxiliary Power Units (APUs)	3	1	-	-	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

Chapters	Aeroplanes turbine		Aeroplanes piston		Helicopters turbine		Helicopters piston		Avionics
	B1	C	B1	C	B1	C	B1	C	B2
73A FADEC	-	-	3	1	-	-	3	1	3
74 Ignition	-	-	3	1	-	-	3	1	3
76 Engine Control	-	-	3	1	-	-	3	1	1
77 Engine Indication Systems	-	-	3	1	-	-	3	1	3
79 Oil	-	-	3	1	-	-	3	1	1
80 Starting	-	-	3	1	-	-	3	1	1
81 Turbines	-	-	3	1	-	-	3	1	1
82 Water Injection	-	-	3	1	-	-	3	1	1
83 Accessory Gear boxes	-	-	3	1	-	-	3	1	1
84 Propulsion Augmentation	-	-	3	1	-	-	3	1	1
Propellers									
60A Standard Practices - Propeller	3	1	3	1	-	-	-	-	1
61 Propellers/Propulsion	3	1	3	1	-	-	-	-	1
61A Propeller Construction	3	1	3	1	-	-	-	-	-
61B Propeller Pitch Control	3	1	3	1	-	-	-	-	-
61C Propeller Synchronising	3	1	3	1	-	-	-	-	1
61D Propeller Electronic control	3	1	3	1	-	-	-	-	3
61E Propeller Ice Protection	3	1	3	1	-	-	-	-	-
61F Propeller Maintenance	3	1	3	1	-	-	-	-	1
Military-Specific Systems									
92 Radar	2	1	2	1	2	1	-	-	3
93 Surveillance	2	1	2	1	2	1	-	-	3
94 Weapon System	2	1	2	1	2	1	-	-	3
95 Crew Escape and Safety (partially covered by 25 for Helicopters)	3	1	3	1	3	1	3	1	2
97 Image Recording	2	1	2	1	2	1	-	-	2
99 Electronic Warfare	2	1	2	1	2	1	-	-	3

(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 NMAA 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.

If the aircraft type has a different system for the elements (chapters), it may be accepted to use that system, after justification by the MTO and approval by the authority (SE-MAA).

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.

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 and Return to Service	X/X	-	X	-	-	-	-	X	-	-	-
11 Placards and Markings	X/X	-	-	-	-	-	-	-	-	-	-
12 Servicing	X/X	-	X	-	-	-	-	X	-	-	-
14 Product loading and off loading	X/X	-	X	-	-	-	-	X	-	-	-
20 Standard practices including armament safety - only type particular	X/X	-	X	-	-	-	-	X	-	-	-
Helicopters:											
18 Vibration and Noise Analysis (Blade tracking)	X/-	-	-	-	-	X	-	-	-	-	-
25 Emergency Flotation Equipment	X/X	X	X	X	X	X	X	X	-	-	-
53 Airframe Structure (Helicopter) Note: covered under Airframe structures											

Chapters	B1/B2	B1					B2				
	LOC	FOT	SGH	R/I	MEL	TS	FOT	SGH	R/I	MEL	TS
60 Standard Practices Rotor - only type specific	X/X	-	X	-	-	-	-	X	-	-	-
62 Rotors	X/-	-	X	X	-	X	-	-	-	-	-
62A Rotors - Monitoring and indicating	X/X	X	X	X	X	X	-	-	X	-	X
63 Rotor Drives	X/-	X	-	-	-	X	-	-	-	-	-
63A Rotor Drives - Monitoring and indicating	X/X	X	-	X	X	X	-	-	X	-	X
64 Tail Rotor	X/-	-	X	-	-	X	-	-	-	-	-
64A Tail rotor -Monitoring and indicating	X/X	X	-	X	X	X	-	-	X	-	X
65 Tail Rotor Drive	X/-	X	-	-	-	X	-	-	-	-	-
65A Tail Rotor Drive - Monitoring and indicating	X/X	X	-	X	X	X	-	-	X	-	X
66 Folding Blades/Pylon	X/-	X	X	-	-	X	-	-	-	-	-
67 Rotors Flight Control	X/-	X	X	-	X	X	-	-	-	-	-
Airframe structures:											
27A Flight Control Surfaces	X/-	-	-	-	-	X	-	-	-	-	-
51 Standard Practices and Structures (damage classification, assessment and repair)											
52 Doors	X/X	X	X	-	-	-	-	X	-	-	-
53 Fuselage	X/-	-	-	-	-	X	-	-	-	-	-
54 Nacelles/Pylons	X/-	-	-	-	-	-	-	-	-	-	-
55 Stabilisers	X/-	-	-	-	-	-	-	-	-	-	-
56 Windows and canopies	X/-	-	-	-	-	X	-	-	-	-	-
57 Wings	X/-	-	-	-	-	-	-	-	-	-	-
Airframe systems:											
21 Air Conditioning	X/X	X	X	-	X	X	X	X	-	X	X
21A Air Supply	X/X	X	-	-	-	-	X	-	-	-	-
21B Pressurisation	X/X	X	-	-	X	X	X	-	-	X	X
21C Safety and warning Devices	X/X	-	X	-	-	-	-	X	-	-	-
22 Autoflight	X/X	-	-	-	X	-	X	X	X	X	X
23 Communications	X/X	-	X	-	X	-	X	X	X	X	X
24 Electrical Power	X/X	X	X	X	X	X	X	X	X	X	X
25 Equipment and Furnishings	X/X	X	X	X	-	-	X	X	X	-	-
25A Electronic Equipment including emergency equipment	X/X	X	X	X	-	-	X	X	X	-	-
26 Fire Protection	X/X	X	X	X	X	X	X	X	X	X	X
27 Flight Controls	X/X	X	X	X	X	X	X	-	-	-	-
27A Sys. Operation: Electrical/Fly-by-Wire	X/X	X	X	X	X	-	X	-	X	-	X
28 Fuel Systems	X/X	X	X	X	X	X	X	X	-	X	-
28A Fuel Systems - Monitoring and indicating	X/X	X	-	-	-	-	X	-	X	-	X
29 Hydraulic Power	X/X	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
29A Hydraulic Power - Monitoring and indicating	X/X	X	-	X	X	X	X	-	X	X	X
30 Ice and Rain Protection	X/X	X	X	-	X	X	X	X	-	X	X
31 Indicating/Recording Systems	X/X	X	X	X	X	X	X	X	X	X	X
31A Instrument Systems	X/X	X	X	X	X	X	X	X	X	X	X
32 Landing Gear	X/X	X	X	X	X	X	X	X	X	X	-
32A Landing Gear - Monitoring and indicating	X/X	X	-	X	X	X	X	-	X	X	X
33 Lights	X/X	X	X	-	X	-	X	X	X	X	-
34 Navigation	X/X	-	X	-	X	-	X	X	X	X	X
35 Oxygen	X/-	X	X	X	-	-	X	X	-	-	-
36 Pneumatic	X/-	X	-	X	X	X	X	-	X	X	X
36A Pneumatic - Monitoring and indicating	X/X	X	X	X	X	X	X	X	X	X	X
37 Vacuum	X/-	X	-	X	X	X	-	-	-	-	-
38 Water/Waste	X/-	X	X	-	-	-	X	X	-	-	-
40 Operational attack functions	X/X	-	-	-	-	-	X	X	X	X	X
42 Integrated modular avionics	X/X	-	-	-	-	-	X	X	X	X	X
42A Cross-technical attack functions	X/X	X	-	-	-	-	X	X	X	X	X
44 Cabin Systems	X/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
48 In-Flight refueling tanker	X/X	X	X	X	X	X	X	X	-	X	-
48A In-Flight refueling tanker - Monitoring and Indicating	X/X	X	X	X	X	X	X	X	X	X	X
50 Cargo and Accessory Compartments	X/X	-	X	-	-	-	-	-	-	-	-
Turbine Engines:											
70 Standard Practices - Engines - only type particular	-	-	X	-	-	-	-	X	-	-	-
70A Constructional arrangement and operation (Installation Inlet, Compressors, Combustion Section, Turbine Section, Bearings and Seals, Lubrication Systems	X/X	-	-	-	-	-	-	-	-	-	-
70B Engine Performance	-	-	-	-	-	X	-	-	-	-	-
71 Power Plant	X/-	X	X	-	-	-	-	X	-	-	-
72 Engine Turbine/Turbo Prop/Ducted Fan/ Unducted fan	X/-	-	-	-	-	-	-	-	-	-	-
73 Engine Fuel and Control	X/X	X	-	-	-	-	-	-	-	-	-
73A FADEC Systems	X/X	X	-	X	X	X	X	-	X	X	X
74 Ignition	X/X	X	-	-	-	-	X	-	-	-	-
75 Air	X/-	-	-	X	-	X	-	-	-	-	-
76 Engine Controls	X/-	X	-	-	-	X	-	-	-	-	-
77 Engine Indicating	X/X	X	-	-	X	X	X	-	-	X	X
78 Exhaust	X/-	X	-	-	X	-	-	-	-	-	-

Chapters	B1/B2	B1					B2				
	LOC	FOT	SGH	R/I	MEL	TS	FOT	SGH	R/I	MEL	TS
79 Oil	X/-	-	X	X	-	-	-	-	-	-	-
80 Starting	X/-	X	-	-	X	X	-	-	-	-	-
82 Water Injection	X/-	X	-	-	-	-	-	-	-	-	-
83 Accessory Gearboxes	X/-	-	X	-	-	-	-	-	-	-	-
84 Propulsion Augmentation	X/-	X	-	-	-	-	-	-	-	-	-
Auxiliary Power Units (APUs):											
49 Auxiliary Power Units (APUs)	X/-	X	X	-	-	X	-	-	-	-	-
Piston Engines:											
70 Standard Practices - Engines - only type particular	-	-	X	-	-	-	-	X	-	-	-
70A Constructional arrangement and operation (Installation Inlet, Compressors, Combustion Section, Turbine Section, Bearings and Seals, Lubrication Systems	X/X	-	-	-	-	-	-	-	-	-	-
70B Engine Performance	-	-	-	-	-	X	-	-	-	-	-
71 Power Plant	X/-	X	X	-	-	-	-	X	-	-	-
73 Engine Fuel and Control	X/X	X	-	-	-	-	-	-	-	-	-
73A FADEC Systems	X/X	X	-	X	X	X	X	-	X	X	X
74 Ignition	X/X	X	-	-	-	-	X	-	-	-	-
76 Engine Controls	X/-	X	-	-	-	X	-	-	-	-	-
77 Engine Indicating	X/X	X	-	-	X	X	X	-	-	X	X
78 Exhaust	X/-	X	-	-	X	X	-	-	-	-	-
79 Oil	X/-	-	X	X	-	-	-	-	-	-	-
80 Starting	X/-	X	-	-	X	X	-	-	-	-	-
81 Turbines	X/-	X	X	X	-	X	-	-	-	-	-
82 Water Injection	X/-	X	-	-	-	-	-	-	-	-	-
83 Accessory Gearboxes	X/-	-	X	X	-	-	-	-	-	-	-
84 Propulsion Augmentation	X/-	X	-	-	-	-	-	-	-	-	-
Propellers:											
60A Standard Practices - Propeller	-	-	-	X	-	-	-	-	-	-	-
61 Propellers/Propulsion	X/X	X	X	-	X	X	-	-	-	-	-
61A Propeller Construction	X/X	-	X	-	-	-	-	-	-	-	-
61B Propeller Pitch Control	X/-	X	-	X	X	X	-	-	-	-	-
61C Propeller Synchronising	X/-	X	-	-	-	X	-	-	-	X	-
61D Propeller Electronic control	X/X	X	X	X	X	X	X	X	X	X	X
61E Propeller Ice Protection	X/-	X	-	X	X	X	-	-	-	-	-
61F Propeller Maintenance	X/X	X	X	X	X	X	X	X	X	X	X
Military-Specific Systems											
92 Radar	X/X	X	X	X	X	-	X	X	X	X	X
93 Surveillance	X/X	X	X	X	X	-	X	X	X	X	X
94 Weapon system	X/X	X	X	X	X	-	X	X	X	X	X
95 Crew escape and Safety	X/X	X	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
97 Image recording	X/X	X	X	X	X	-	X	X	X	X	X
99 Electronic Warfare	X/X	X	X	X	X	-	X	X	X	X	X

4. Military Aircraft Type Training examination and assessment standard

4.1 Theoretical element examination standard

After the theoretical portion of the Military Aircraft Type Training has been completed, a written examination shall be performed, which shall comply with the following:

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

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

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

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

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

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

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

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

(g) The minimum examination pass mark is 75 %. When the Military Aircraft Type Training examination is split in several examinations, each examination shall be passed with at least a 75 % mark. In order to be

possible to achieve exactly a 75 % pass mark, the number of questions in the examination shall be a multiple of 4.

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

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

(*) 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 Military 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

NOT APPLICABLE.

6. On the Job Training

On the Job Training (OJT) shall be approved by the NMAA who has issued the MAML.

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

It shall have been started and completed within the 3 years preceding the application for a Military Aircraft 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 NMAA. 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. Service Number or Employee Number
4. Approved Maintenance Organisation;
5. Location;
6. Name of supervisor(s) and assessor, (including MAML number if applicable);
7. Date of task completion;
8. Description of task and job card/work order/tech log, etc.;
9. Aircraft type and aircraft registration;
10. Military Aircraft Type Rating applied for.

In order to facilitate the verification by the NMAA, demonstration of the OJT shall consist of:

(i) detailed worksheets/logbook and

(ii) a compliance report demonstrating how the OJT meets the requirement of EMAR 66.

AMC to Appendix III to EMAR 66

AMC to Section 1 of Appendix III “Military Aircraft Type Training and Examination Standard, and On-the-Job Training”

Military Aircraft Type Training

1. Military 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.
   - Avionics/electrical systems type training course means type training on avionics and electrical systems.

     Type training for military specific systems (and their interfaces with other aircraft systems) may be included in these sub-divisions as appropriate, or carried out as a separate course.
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 or national equivalent;
   - 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, NVIS (Night Vision Imaging Systems);
- Knowledge of relevant inspections and limitations as applicable to the effects of environmental factors or operational procedures such as cold and hot climates, wind, moisture, sand, de-icing / anti-icing, etc.

4. Limited avionic system training should be included in the Category B1 Military Aircraft 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 Military Aircraft 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 “Military Aircraft Type Training and Examination Standard, and On-the Job Training”

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

1. NOT APPLICABLE.
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.
3. The content and the duration deriving from this TNA may be supported by an analysis from the (Military) Type Certificate holder.
4. NOT APPLICABLE.

5. When developing the TNA the following should be considered:
   i. 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.
   ii. As a minimum, the Training Need Analysis (TNA) should take into account all the applicable elements contained in paragraph 3.1 of EMAR-66 Appendix III and associated AMCs.
   iii. 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 EMAR-66 Appendix III.
   iv. For each chapter described in the theoretical element table contained in paragraph 3.1 of EMAR 66 Appendix III, the corresponding training time should be recorded.
   v. 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 or national equivalent.
   vi. 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; o Difficulty of the task;
        - Criticality and safety impact of the task; o In-service experience;

- Novel or unusual design features (not covered by EMAR 66 Appendix I);
- Similarities with other aircraft types; o 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.

6. 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 EMAR 66);
   - Organise the training into modules in a logical sequence (adequate combination of chapters as defined in Appendix III of EMAR 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 to 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.

7. 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.
8. The maximum number of training hours per day for the theoretical element of Military Aircraft 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. The NMAA 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.
9. 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, unless the NMAA approves otherwise. 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.
10. The TNA is a living process and should be reviewed/updated based on operational feedback, maintenance occurrences, airworthiness directives or national equivalent , 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 Maintenance Review Boards, Maintenance Planning Documents, Maintenance Manuals, 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 “Military Aircraft Type Training and Examination Standard, and On-the-Job Training”

Practical Element of the Military 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 EMAR 66.
3. The duration of the practical training should ensure that the content of training required by paragraph 3.2 of Appendix III to EMAR-66 is completed.
4. The organisation providing the practical element of the Military Aircraft 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 EMAR 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 EMAR 66.
6. The practical element (for powerplant and avionic systems) of the Military Aircraft Type Rating Training may be subcontracted by the approved EMAR 147 organisation under its quality system according to the provisions of EMAR 147.A.145(d)3 and the corresponding Guidance Material.
7. The practical element of the Military Aircraft Type Training can be performed concurrently with the OJT element if both are performed on the same military aircraft type and in a real maintenance environment.

AMC to Paragraph 1(c) of Appendix III “Military Aircraft Type Training and Examination Standard, and On-the-Job Training”

Differences Training

Approved difference training is not required for different variants within the same aircraft type rating (as specified by the NMAA) for the purpose of Military Aircraft Type Rating endorsement on the MAML.

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

AMC to Section 5 of Appendix III “Military Aircraft Type Training and Examination Standard, and On-the-Job Training”

Type Examination Standard

NOT APPLICABLE.

AMC to Section 6 of Appendix III “Military Aircraft Type Training and Examination Standard, and 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 EMAR 145 AMO holding an A rating for such aircraft.
2. The OJT should include a number of tasks that are carried out under 'one to one' supervision (ie one supervisor dedicated to one trainee) 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. Appendix II to AMC to EMAR 66 contains a list of tasks, from which a representative sample appropriate to the type and licence (sub-) category applied for, should be extracted and approved by the NMAA. The OJT should cover at least 50% of this approved extracted list. Some tasks should be selected from each paragraph of the approved extracted list. 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 Military Aircraft Type Training starts.
6. The organisation providing the OJT 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 EMAR 145 AMO 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 necessarily a direct evaluation by 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 appropriate behaviour in the maintenance environment.
    - The supervisor(s) should personally observe the work being performed to ensure safe completion 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 not yet 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 o 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 EMAR 145 AMO 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 EMAR 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 EMAR 66, the term "designated assessor appropriately qualified" means that the assessor should demonstrate training on and experience of the assessment process being undertaken and should be authorised to do so by the EMAR 145 AMO.

     Further guidance about the assessment and the designated assessors is provided in Appendix III to AMC to EMAR 66.
9. The procedures for OJT should be included in the MOE of the EMAR 145 AMO (a new chapter 3.15 must be included in the MOE for this purpose).

AMC to Appendix III "Military Aircraft Type Training and Examination Standard, and On-the-Job Training"

Military 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 an addition to an EMAR 66 Military Aircraft Maintenance Licence

The table below shows the experience requirements for adding a new category or subcategory to an existing EMAR 66 MAML including military-specific modules.

The experience shall 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 EMAR 147 course relevant to the subcategory.

From \ To	A1	A2	A3	A4	B1.1	B1.2	B1.3	B1.4	B2
A1	-	6 months	6 months	6 months	2 years	6 months	2 years	1 year	2 years
A2	6 months	-	6 months	6 months	2 years	6 months	2 years	1 year	2 years
A3	6 months	6 months	-	6 months	2 years	1 year	2 years	6 months	2 years
A4	6 months	6 months	6 months	-	2 years	1 year	2 years	6 months	2 years
B1.1	None	6 months	6 months	6 months	-	6 months	6 months	6 months	1 year
B1.2	6 months	None	6 months	6 months	2 years	-	2 years	6 months	2 years
B1.3	6 months	6 months	None	6 months	6 months	6 months	-	6 months	1 year
B1.4	6 months	6 months	6 months	None	2 years	6 months	2 years	-	2 years
B2	6 months	6 months	6 months	6 months	1 year	1 year	1 year	1 year	-

Appendix V - Application Form - EMAR Form 19

EMAR Form 19 is contained in the EMAR Forms document.

Appendix VI - Military Aircraft Maintenance Licence (MAML) - EMAR Form 26

EMAR Form 26 is contained in the EMAR Forms document.

APPENDICES TO AMCs

Appendix I - Military Aircraft Type Ratings for EMAR Form 26 Military Aircraft Maintenance Licence

The NMAA is responsible for publishing the Military Aircraft Type Ratings that it will endorse on the EMAR Form 26 MAML. It is the responsibility of the EMAR 145 AMO to ensure that any certification privileges issued to the MAML holder are appropriate for the Military Aircraft Type Rating held (EMAR 145.A.35(b)).

Notes:

When there is a change to a Military Aircraft Type Rating (or to an engine designation in the rating) which affects MAMLs already issued, the Military Aircraft Type Ratings on the MAML may be modified when the MAML is next submitted to the NMAA for an amendment unless there is an urgent reason to modify the MAML.

The Military Aircraft Type Ratings published by an NMAA for the MAML may be subject to change. MAML holders and EMAR 145 AMOs should ensure they frequently check the latest version issued by the NMAA.

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

Time limits/Maintenance checks

100 hour, “B” or “C” checks or other military equivalent inspection.

Assist carrying out a scheduled maintenance check i.a.w. Aircraft Maintenance Manual.

Review Aircraft maintenance log for correct completion.

Review records for compliance with Airworthiness Directives (or national equivalent).

Review records for compliance with component life limits.

Procedure for inspection following heavy / hard landing.

Procedure for inspection following excessive load factor.

Procedure for inspection following exceeding engine limits.

Procedure for inspection following lightning strike.

Dimensions/Areas

Locate component(s) by zone/station number.

Perform symmetry check.

Lifting and Shoring

Assist in:

Jack aircraft nose or tail wheel.

Jack complete aircraft.

Sling or trestle major component.

Leveling/Weighing

Level aircraft.

Weigh aircraft.

Prepare weight and balance amendment.

Check aircraft against equipment list.

Towing and Taxiing

Prepare for aircraft towing.

Tow aircraft.

Be part of aircraft towing team.

Parking and Mooring

Tie down aircraft.

Park, secure and cover aircraft.

Position aircraft in maintenance dock.

Secure rotor blades.

Placards and Markings

Check aircraft for correct placards.

Check aircraft for correct markings.

Servicing

Refuel aircraft.

Defuel aircraft.

Carry out tank to tank fuel transfer.

Check/adjust tire pressures.

Check/replenish oil level.

Check/replenish hydraulic fluid level.

Check/replenish accumulator pressure.

Charge pneumatic system.

Grease aircraft.

Connect ground power.

Service toilet/potable water system.

Perform pre-flight/daily check.

Vibration and Noise Analysis

Analyse helicopter vibration problem.

Analyse noise spectrum.

Analyse engine vibration.

Air Conditioning

Replace combustion heater.

Replace flow control valve.

Replace outflow valve.

Replace safety valve.

Replace vapour cycle unit.

Replace air cycle unit.

Replace cabin blower.

Replace heat exchanger.

Replace pressurisation controller.

Clean outflow valves.

Deactivate/reactivate cargo isolation valve.

Deactivate/reactivate avionics ventilation components.

Check operation of air conditioning/heating system.

Check operation of pressurisation system.

Troubleshoot faulty system.

Auto flight

Install servos.

Rig bridle cables.

Replace controller.

Replace amplifier.

Replacement of the auto flight system LRUs.

Check operation of auto-pilot.

Check operation of auto-throttle/auto-thrust.

Check operation of yaw damper.

Check and adjust servo clutch.

Perform autopilot gain adjustments.

Perform mach trim functional check.

Troubleshoot faulty system.

Check autoland system.

Check flight management systems.

Check stability augmentation system.

Communications

Replace V/UHF com unit.

Replace HF com unit.

Replace existing antenna.

Check operation of radios.

Perform antenna VSWR check.

Perform Selcal operational check.

Perform operational check of passenger address system.

Functionally check audio integrating system.

Repair co-axial cable.

Troubleshoot faulty system.

Electrical Power

Charge lead/acid battery.

Charge Ni-Cad battery.

Check battery capacity.

Deep-cycle Ni-Cad battery.

Replace integrated drive/generator/alternator.

Replace switches.

Replace circuit breakers.

Adjust voltage regulator.

Change voltage regulator.

Amend electrical load analysis report.

Repair/replace electrical feeder cable.

Troubleshoot faulty system.

Perform functional check of integrated drive/generator/alternator.

Perform functional check of voltage regulator.

Perform functional check of emergency generation system.

Equipment/Furnishings

Replace carpets.

Replace crew seats.

Replace passenger seats.

Check inertia reels.

Check seats/belts for security.

Check emergency equipment.

Check ELT for compliance with regulations.

Repair toilet waste container.

Remove and install ceiling and sidewall panels.

Repair upholstery.

Change cabin / cargo configuration.

Replace cargo loading system actuator.

Test cargo loading system.

Replace escape slides/ropes.

Fire protection

Check fire bottle contents.

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

Check cabin fire extinguisher contents.

Check smoke detector system.

Check cargo panel sealing.

Install new fire bottle.

Replace fire bottle squib.

Troubleshoot faulty system.

Inspect engine fire wire detection systems.

Flight Controls

Inspect primary flight controls and related components in accordance with AMM.

Extending/retracting flaps & slats.

Replace horizontal stabiliser.

Replace spoiler/lift damper.

Replace elevator.

Deactivation/reactivation of aileron servo control.

Replace aileron.

Replace rudder.

Replace trim tabs.

Install control cable and fittings.

Replace slats.

Replace flaps.

Replace powered flying control unit.

Replace flat actuator.

Rig primary flight controls.

Adjust trim tab.

Adjust control cable tension.

Check control range and direction of movement.

Check for correct assembly and locking.

Troubleshoot faulty system.

Functional test of primary flight controls.

Functional test of flap system.

Operational test of the side stick assembly.

Operational test of the Trimmable Horizontal Stabiliser.

Trimmable Horizontal Stabiliser system wear check.

Fuel

Water drain system (operation).

Replace booster pump.

Replace fuel selector.

Replace fuel tank cells.

Replace/test fuel control valves.

Replace magnetic fuel level indicators.

Replace water drain valve.

Check/calculate fuel contents manually.

Check filters.

Flow check system.

Check calibration of fuel quantity gauges.

Check operation feed/selectors.

Check operation of fuel dump/jettison system.

Fuel transfer between tanks.

Pressure defuel.

Pressure refuel (manual control).

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

Troubleshoot faulty system.

Hydraulics

Replace engine-driven pump.

Check/replace case drain filter.

Replace standby pump.

Replace hydraulic motor pump/generator.

Replace accumulator.

Check operation of shut off valve.

Check filters/clog indicators.

Check indicating systems.

Perform functional checks.

Pressurisation/depressurisation of the hydraulic system.

Power Transfer Unit (PTU) operation.

Replacement of PTU.

Troubleshoot faulty system.

Ice and rain protection

Replace pump.

Replace timer.

Inspect repair propeller deice boot.

Test propeller de-icing system.

Inspect/test wing leading edge de-icer boot.

Replace anti-ice/deice valve.

Install wiper motor.

Check operation of systems.

Operational test of the pitot-probe ice protection.

Operational test of the Total Air Temperature ice protection.

Operational test of the wing ice protection system.

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

Troubleshoot faulty system.

Indicating/recording systems

Replace Flight Data Recorder (FDR).

Replace cockpit voice recorder.

Replace clock.

Replace master caution unit.

Perform FDR data retrieval.

Troubleshoot faulty system.

Implement Electro-Static Discharge and Soldering procedures.

Inspect for High Intensity Radiated Field requirements.

Start/stop Engine Indication System procedure.

Bite test of the Centralized Fault Display Interface Unit.

Ground scanning of the central warning system.

Landing Gear

Build up wheel.

Replace main wheel.

Replace nose wheel.

Replace steering actuator.

Replace truck tilt actuator.

Replace gear retraction actuator.

Replace uplock/downlock assembly.

Replace shimmy damper.

Rig nose wheel steering.

Functional test of the nose wheel steering system.

Replace shock strut seals.

Servicing of shock strut.

Replace brake unit.

Replace brake control valve.

Bleed brakes.

Replace brake fan.

Test anti-skid unit.

Test gear retraction.

Change bungees.

Adjust micro switches/sensors.

Charge struts with oil and air.

Troubleshoot faulty system.

Test auto-brake system.

Replace rotorcraft skids.

Replace rotorcraft skid shoes.

Pack and check floats.

Flotation equipment.

Check/test emergency landing gear extension.

Operational test of the landing gear doors.

Lights

Repair/replace rotating beacon.

Repair/replace landing lights.

Repair/replace navigation lights.

Repair/replace formation lights.

Repair/replace interior lights.

Replace ice inspection 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/TACAN unit.

Replace ADI.

Replace HSI.

Check pitot static system for leaks.

Check operation of directional gyro.

Functional check doppler.

Functional check TCAS.

Functional check DME.

Functional check ATC Transponder.

Functional check flight director system.

Functional check inertial navigation system.

Complete quadrantal error correction of ADF system.

Update flight management system database.

Check calibration of pitot static instruments.

Check calibration of pressure altitude reporting system.

Troubleshoot faulty system.

Check marker systems.

Compass replacement direct/indirect.

Check Satcom.

Check GPS.

Oxygen

Inspect on-board oxygen equipment.

Purge and recharge oxygen system.

Replace regulator.

Replace oxygen generator.

Test crew oxygen system.

Perform auto oxygen system deployment check.

Troubleshoot faulty system.

Pneumatic systems

Replace filter.

Replace air shut off valve.

Replace pressure regulating valve.

Replace compressor.

Recharge dessicator.

Adjust regulator.

Check for leaks.

Troubleshoot faulty system.

Vacuum systems

Inspect the vacuum system in accordance with AMM.

Replace vacuum pump.

Check/replace filters.

Adjust regulator.

Troubleshoot faulty system.

Water/Waste

Replace water pump.

Replace tap.

Replace toilet pump.

Perform water heater functional check.

Troubleshoot faulty system.

Inspect waste bin flap closure.

Central Maintenance System

Retrieve data from Central Maintenance Unit (CMU).

Replace CMU.

Perform Bite check.

Troubleshoot faulty system.

Structures

Assessment of damage.

Sheet metal repair.

Composite material repair.

Treat corrosion.

Apply protective treatment.

Replace static wicks

Doors

Inspect passenger door in accordance with AMM.

Rig/adjust locking mechanism.

Adjust air stair system.

Check operation of emergency exits.

Test door warning system.

Troubleshoot faulty system.

Remove and install passenger / cargo / paratroops doors in accordance with AMM.

Remove and install emergency exit in accordance with AMM.

Inspect cargo door in accordance with AMM.

Windows

Replace windshield.

Replace direct vision window.

Replace cabin window.

Repair transparency.

Wings

Skin repair.

Replace tip.

Replace rib.

Replace integral fuel tank panel.

Check incidence/rig.

Propeller

Assemble prop after transportation.

Replace propeller.

Replace governor.

Adjust governor.

Perform static functional checks.

Check operation during ground run.

Check track.

Check setting of micro switches.

Assessment of blade damage in accordance with AMM.

Dynamically balance prop.

Troubleshoot faulty system.

Main Rotors

Install rotor assembly.

Replace blades.

Replace damper assembly.

Check track / tabs.

Check static balance.

Check dynamic balance.

Troubleshoot.

Rotor Drive

Replace mast.

Replace drive coupling.

Replace clutch/freewheel unit.

Replace drive belt.

Install main gearbox.

Overhaul main gearbox.

Check gearbox chip detectors.

Tail Rotors

Install rotor assembly.

Replace blades.

Troubleshoot.

Tail Rotor Drive

Replace bevel gearbox.

Replace universal joints.

Overhaul bevel gearbox.

Install drive assembly.

Check chip detectors.

Check/install bearings and hangers.

Check/service/assemble flexible couplings.

Check alignment of drive shafts.

Install and rig drive shafts.

Rotorcraft flight controls

Install swash plate.

Install mixing box.

Adjust pitch links.

Rig collective system.

Rig cyclic system.

Rig anti-torque system.

Check controls for assembly and locking.

Check controls for operation and sense.

Troubleshoot faulty system.

Power Plant

Replace engine.

Repair cooling baffles.

Repair cowling.

Adjust cowl flaps.

Repair faulty wiring.

Troubleshoot.

Assist in dry motoring check.

Assist in wet motoring check.

Assist in engine start (manual mode).

Piston Engines

Remove/install reduction gear.

Check crankshaft run-out.

Check tappet clearance.

Check compression.

Extract broken stud.

Install helicoil.

Perform ground run.

Establish/check reference RPM.

Troubleshoot.

Turbine Engines

Replace module.

Replace fan blade.

Hot section inspection/boroscope check.

Carry out engine/compressor wash.

Carry out engine dry cycle.

Engine ground run.

Establish reference power.

Trend monitoring/gas path analysis.

Troubleshoot.

Fuel and control, piston

Replace engine driven pump.

Adjust Automatic Mixture Control.

Adjust ABC (Aluminium piston, Brass cylinder, Chrome plated).

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 Electronic Control Unit (FADEC).

Replace Fuel Metering Unit (FADEC).

Replace engine driven pump.

Clean/test fuel nozzles.

Clean/replace filters.

Adjust FCU.

Troubleshoot faulty system.

Functional test of FADEC.

Ignition systems, piston

Change magneto.

Change ignition vibrator.

Change plugs.

Test plugs.

Check High Tension. leads.

Install new leads.

Check timing.

Check system bonding.

Troubleshoot faulty system.

Ignition systems, turbine

Perform functional test of the ignition system.

Check glow plugs/igniters.

Check High Tension leads.

Check ignition unit.

Replace ignition unit.

Troubleshoot faulty system.

Engine Controls

Rig thrust lever

Rig RPM control.

Rig mixture HP cock lever.

Rig power lever.

Check control sync (multi-eng).

Check controls for correct assembly and locking.

Check controls for range and direction of movement.

Adjust pedestal micro-switches.

Troubleshoot faulty system.

Engine Indicating

Replace engine instrument(s).

Replace oil temperature bulb.

Replace thermocouples.

Check calibration.

Troubleshoot faulty system.

Exhaust, piston

Replace exhaust gasket.

Inspect welded repair.

Pressure check cabin heater muff.

Troubleshoot faulty system.

Exhaust, turbine

Change jet pipe.

Change shroud assembly.

Install trimmers.

Inspect/replace thrust reverser.

Inspect/replace variable nozzle section

Replace thrust reverser component.

Deactivate/reactivate thrust reverser.

Operational test of the thrust reverser system.

Oil

Change oil.

Check filter(s).

Adjust pressure relief valve.

Replace oil tank.

Replace oil pump.

Replace oil cooler.

Replace firewall shut off valve.

Perform oil dilution test.

Troubleshoot faulty system.

Starting

Replace starter.

Replace start relay.

Replace start control valve.

Check cranking speed.

Troubleshoot faulty system.

Turbines, piston engines

Replace turbo-blower.

Replace heat shields.

Replace waste gate.

Adjust density controller.

Engine water injection

Replace water/methanol pump.

Flow check water/methanol system.

Adjust water/methanol control unit.

Check fluid for quality.

Troubleshoot faulty system

Accessory gear boxes

Replace gearbox.

Replace drive shaft.

Inspect magnetic chip detector.

APU

Removal/installation of the APU.

Removal/installation of the inlet guide-vane actuator.

Operational test of the APU emergency shut-down test.

Operational test of the APU.

Attack systems

Replace Head Up Display.

Replace Map / Tactical Situation Display.

Replace Multi-function Display.

Replace Weapons Management Display.

Removal/installation/functional check of laser designator systems.

Radar / surveillance

Functional check of air to air radar.

Functional check of air to surface / terrain following / mapping radars.

Functional check of weather radar.

Removal/installation/functional check of FLIR.

Removal/installation/functional check of Electro-Optical cameras.

Weapon systems

Removal/installation of guns/cannons.

Removal/installation of mission specific equipment.

Harmonisation/calibration of weapon aiming devices.

Removal/installation/functional check of interface between mission computer and missiles/bombs/rockets/pods.

Crew escape

Removal/installation of ejection seats.

Removal/installation of crew survival kits.

Inspection of canopy/window jettison devices.

Reconnaissance

Removal/installation/functional check of cameras / reconnaissance pods.

Electronic warfare

Removal/installation of chaff/flares dispenser.

Removal/installation/functional check of Electronic Counter Measures systems.

Removal/installation/functional check of missile warning systems.

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 of novelty (areas peculiar to the aircraft type, domains not covered by EMAR 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 asked 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.

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 competence of the assessor.

3) Who should assess

In order to qualify, the assessor should:

- Be proficient and have sufficient experience and knowledge in:
  - human performance and safety culture;
  - the aircraft type;
  - 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 an assessment taking into account the trainee's 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 Military Aircraft 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 organisation'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 conflict of interests.

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

Version: 1.2 (1 March 2022 – 2022-03-01)

This SE-EMAR 66 describes the special provisions for the Military Aircraft Maintenance Licence (MAML) and establishes the requirements for application, issue and continuation of its validity.

This SE-EMAR 66 is a consolidated issue including the requirements, acceptable means of compliance (AMC) and guidance material (GM).

MILITARY AVIATION AUTHORITY
SWEDEN

SE-107 85 STOCKHOLM, SWEDEN
www.forsvarsmakten.se