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JAR - 66

Règlement grand-ducal du 29 avril 2002 relatif aux conditions d'aptitude requises pour le personnel habilité à prononcer l'approbation pour la remise des aéronefs (APRS) en transport aérien commercial (JAR - 66) . . . . . page 2244

Règlement grand-ducal du 29 avril 2002 relatif aux conditions d'aptitude requises pour le personnel habilité à prononcer l'approbation pour la remise en service des aéronefs (APRS) en transport aérien commercial (JAR-66).

Nous Henri, Grand-Duc de Luxembourg, Duc de Nassau,

Vu la loi modifiée du 31 janvier 1948 relative à la réglementation de la navigation aérienne;

Vu la loi du 25 mars 1948 relative à l'adhésion du Grand-Duché de Luxembourg à la Convention relative à l'Aviation Civile Internationale et à l'Accord relatif au Transit des Services Aériens Internationaux, établis le 7 décembre 1944 par la Conférence Internationale de l'Aviation Civile réunie à Chicago ;

Vu le règlement N° 3922/91 (CEE) du Conseil du 16 décembre 1991 relatif à l'harmonisation des règles techniques et de procédures administratives dans le domaine de l'aviation civile et notamment le code JAR-145 élaboré par les Autorités conjointes de l'Aviation (JAA : Joint Aviation Authorities) relatif aux organisations d'entretien approuvées ;

Vu la loi du 19 mai 1999 ayant pour objet :

a) de réglementer l'accès au marché de l'assistance en escale à l'aéroport de Luxembourg,

b) de créer un cadre réglementaire dans le domaine de la sûreté de l'aviation civile, et

c) d'instituer une Direction de l'Aviation Civile ;

Vu le règlement grand-ducal du 23 mars 1998 concernant les conditions techniques d'exploitation des aéronefs en transport aérien commercial et notamment le code JAR-OPS 1 introduit en droit national par ledit règlement ;

Vu les avis de la Chambre de Commerce, de la Chambre des Employés Privés, de la Chambre des Métiers et de la Chambre de Travail ;

Vu l'article 2 (1) de la loi du 12 juillet 1996 portant réforme du Conseil d'Etat et considérant qu'il y a urgence;

Sur le rapport de Notre Ministre des Transports, de Notre Ministre de l'Éducation Nationale, de la Formation Professionnelle et des Sports ainsi que de Notre Ministre du Trésor et du Budget, Ministre de la Justice et après délibération du Gouvernement en Conseil;

Arrêtons:

Art. 1er. - Champ d'application du présent règlement

L'organisation d'entretien agréée, autorisée à prononcer la qualification d'aptitude à la remise en service d'un aéronef (APRS) en vue du transport aérien commercial en conformité avec le code JAR-145 doit désigner le personnel habilité à délivrer cette qualification d'aptitude.

Ce personnel est désigné parmi les titulaires d'une licence de personnel d'entretien d'aéronef dite « licence AML » (Aircraft Maintenance Licence). Les conditions d'aptitude pour obtenir ladite licence AML sont celles du code JAR-66 qui est reproduit en annexe 1 du présent règlement et qui en fait partie intégrante.

L'obligation définie à l'alinéa premier du présent article vaut uniquement en relation avec la remise en service d'aéronefs d'une masse maximale au décollage supérieure à 5.700 kg exploités en transport aérien commercial, à l'exclusion de tout autres aéronefs et éléments d'aéronefs, y compris hélices, moteurs ou groupes auxiliaires de puissance.

Art. 2. - Catégories d'habilitation et privilèges associés

Les personnes autorisées à prononcer l'aptitude à la remise en service (APRS) doivent être titulaires d'une licence AML attestant la réussite à l'examen portant sur les connaissances définies à l'article 3 du présent règlement conformément aux codes JAR-66 et JAR-145.

L'habilitation pour prononcer l'APRS est accordée dans les limites des quatre catégories définies ci-dessous et liées à un ou plusieurs types d'aéronefs ou à une ou plusieurs tâches d'entretien :

- Catégorie A: mécanicien habilité, pour les tâches d'entretien en ligne qualifiées mineures et des rectifications de défauts simples ;

- Catégorie B1: technicien en mécanique habilité, pour les opérations d'entretien en ligne sur la cellule de l'aéronef, les groupes motopropulseurs et les systèmes mécaniques et électriques ;

- Catégorie B2: technicien en avionique habilité, pour les opérations d'entretien en ligne sur des systèmes avioniques et électriques ;

- Catégorie C: personnel habilité pour les visites d'entretien « Base maintenance »

Art. 3. - Conditions d'aptitude pour l'obtention de la licence AML.

- *Exigences préalables :*

Le candidat doit avoir atteint l'âge minimum de 21 ans pour présenter sa demande d'obtention d'une licence AML. Cette demande est à introduire auprès de l'autorité de délivrance et de gestion telle que définie à l'article 4 ci-après. Le candidat doit être capable de lire, écrire et pouvoir s'exprimer à un degré suffisant dans les langues où sont notamment exprimées la documentation technique et les procédures de l'organisation.

- *Exigences en matière des connaissances de base :*

Les personnels candidats à la licence AML doivent démontrer, en passant un examen, le niveau de connaissances de base requis pour chaque catégorie énumérée à l'article 2 ci-avant.

Le niveau de connaissances pour les catégories respectives est fixé dans le programme de formation qui figure en Annexe 2 faisant partie intégrante du présent règlement.

Un personnel de catégorie C doit atteindre le niveau de connaissances applicable aux catégories B1 et B2.

- *Examen de qualification à la formation de base*

A défaut d'existence au Grand-Duché de Luxembourg d'un organisme de formation qualifié JAR-147, la Direction de l'Aviation Civile est chargée de la réception des examens pour les personnels candidats à la licence AML ou aux compléments de licence AML selon des modalités à déterminer sur avis du Ministre ayant l'éducation nationale et la formation professionnelle dans ses attributions.

La réussite à l'examen est sanctionnée par une attestation délivrée par la Direction de l'Aviation Civile.

Les questions issues d'une base de données internationale de référence (JAA) sont libellées en anglais.

- *Formation aux types d'aéronefs ou tâches :*

Les conditions de formation relatives aux types d'aéronefs ou tâches sont définies dans le paragraphe 66.45 du code JAR-66.

- *Exigences en matière de durée d'expérience*

Les personnels candidats à la licence AML doivent répondre à des exigences d'expérience minimale en entretien d'aéronefs civils adaptées à la catégorie de licence demandée. Ces conditions sont définies au paragraphe 66.30 du code JAR-66.

- *Aptitude médicale :*

Les personnels candidats à la licence AML ne doivent pas exercer les privilèges résultant de leur habilitation s'ils savent, ou suspectent, que leur condition physique ou mentale les rend inaptes à l'exercice de ces privilèges.

Art. 4. - Délivrance, gestion et coûts des licences AML.

Le Directeur de l'Aviation Civile est l'autorité qui délivre les licences AML.

La Direction de l'Aviation Civile est chargée de la gestion des licences AML des personnels employés par une organisation agréée conformément au code JAR-145 et installée au Grand-Duché de Luxembourg. La gestion ne porte que sur les seules licences délivrées au Grand-Duché de Luxembourg.

La licence AML a une durée de validité de cinq ans ; elle est renouvelable à la demande du titulaire à introduire auprès du Directeur de l'Aviation Civile dans un délai approprié avant l'échéance de validité. A défaut, le titulaire perd sa qualification APRS.

Le titulaire est tenu d'informer la Directeur de l'Aviation Civile de tout changement concernant les mentions de la licence pendant la durée de validité de celle-ci. Toute mise à jour des mentions de la licence donne lieu au renouvellement de la validité de la licence pour une durée nouvelle de cinq ans.

Les taxes suivantes non-remboursables sont perçues au profit du Trésor lors de la présentation d'une :

a) demande en obtention d'une licence AML : 125 euros,

b) demande en obtention d'un duplicata d'une licence AML : 50 euros,

c) demande en modification d'une mention de la licence AML : 50 euros.

La preuve du paiement des taxes est à présenter ensemble avec les demandes énumérées ci-dessus.

Art. 5. - Exceptions

Dans des cas dûment motivés, le Ministre ayant les transports dans ses attributions, ci-après dénommé le Ministre, peut exceptionnellement, pour des cas dûment justifiés, accorder des dérogations à caractère temporaire aux dispositions du code JAR-66, notamment pour prévenir des cas de rigueur et, sous réserve du respect de toute condition jugée nécessaire, pour assurer un niveau de compétence jugé suffisant.

Art. 6. - Vérifications et surveillance

Le Ministre peut, en cas de besoin, avoir recours à des organismes spécialisés pour faire procéder aux vérifications et à la surveillance qu'il juge nécessaires pour l'application du présent règlement.

Art. 7. - Révocation, suspension et limitations

Les conditions dans lesquelles une licence AML est susceptible d'être annulée, suspendue ou limitée dans ses effets sont celles définies au paragraphe 66.65 du code JAR-66.

Art. 8. - Dispositions transitoires

Conformément au code JAR-66 les personnels habilités à délivrer une APRS des aéronefs en transport aérien commercial de masse maximale au décollage supérieure à 5.700 kg avant le 1er juin 2001, conservent leur habilitation pour autant que la catégorie d'habilitation reste inchangée.

Les personnels qui ont commencé leur formation en vue d'obtenir une qualification les habilitant à délivrer une APRS avant le 1er juin 2001 peuvent continuer leur formation sur la base du programme préalablement en vigueur à l'introduction du code JAR-66.

Art. 9. - Exécution du règlement

Notre Ministre des Transports, Notre Ministre de l'Éducation Nationale, de la Formation Professionnelle et des Sports, Notre Ministre du Trésor et du Budget, Ministre de la Justice sont chargés, chacun en ce qui le concerne, de l'exécution du présent règlement qui sera publié au Mémorial.

Le Ministre des Transports,
Henri Grethen

Palais de Luxembourg, le 29 avril 2002.
Henri

Le Ministre de l'Education Nationale, de la Formation Professionnelle et des Sports,
Anne Brasseur

Le Ministre du Trésor et du Budget, Ministre de la Justice,
Luc Frieden

ANNEXE I

Joint Aviation Authorities – Joint Aviation Requirements – JAR - 66 – Certifying Staff Maintenance

JAR 66.1 General
(See AMC 66.1)

(a) JAR–145 requires appropriately authorised certifying staff to issue a certificate of release to service on behalf of the JAR–145 approved maintenance organisation when satisfied that all required maintenance has been completed.

(b) Except where stated otherwise in paragraphs (c), (d), (e)and (f), certifying staff responsible for issuing the certificate of release to service must be qualified in accordance with the appropriate requirements of this JAR–66.

(c) This JAR–66 is limited to those certifying staff responsible for issuing the certificate of release to service for aeroplanes and helicopters with a maximum take off mass of 5700 kg and above.

Note: The application of JAR 66 to aeroplanes and helicopters with a maximum take off mass below 5700 kg, airships and aircraft components will be considered in a future issue. Aircraft components include engines, auxiliary power units and propellers.

(d) Personnel authorised to exercise certification privileges in accordance with National aviation regulations valid before the effective date of JAR–66, may continue to exercise these privileges.

(e) Personnel undergoing a course of approved basic or type training at the JAR–66.3(b) compliance date in accordance with National aviation regulations valid before the effective date of JAR–66, may continue to be qualified in accordance with these National aviation regulations. The qualifications gained following such training will be recognised for the purposes of certification privileges in accordance with JAR–66.1(d).

(f) Certifying staff qualified in accordance with paragraph (d) or (e) may continue to exercise the authorisation except in the case of adding other basic categories / sub-categories of qualification to that authorisation when the appropriate additional requirements of JAR–66 will apply to such extension. Certifying staff qualified in accordance with paragraph (d) or (e) may extend the scope of their authorisation to include new aircraft types subject to compliance with National aviation regulations valid before the effective date of JAR–66.

(g) Notwithstanding that paragraph (d), (e) and (f) personnel may continue to exercise such privileges, such personnel must be issued a

JAR 66.1(g) (continued)

JAR–66 aircraft maintenance licence based upon the National qualification without further examination but within the time limits of JAR 66.3 (d). The JAR–66 aircraft maintenance licence may contain technical limitations in relation to JAR–66 where not appropriately qualified but does not change any existing certification privileges. Technical limitations will be deleted, as appropriate, when the person satisfactorily sits the relevant conversion examination.

JAR 66.3 Effectivity

(a) This JAR–66 was first issued on 03 April 1998 and becomes effective on 01 June 1998.

(b) After 01 June 2001 any person required to be approved in accordance with JAR–66.1(b) or (f) must be in compliance with this JAR–66.

(c) A JAR–66 aircraft maintenance licence may be issued by the JAA full member Authority during the sub-paragraph (b) transition period.

(d) Any person required by JAR–66.1 (g) to convert a National qualification to a JAR–66 aircraft maintenance licence must do so not later than 10 years after the end of the transition period of sub-paragraph (b).

JAR 66.5 Definitions

For the purpose of this JAR–66, the following definitions shall apply:

'Aircraft maintenance licence' means a document issued as evidence of qualification confirming that the person to whom it refers has met the JAR–66 knowledge and experience requirements for any aircraft basic category and aircraft type rating specified in the document.

Note: The aircraft maintenance licence alone does not permit the holder to issue certificates of release to service in respect of aircraft used for commercial air transport. To issue a certificate of release to service for such aircraft, the aircraft maintenance licence holder must in addition hold a JAR–145 certification authorisation issued by the JAR–145 approved maintenance organisation.

'Certification' means the issuance of a certificate of release to service.

JAR 66.5 (continued)

'JAA full member Authority' means an Authority who is a full member of the JAA which means that any approval certificate or licence issued in accordance with the JAR's by such an Authority will be recognised and accepted by all other such Authorities.

Note: The JAA full member States are listed in Section 2 Appendix 3. See also paragraph 10 of the Foreword.

'Organisation procedures' means the procedures applied by the JAR–145 approved maintenance organisation in accordance with the maintenance organisation exposition within the scope of the approval.

JAR 66.10 Applicability

(a) This JAR–66 prescribes the requirements for the qualification of those personnel authorised by a JAR–145 approved maintenance organisation to issue certificates of release to service in accordance with JAR–145.50.

Such personnel are required to hold a valid type rated JAR–66 aircraft maintenance licence, which attests to their knowledge and experience and a valid JAR–145 certification authorisation which grants certification privileges to the individual.

(b) For the JAR–66 aircraft maintenance licence compliance is required with JAR–66.15, JAR–66.25 and JAR–66.30 for the appropriate JAR–66.20 basic category or categories.

The JAR–66 aircraft maintenance licence will be endorsed with the relevant JAR–66.20 basic category / categories and where appropriate any aircraft type ratings granted under JAR–66.45.

Note: The JAR–66 aircraft maintence licence can be issued without any aircraft type ratings, but it should be remembered that an aircraft type rating is one of the prerequisites for a JAR–145 certification authorisation.

(c) For the JAR–145 certification authorisation compliance is required with paragraph (b), JAR–66.40, JAR–66.45, JAR–66.50 and JAR–66.55.

Note: JAR–145 contains additional requirements to qualify for JAR–145 certification authorisation

JAR 66.13 Application and Issue

(a) An application for a JAR 66.10 (b) aircraft maintenance licence or amendment to such licence must be made on a form and in a manner prescribed by the JAA full member Authority and submitted to such Authority.

Note: Appendix 2 of Section 2 contains an example application form.

(b) An applicant who meets the appropriate requirements of JAR–66.10(b) and has paid any charges prescribed by the JAA full member Authority is entitled to the JAR–66 aircraft maintenance licence.

(c) The JAR–66 aircraft maintenance licence is issued by the JAA full member Authority but the process of preparing such licence for issue may be delegated to appropriately approved JAR–145 maintenance organisations.

Note: The issue of the JAR–145 certification authorisation is carried out by the JAR–145 approved maintenance organisation after establishing compliance with appropriate paragraphs of JAR–66 and JAR–145.

JAR 66.15 Eligibility
(See IEM 66.15)

(a) Certifying staff must not be less than 21 years of age.

(b) Certifying staff must be able to read, write and communicate to an understandable level in the language(s) in which the technical documentation and organisation procedures necessary to support the issue of the certificate of release to service are written.

JAR 66.20 Categories and certification privileges
(See AMC 66.20)

(a) Certifications are made in accordance with the procedures of the JAR–145 approved maintenance organisation and within the scope of the authorisation.

(b) Certifying staff qualified in accordance with this JAR–66, and holding a valid aircraft maintenance licence with where applicable the appropriate type ratings, will be eligible to hold

JAR 66.20(b) (continued)

a JAR–145 certification authorisation in one or more of the following categories:

(1) A category A certifying staff authorisation permits the holder to issue certificates of release to service following minor scheduled line maintenance and simple defect rectification, as specified in JAR–145, within the limits of tasks specifically endorsed on the authorisation. The certification privileges are restricted to work that the authorisation holder has personally performed. Category A is sub-divided into sub-categories relative to combinations of aeroplanes, helicopters, turbine and piston engines.

Note: Category B1 certifying staff authorisation automatically permits certification in the appropriate A sub-categories. Category B2 certifying staff can qualify for any A sub-category as can any avionic mechanic subject to compliance with the appropriate A sub-category requirements.

(2) A category B1 certifying staff authorisation permits the holder to issue certificates of release to service following line maintenance, including aircraft structure, powerplants and mechanical and electrical systems. Replacement of avionic line replaceable units, requiring simple tests to prove their serviceability, is also included in the privileges. Category B1 is sub-divided into sub-categories relative to combinations of aeroplanes, helicopters, turbine and piston engines.

(3) A category B2 certifying staff authorisation permits the holder to issue certificates of release to service following line maintenance on avionic and electrical systems.

(4) A category C certifying staff authorisation permits the holder to issue certificates of release to service following base maintenance. The authorisation is valid for the aircraft in its entirety, including all systems.

Note: JAR–145 specifies the personnel required to support category C certifying staff in base maintenance, including in particular the requirement for qualified category B1 and B2 staff.

JAR 66.25 Basic knowledge requirements
(See AMC 66.25 and IEM 66.25))

(a) Certifying staff must demonstrate by examination a level of knowledge acceptable to the JAA full member Authority, in subject modules appropriate to the JAR–66.20 category for which a JAR–66 aircraft maintenance licence is issued or extended.

(b) The levels of knowledge are directly related to the complexity of certifications appropriate to the particular JAR–66.20 category which means that category A must demonstrate a limited but adequate level of knowledge, whereas category B1 and B2 must demonstrate a complete level of knowledge in the appropriate subject modules. Category C certifying staff must meet the relevant level of knowledge for B1 or B2.

Note: JAR–66 Section 2 Appendix 1 contains detailed information on category A, B1 and B2 levels of knowledge.

(c) Full or partial credit against the basic knowledge requirements and associated examination will be given for any other technical qualification considered by the JAA full member Authority to be equivalent to the JAR–66 knowledge standard.

JAR 66.30 Experience requirements
(See AMC 66.30)

(a) Certifying staff must meet a minimum civil aircraft maintenance experience requirement appropriate to the JAR–66 aircraft maintenance licence sought, which will be reduced by the JAA full member Authority when satisfied that either JAR–147 approved training or other appropriate technical training has been received. For category A and B1 or B2 the experience must be practical which means being involved with a representative cross section of maintenance tasks on aircraft.

(b) The minimum civil aircraft maintenance experience before possible paragraph (a) reductions means, for category A three years and for category B1 or B2 five years.

(c) The minimum civil aircraft maintenance experience for category C is three years qualified as a B1 or B2 certifying staff in line maintenance, or, in base maintenance supporting the category C certifying staff, or, a combination of both. Alternatively, the minimum civil aircraft

JAR 66.30(c) (continued)

experience for category C certifying staff qualified by holding an academic degree in a technical discipline from a university or other higher educational institute accepted by the JAA full member Authority is three years on a representative selection of tasks directly associated with aircraft maintenance including six months of observation of base maintenance tasks.

(d) For all certifying staff, at least 1 year of the required experience must be recent maintenance experience on aircraft typical of the category/sub-category for which the JAR–66 aircraft maintenance licence is sought.

(e) Aircraft maintenance experience gained outside a civil aircraft maintenance environment will be accepted by the JAA full member Authority when satisfied that such maintenance is equivalent to that required by JAR–66 but additional experience of civil aircraft maintenance will be required to ensure understanding of the civil aircraft maintenance environment.

JAR 66.40 Continuity of the aircraft maintenance licence
(See AMC and IEM 66.40)

The JAR–66 aircraft maintenance licence holder must ensure that the information contained in the licence is the same as recorded in the licence copy held by the original issuing JAA full member Authority by submitting the said licence to that JAA full member Authority for review no later than 5 years after the last issue or amendment of the licence as appropriate. Failure to carry out this action would invalidate any JAR–145 certification authorisation issued on the basis of such JAR–66 aircraft maintenance licence and may require recent aircraft maintenance experience and / or the resit of some examinations before re-issue of the licence. The JAA full member Authority will decide for each particular case.

JAR 66.45 Type/task training and ratings (See AMC and IEM 66.45)

(a) Category A certifying staff are required to hold an appropriate JAR–66 aircraft maintenance licence prior to the grant of a JAR–145 certification authorisation on a specific aircraft type. JAR–145 certification

JAR 66.45(a) (continued)

authorisations may only be granted following the satisfactory completion of the relevant category A aircraft task training carried out by an appropriately approved JAR–145 or JAR–147 organisation.

(b) Category B1 and B2 certifying staff are required to hold an appropriate aircraft type rated JAR–66 aircraft maintenance licence prior to the grant of a JAR–145 certification authorisation on a specific aircraft type. Ratings will be granted following satisfactory completion of the relevant category B1 or B2 aircraft type training approved by the JAA full member Authority or by an appropriately approved JAR–147 maintenance training organisation.

(c) Category C certifying staff are required to hold an appropriate aircraft type rated JAR–66 aircraft maintenance licence prior to the grant of a JAR–145 certification authorisation on a specific aircraft type. Ratings will be granted following satisfactory completion of the relevant category C aircraft type training approved by the JAA full member Authority or by an appropriately approved JAR–147 maintenance training organisation except in the case of a category C person qualified by holding an academic degree as specified in JAR–66.30 (c), where the first relevant aircraft type training must be at the category B1 or B2 level.

(d) Completion of approved aircraft task or type training, as required by sub-paragraphs (a) to (c) above, must be satisfactorily demonstrated by an examination.

JAR 66.50 Medical fitness
(See AMC 66.50)

Certifying staff must not exercise the privileges of their certification authorisation if they know or suspect that their physical or mental condition renders them unfit to exercise such privileges.

JAR 66.55 Evidence of qualification
(See IEM 66.55)

Certifying staff qualified in accordance with this JAR–66 will be issued with an aircraft maintenance licence by the JAA full member Authority as evidence of one of the

qualifications necessary for the grant of a JAR–145 certification authorisation. Certifying staff must be able to produce their licence if requested by an authorised person within a reasonable time.

JAR 66.60 Equivalent safety cases
(See AMC 66.60)

The JAA full member Authority may exempt any person, required to be qualified in accordance with JAR–66, from any requirement in JAR–66 when satisfied that a situation exists not covered by JAR–66 and subject to compliance with any supplementary condition(s) the JAA full member Authority considers necessary to ensure equivalent safety. Such exemption and supplementary condition(s) must be agreed by the JAA full member Authorities to ensure continued recognition of the person.

JAR 66.65 Revocation, suspension or limitation of the JAR–66 aircraft maintenance licence
(See IEM 66.65)

(a) The JAA full member Authority may, on reasonable grounds after due enquiry, revoke, suspend or limit the JAR–66 aircraft maintenance licence or direct the JAR–145 approved maintenance organisation to revoke, suspend or limit the JAR–145 certification authorisation if the JAA full member Authority is not satisfied that the holder of the licence and authorisation is a fit and proper person to hold such licence and authorisation subject to the conditions of paragraph (a)(1) or (a)(2) as appropriate.

(1) Before revoking or limiting the JAR–66 aircraft maintenance licence or directing the JAR–145 approved maintenance organisation the JAA full member Authority must first give at least 28 days notice to the affected party or parties in writing of its intention so to do and of the reasons for its proposal and must offer the affected party or parties an opportunity to make representations and the JAA full member Authority will consider those representations.

(2) In the case where the JAA full member Authority has determined that the safe operation of the aircraft is adversely affected the JAA full member Authority may in addition to sub-paragraph (a)(1)

provisionally suspend the JAR–66 aircraft maintenance licence without prior notice until the sub-paragraph (a)(1) procedure is complete.

(b) For the JAA full member Authority to consider a person to be not a fit and proper person means that there is clear evidence that the person has knowingly carried out or been involved in one or more of the following activities;

(1) Obtained the JAR–66 aircraft maintenance licence and/or the JAR–145 certification authorisation by falsification of submitted evidence.

(2) Failed to carry out requested maintenance combined with failure to to report such fact to the organisation that requested the maintenance.

(3) Failed to carry out required maintenance resulting from own inspection combined with failure to report such fact to the organisation for whom the maintenance was intended to be carried out.

(4) Negligent maintenance.

(5) Falsification of the maintenance record.

(6) The issue of a certificate of release to service knowing that the maintenance specified on the certificate of release to service has not been carried out or without verifying that such maintenance has been carried out.

(7) Carrying out maintenance or issuing a certificate of release to service when adversely affected by alcohol or drugs.

ANNEXE 2

APPENDIX 1

AMC 66.25 Basic Knowledge – Introduction

1 KNOWLEDGE LEVELS – CATEGORY A, B1, B2 AND C CERTIFYING STAFF

Basic knowledge for category A, B1 and B2 certifying staff are indicated by the allocation of knowledge levels indicators (1, 2 or 3) against each applicable subject area in this Appendix 1. Category C certifying staff with a mechanical background should meet the category B1 basic knowledge levels. Category C certifying staff with a avionic background should meet the category B2 basic knowledge levels

The knowledge level indicators are defined as follows:

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

Objectives: The student should be familiar with the basic elements of the subject.

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

The student should be able to use typical terms.

LEVEL 2 ***A general knowledge of the theoretical and practical aspects of the subject.***

An ability to apply that knowledge.

Objectives: The student should be able to understand the theoretical fundamentals of the subject.

The student should be able to give a general description of the subject using, as appropriate, typical examples.

The student should be able to use mathematical formulae in conjunction with physical laws describing the subject.

The student should be able to read and understand sketches, drawings and schematics describing the subject.

The student 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.***

A capacity to combine and apply the separate elements of knowledge in a logical and comprehensive manner.

Objectives: The student should know the theory of the subject and interrelationships with other subjects.

The student should be able to give a detailed description of the subject using theoretical fundamentals and specific examples.

The student should understand and be able to use mathematical formulae related to the subject.

The student should be able to read, understand and prepare sketches, simple drawings and schematics describing the subject.

Introduction (continued)

The student should be able to apply his knowledge in a practical manner using manufacturer's instructions.

The student should be able to interpret results from various sources and measurements and apply corrective action where appropriate.

Note: The Administrative & Guidance Material, Section Two - Maintenance Part Two – Procedures, Chapter 23 contains an explanation of the basic knowledge objective relative to each subject.

2. MODULARISATION

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

SUBJECT MODULES	A or B1 AEROPLANE WITH:		A or B1 HELICOPTER WITH:		B2	RESERVED
	TURBINE ENGINE(S)	PISTON ENGINE(S)	TURBINE ENGINE(S)	PISTON ENGINE(S)	AVIONICS	
1	X	X	X	X	X	
2	X	X	X	X	X	
3	X	X	X	X	X	
4	X	X	X	X	X	TO
5	X	X	X	X	X	BE
6	X	X	X	X	X	DEVE-
7	X	X	X	X	X	LOPED
8	X	X	X	X	X	
9	X	X	X	X	X	
10	X	X	X	X	X	
11	X	X				
12			X	X		
13					X	
14					X	
15	X		X			
16		X		X		
17	X	X				
18	Reserved					

APPENDIX

AMC 66.25 Basic Knowledge Levels

SUBJECT MODULES

1. Mathematics
2. Physics
3. Electrical Fundamentals
4. Electronic Fundamentals
5. Digital Techniques / Electronic Instrument Systems
6. Materials and Hardware
7. Maintenance Practices
8. Basic Aerodynamics
9. Human Factors
10. Aviation Legislation
11. Aeroplane Aerodynamics, Structures and Systems
12. Helicopter Aerodynamics, Structures and Systems
13. Aircraft Aerodynamics, Structures and Systems
14. Propulsion
15. Gas Turbine Engine
16. Piston Engine
17. Propeller
18. Reserved

Note 1: The subject modules may be sub-divided into sub-modules for the purpose of training and/or examination.

Note 2: The levels specified in this Appendix will be subjected to regular review in the light of experience.

MODULE 1. MATHEMATICS

		Level A	Level B1	Level 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 co-ordinates.	–	**2**	**2**

MODULE 2. PHYSICS

Students should become conversant with Metric, Imperial (British) and US units and measurements.

		Level A	Level B1	Level B2
2.1	**Matter**			
	• Nature of matter: the chemical elements, structure of atoms, molecules;	**1**	**1**	**1**
	• Chemical compounds.			
	• States: solid, liquid and gaseous;			
	• Changes between states.			
2.2	**Mechanics**			
2.2.1	**Statics**			
	• Forces, moments and couples, representation as vectors;	**1**	**2**	**1**
	• Centre of gravity.			
	• Elements of theory of stress, strain and elasticity: tension, compression, shear and torsion;			
	• Nature and properties of solid, fluid and gas;			
	• Pressure and buoyancy in liquids (barometers).			
2.2.2	**Kinetics**			
	• Linear movement: uniform motion in a straight line, motion under constant acceleration (motion under gravity);	**1**	**2**	**1**
	• Rotational movement: uniform circular motion (centrifugal/ centripetal forces);			
	• Periodic motion: pendular movement;			
	• Simple theory of vibration, harmonics and resonance;			
	• Velocity ratio, mechanical advantage and efficiency.			
2.2.3	**Dynamics**			
	a)			
	• Mass;	**1**	**2**	**1**
	• Force, inertia, work, power, energy (potential, kinetic and total energy), heat, efficiency;			
	b)			
	• Momentum, conservation of momentum;	**1**	**2**	**2**
	• Impulse;			
	• Gyroscopic principles;			
	• Friction: nature and effects, coefficient of friction (rolling resistance).			
2.2.4	**Fluid dynamics**			
	a)			
	• Specific gravity and density;	**2**	**2**	**2**
	b)	**1**	**2**	**1**
	• Viscosity, fluid resistance, effects of streamlining;			
	• effects of compressibility on fluids;			
	• Static, dynamic and total pressure: Bernoulli's Theorem, venturi.			

Module 2 (continued)

		Level A	B1	B2
2.3	**Thermodynamics**			
	a)	**2**	**2**	**2**
	• Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin; Heat definition.			
	b)	**–**	**2**	**2**
	• 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.			
2.4	**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**
3.5	**DC Sources of Electricity** Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, other alkaline cells; Cells connected in series and parallel; Internal resistance and its effect on a battery; • Construction, materials and operation of thermocouples; • Operation of photo-cells.	**1**	**2**	**2**
3.6	**DC Circuits** Ohms Law, Kirchoff's Voltage and Current Laws; Calculations using the above laws to find resistance, voltage and current; Significance of the internal resistance of a supply.	**–**	**2**	**2**
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**

Module 3 (continued)

		Level A	B1	B2
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
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; Principal uses of inductors;	–	2	2

Module 3 (continued)

		Level A	B1	B2
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 C motors; Series wound, shunt wound and compound motors; Starter Generator construction.	–	2	2
3.13	**AC Theory** Sinusoidal waveform: phase, period, frequency, cycle; Instantaneous, average, root mean square, peak, peak to peak current values and calculations of these values, in relation to voltage, current and power; Triangular/Square waves; Single / 3 phase principles.	1	2	2
3.14	**Resistive (R), Capacitive (C) and Inductive (L) Circuits** Phase relationship of voltage and current in L, C and R circuits, parallel, series and series parallel; Power dissipation in L, C and R circuits; Impedance, phase angle, power factor and current calculations; True power, apparent power and reactive power calculations.	–	2	2
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; 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; Calculation of line and phase voltages and currents; Calculation of power in a three phase system; 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	Level B1	Level B2
4.1	**Semiconductors**			
4.1.1	***Diodes***	**–**	**2**	**2**
	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.			
	b) Materials, electron configuration, electrical properties; P and N type materials: effects of impurities on conduction, majority and minority carriers; 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, Shottky 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**

Module 4 (continued)

		Level A	B1	B2
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**
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.	**–**	**2**	**2**
5.5	**Logic Circuits**	**–**	**2**	**2**
	a) Identification of common logic gate symbols, tables and equivalent circuits; Applications used for aircraft systems, schematic diagrams.			
	b) Interpretation of logic diagrams.	**–**	**–**	**2**
5.6	**Basic Computer Structure**			
	a) Computer terminology (including bit, byte, software, hardware, CPU, IC, and various memory devices such as RAM, ROM, PROM); Computer technology (as applied in aircraft systems).	**1**	**2**	**–**
	b) Computer related terminology; Operation, layout and interface of the major components in a micro computer including their associated bus systems; Information contained in single and multiaddress instruction words; Memory associated terms; Operation of typical memory devices; Operation, advantages and disadvantages of the various data storage systems.	**–**	**–**	**2**
5.7	**Microprocessors** Functions performed and overall operation of a microprocessor; Basic operation of each of the following microprocessor elements: control and processing unit, clock, register, arithmetic logic unit.	**–**	**–**	**2**
5.8	**Integrated Circuits** Operation and use of encoders and decoders; Function of encoder types; Uses of medium, large and very large scale integration.	**–**	**–**	**2**

Module 5 (continued)

		Level A	B1	B2
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
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) testing such as: ACARS – ARINC Communication and Addressing and Reporting System ECAM – Electronic Centralised Aircraft Monitoring EFIS – Electronic Flight Instrument System EICAS – Engine Indication and Crew Alerting System FBW – Fly by Wire FMS – Flight Management System GPS – Global Positioning System IRS – Inertial Reference System TCAS – Traffic Alert Collision Avoidance System Note : Different manufacturers may use different terminology for similar systems.	–	2	2

MODULE 6. MATERIALS AND HARDWARE

		Level A	B1	B2
6.1	**Aircraft Materials – *Ferrous***			
	a)	**1**	**2**	**1**
	Characteristics, properties and identification of common alloy steels used in aircraft; Heat treatment and application of alloys steels;			
	b)	**–**	**1**	**1**
	Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.			
6.2	**Aircraft Materials – *Non-Ferrous***			
	a)	**1**	**2**	**1**
	Characteristics, properties and identification of common non-ferrous materials used in aircraft; Heat treatment and application of non-ferrous materials;			
	b)	**–**	**1**	**1**
	Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.			
6.3	**Aircraft Materials – *Composite and Non-Metallic***			
	a)	**1**	**2**	**2**
	Characteristics, properties and identification of common composite and non-metallic materials, other than wood, used in aircraft; Sealants and bonding agents.			
	b)	**1**	**2**	**–**
	The detection of defects in composite material. Repair of composite material.			
6.4	**Corrosion**			
	a)	**1**	**1**	**1**
	Chemical fundamentals; Formation by, galvanic action process, microbiological, stress;			
	b)	**2**	**3**	**2**
	Types of corrosion and their identification; Causes of corrosion; Material types, susceptibility to corrosion.			
6.5	**Fasteners**			
6.5.1	***Screw threads***	**2**	**2**	**2**
	Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; Measuring screw threads.			
6.5.2	***Bolts, studs and screws***	**2**	**2**	**2**
	Bolt types: specification, identification and marking of aircraft bolts, international standards; Nuts: self locking, anchor, standard types; Machine screws: aircraft specifications; Studs: types and uses, insertion and removal; Self tapping screws, dowels.			

Module 6 (continued)

		Level A	B1	B2
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.	**–**	**2**	**1**
6.8	**Bearings** Purpose of bearings, loads, material, construction; Types of bearings and their application.	**1**	**2**	**2**
6.9	**Transmissions** Gear types and their application; Gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns; Belts and pulleys, chains and sprockets.	**1**	**2**	**2**
6.10	**Control Cables** Types of cables; End fittings, turnbuckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems.	**1**	**2**	**1**
6.11	**Electrical Cables and Connectors** Cable types, construction and characteristics; High tension and 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.	**3**	**3**	**3**
7.2	**Workshop Practices** Care of tools, control of tools, use of workshop materials; Dimensions, allowances and tolerances, standards of workmanship; Calibration of tools and equipment, calibration standards.	**3**	**3**	**3**
7.3	**Tools** Common hand tool types; Common power tool types; Operation and use of precision measuring tools; Lubrication equipment and methods; Operation, function and use of electrical general test equipment.	**3**	**3**	**3**
7.4	**Avionic General Test Equipment** Operation, function and use of avionic general test equipment.	**–**	**2**	**3**
7.5	**Engineering Drawings, Diagrams and Standards** Drawing types and diagrams, their symbols, dimensions, tolerances and projections; Identifying title block information; Microfilm, microfiche and computerised presentations; Specification 100 of the Air Transport Association (ATA) of America; Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL; Wiring diagrams and schematic diagrams.	**1**	**2**	**2**
7.6	**Fits and Clearances** Drill sizes for bolt holes, classes of fits; Common system of fits and clearances; Schedule of fits and clearances for aircraft and engines; Limits for bow, twist and wear; Standard methods for checking shafts, bearings and other parts.	**1**	**2**	**1**
7.7	**Electrical Cables and Connectors** Continuity, insulation and bonding techniques and testing; Use of crimp tools: hand and hydraulic operated; Testing of crimp joints; Connector pin removal and insertion; Co-axial cables: testing and installation precautions; Wiring protection techniques : Cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding.	**1**	**2**	**2**

Module 7 (continued)

		Level A	B1	B2
7.8	**Riveting** Riveted joints, rivet spacing and pitch; Tools used for rivetting and dimpling; Inspection of rivetted joints.	**1**	**2**	**–**
7.9	**Pipes and Hoses** Bending and belling/flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes.	**1**	**2**	**–**
7.10	**Springs** Inspection and testing of springs.	**1**	**2**	**–**
7.11	**Bearings** Testing, cleaning and inspection of bearings; Lubrication requirements of bearings; Defects in bearings and their causes.	**1**	**2**	**–**
7.12	**Transmissions** Inspection of gears, backlash; Inspection of belts and pulleys, chains and sprockets; Inspection of screw jacks, lever devices, push-pull rod systems.	**1**	**2**	**–**
7.13	**Control Cables** Swaging of end fittings; Inspection and testing of control cables; Bowden cables; aircraft flexible control systems.	**1**	**2**	**–**
7.14	**Sheet Metal Work** Marking out and calculation of bend allowance; Sheet metal working, including bending and forming; Inspection of sheet metal work.	**–**	**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**	**–**

Module 7 (continued)

		Level A	B1	B2
7.17	**Aircraft Handling and Storage** Aircraft taxiing / towing and associated safety precautions; Aircraft jacking, chocking, securing and associated safety precautions; Aircraft storage methods; Refuelling / defuelling procedures; De-icing/anti-icing procedures; Electrical, hydraulic and pneumatic ground supplies. Effects of environmental conditions on aircraft handling and operation.	**2**	**2**	**2**
7.18	**Disassembly, Inspection, Repair and Assembly Techniques**			
	a) Types of defects and visual inspection techniques. Corrosion removal, assessment and reprotection.	**2**	**3**	**2**
	b) General repair methods, Structural Repair Manual; Ageing, fatigue and corrosion control programmes.	**–**	**2**	**–**
	c) Non destructive inspection techniques including, penetrant, radiographic, eddy current, ultrasonic and boroscope methods.	**–**	**2**	**1**
	d) Disassembly and re-assembly techniques.	**2**	**2**	**2**
	e) Trouble shooting techniques.	**–**	**2**	**2**
7.19	**Abnormal Events**			
	a) Inspections following lightning strikes and HIRF penetration.	**2**	**2**	**2**
	b) Inspections following abnormal events such as heavy landings and flight through turbulence.	**2**	**2**	**–**
7.20	**Maintenance Procedures** Maintenance planning; Modification procedures; Stores procedures; Certification/release procedures; Interface with aircraft operation; Maintenance Inspection/Quality Control/Quality Assurance; Additional maintenance procedures. Control of life limited components.	**1**	**2**	**2**

MODULE 8. BASIC AERODYNAMICS

		Level A	Level B1	Level 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.	**1**	**1**	**1**
9.4	**Factors Affecting Performance** Fitness / health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload and underload; Sleep and fatigue, shiftwork; Alcohol, medication, drug abuse.	**2**	**2**	**2**
9.5	**Physical Environment** Noise and fumes; Illumination; Climate and temperature; Motion and vibration; Working environment.	**1**	**1**	**1**
9.6	**Tasks** Physical work; Repetitive tasks; Visual inspection; Complex systems.	**1**	**1**	**1**
9.7	**Communication** Within and between teams; Work logging and recording; Keeping up to date, currency; Dissemination of information.	**2**	**2**	**2**
9.8	**Human Error** Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e accidents); Avoiding and managing errors.	**1**	**2**	**2**

Module 9 (continued)

		Level A	Level B1	Level B2
9.9	**Hazards in the Workplace** Recognising and avoiding hazards; Dealing with emergencies.	**1**	**2**	**2**

MODULE 10. AVIATION LEGISLATION

		Level A	B1	B2
10.1	**Regulatory Framework** Role of International Civil Aviation Organisation; Role of the Joint Aviation Authorities (JAA); Role of the JAA full member Authorities; Role of the JAA candidate member Authorities; Joint Airworthiness Requirements: relationship between JAR–OPS, JAR–145, JAR–66, JAR–147 and JAR–Maintenance; Relationship with other Aviation Authorities.	**1**	**1**	**1**
10.2	**JAR–66 – Certifying Staff – Maintenance** Detailed understanding of JAR–66.	**2**	**2**	**2**
10.3	**JAR–145 – Approved Maintenance Organisations** Detailed understanding of JAR–145.	**2**	**2**	**2**
10.4	**JAR–OPS – Commercial Air Transportation :**			
	a) ***General*** Air Operators Certificates; Operators Responsibilities; Documents to be Carried; Aircraft Placarding (Markings);	**1**	**1**	**1**
	b) ***Subpart M*** • Maintenance Responsibility; • Maintenance Management; • Aircraft Maintenance Programme; • Aircraft Technical Log; • Maintenance Records and Log Books; • Accident/Occurrence Reporting.	**2**	**2**	**2**
10.5	**Aircraft Certification**			
	a) ***General*** Certification rules : such as JAR–23/25/27/29; Type Certification; Supplemental Type Certification; JAR–21 Design/Production Organisation Approvals.	**–**	**1**	**1**
	b) ***Documents*** Certificate of Airworthiness; Certificate of Registration; Noise Certificate; Weight Schedule; Radio Station Licence and Approval.	**–**	**2**	**2**
10.6	**JAR–Maintenance** (when adopted)	**2**	**2**	**2**

Module 10 (continued)

		Level A	B1	B2
10.7	**Applicable National and International Requirements for** (if not superseded by JAA requirements)			
	a) Maintenance Programmes, Maintenance checks and inspections; Master Minimum Equipment Lists, Minimum Equipment List, Dispatch Deviation Lists; Airworthiness Directives; Service Bulletins, manufacturers service information; Modifications and repairs; Maintenance documentation: maintenance manuals, structural repair manual, illustrated parts catalogue, etc.	**1**	**2**	**2**
	b) Continuing airworthiness; Test flights; ETOPS, maintenance and dispatch requirements; All Weather Operations, Category 2/3 operations and minimum equipment requirements.	**–**	**1**	**1**

MODULE 11. AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

		Level A	B1	B2
11.1	**Theory of Flight**			
11.1.1	***Aeroplane Aerodynamics and Flight Controls***	**1**	**2**	**–**
	Operation and effect of: – roll control: ailerons and spoilers; – pitch control: elevators, stabilators, variable incidence stabilisers and canards; – yaw control, rudder limiters; Control using elevons, ruddervators; High lift devices, slots, slats, flaps, flaperons; Drag inducing devices, spoilers, lift dumpers, speed brakes; Effects of wing fences, saw tooth leading edges; Boundary layer control using, vortex generators, stall wedges or leading edge devices; Operation and effect of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels;			
11.1.2	***High Speed Flight***	**1**	**2**	**–**
	Speed of sound, subsonic flight, transonic flight, supersonic flight, Mach number, critical Mach number, compressibility buffet, shock wave, aerodynamic heating, area rule; Factors affecting airflow in engine intakes of high speed aircraft; Effects of sweepback on critical Mach number.			
11.2	**Airframe Structures - General Concepts**			
	a)	**2**	**2**	**–**
	Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision.			
	b)	**1**	**2**	**–**
	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.			

Module 11 (continued)

		Level A	B1	B2
11.3	**Airframe Structures – Aeroplanes**			
11.3.1	***Fuselage (ATA 52 / 53 / 56)*** Construction and pressurisation sealing; Wing, stabiliser, pylon and undercarriage attachments; Seat installation and cargo loading system; Doors: construction, mechanisms, operation and safety devices; Windows and windscreen construction and mechanisms.	**1**	**2**	**–**
11.3.2	***Wings (ATA 57)*** Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.	**1**	**2**	**–**
11.3.3	***Stabilisers (ATA 55)*** Construction; Control surface attachment.	**1**	**2**	**–**
11.3.4	***Flight Control Surfaces (ATA 55/57)*** Construction and attachment; Balancing – mass and aerodynamic.	**1**	**2**	**–**
11.3.5	***Nacelles/Pylons (ATA 54)*** Construction; Firewalls; Engine mounts.	**1**	**2**	**–**
11.4	**Air Conditioning and Cabin Pressurisation (ATA 21)**			
11.4.1	***Air supply*** Sources of air supply including engine bleed, APU and ground cart;	**1**	**2**	**–**
11.4.2	***Air Conditioning*** Air conditioning systems; Air cycle and vapour cycle machines; Distribution systems; Flow, temperature and humidity control system.	**1**	**3**	**-**
11.4.3	***Pressurisation*** Pressurisation systems; Control and indication including control and safety valves; Cabin pressure controllers.	**1**	**3**	**–**
11.4.4	***Safety and warning devices*** Protection and warning devices.	**1**	**3**	**–**

Module 11 (continued)

		Level A	B1	B2
11.5	**Instruments/Avionic Systems**			
11.5.1	***Instrument Systems (ATA 31)***	**1**	**2**	**–**
	Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn co-ordinator; Compasses: direct reading, remote reading; Angle of attack indication, stall warning systems; Other aircraft system indication.			
11.5.2	***Avionic Systems***	**1**	**1**	**–**
	Fundamentals of system lay-outs and operation of; Auto Flight (ATA 22); Communications (ATA 23); Navigation Systems (ATA 34).			
11.6	***Electrical Power (ATA 24)***	**1**	**3**	**–**
	Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection; External/Ground power.			
11.7	**Equipment and Furnishings (ATA 25)**			
	a)	**2**	**2**	**–**
	Emergency equipment requirements; Seats, harnesses and belts.			
	b)	**1**	**1**	**–**
	Cabin lay-out; Equipment lay-out; Cabin Furnishing Installation; Cabin entertainment equipment; Galley installation; Cargo handling and retention equipment; Airstairs.			
11.8	**Fire Protection (ATA 26)**	**1**	**3**	**–**
	Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.			
11.9	**Flight Controls (ATA 27)**	**1**	**3**	**–**
	Primary controls: aileron, elevator, rudder, spoiler; Trim control; Active load control; High lift devices; Lift dump, speed brakes.			

Module 11.9 (continued)

		Level A	B1	B2
	System operation: manual, hydraulic, pneumatic, electrical, fly-by-wire; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks; Balancing and rigging; Stall protection system.			
11.10	**Fuel Systems (ATA 28)** System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling; Longitudinal balance fuel systems.	1	3	–
11.11	**Hydraulic Power (ATA 29)** System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation; Pressure Control; Power distribution; Indication and warning systems; Interface with other systems.	1	3	–
11.12	**Ice and Rain Protection (ATA 30)** Ice formation, classification and detection; Anti-icing systems: electrical, hot air and chemical; De-icing systems: electrical, pneumatic and chemical; Rain repellant and removal; Probe and drain heating.	1	3	–
11.13	**Landing Gear (ATA 32)** Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tyres; Steering.	2	3	–
11.14	**Lights (ATA 33)** External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	2	3	–
11.15	**Oxygen (ATA 35)** System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings	1	3	–

Module 11 (continued)

		Level A	B1	B2
11.16	**Pneumatic/Vacuum (ATA 36)** System lay-out; Sources: engine / APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	**1**	**3**	**–**
11.17	**Water/Waste (ATA 38)** Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing; Corrosion aspects.	**2**	**3**	**–**
11.18	**On Board Maintenance Systems (ATA 45)** Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	**1**	**2**	**–**

MODULE 12. HELICOPTER AERODYNAMICS, STRUCTURES AND SYSTEMS

		Level A	B1	B2
12.1	**Theory of Flight – Rotary Wing Aerodynamics** Terminology; Effects of gyroscopic precession; Torque reaction and directional control; Dissymmetry of lift, Blade tip stall; Translating tendency and its correction; Coriolis effect and compensation; Vortex ring state, power settling, overpitching; Auto-rotation; Ground effect.	1	2	–
12.2	**Flight Control Systems** Cyclic control; Collective control; Swashplate; Yaw control: Anti-Torque Control, Tail rotor, bleed air; Main Rotor Head: Design and Operation features; Blade Dampers: Function and construction; Rotor Blades: Main and tail rotor blade construction and attachment; Trim control, fixed and adjustable stabilisers; System operation: manual, hydraulic, electrical and fly-by-wire; Artificial feel; Balancing and Rigging.	2	3	–
12.3	**Blade Tracking and Vibration Analysis** Rotor alignment; Main and tail rotor tracking; Static and dynamic balancing; Vibration types, vibration reduction methods; Ground resonance.	1	3	–
12.4	**Transmissions** Gear boxes, main and tail rotors; Clutches, free wheel units and rotor brake.	1	3	–
12.5	**Airframe Structures**			
	a) Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision.	2	2	–

Module 12.5 (continued)

		Level A	B1	B2
	b) • Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning and anti-corrosive protection; • Pylon, stabiliser and undercarriage attachments; • Seat installation; • Doors: construction, mechanisms, operation and safety devices; Windows and windscreen construction; Fuel storage; Firewalls; Engine mounts; Structure assembly techniques: riveting, bolting, bonding; Methods of surface protection, such as chromating, anodising, painting; Surface cleaning. Airframe symmetry: methods of alignment and symmetry checks.	**1**	**2**	**–**
12.6	**Air Conditioning (ATA 21)**			
12.6.1	***Air supply*** Sources of air supply including engine bleed and ground cart.	**1**	**2**	**–**
12.6.2	***Air Conditioning*** Air conditioning systems; Distribution systems; Flow and temperature control systems; Protection and warning devices.	**1**	**3**	**–**
12.7	**Instruments/Avionic Systems**			
12.7.1	***Instrument Systems (ATA 31)*** Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn co-ordinator; Compasses: direct reading, remote reading; Vibration indicating systems – HUMS; Other aircraft system indication.	**1**	**2**	**–**
12.7.2	***Avionic Systems*** Fundamentals of system layouts and operation of; Auto Flight (ATA 22); Communications (ATA 23); Navigation Systems (ATA 34).	**1**	**1**	**–**
12.8	**Electrical Power (ATA 24)** Batteries Installation and Operation; DC power generation, AC power generation; Emergency power generation; Voltage regulation, Circuit protection; Power distribution; Inverters, transformers, rectifiers; External/Ground power.	**1**	**3**	**–**

Module 12 (continued)

		Level A	B1	B2
12.9	**Equipment and Furnishings (ATA 25)**			
	a)	**2**	**2**	**–**
	Emergency equipment requirements; Seats, harnesses and belts; Lifting systems.			
	b)	**1**	**1**	**–**
	Emergency flotation systems; Cabin lay-out, cargo retention; Equipment lay-out; Cabin Furnishing Installation;			
12.10	**Fire Protection (ATA 26)** Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.	**1**	**3**	**–**
12.11	**Fuel Systems (ATA 28)** System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling.	**1**	**3**	**-**
12.12	**Hydraulic Power (ATA 29)** System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation; Pressure Control; Power distribution; Indication and warning systems; Interface with other systems.	**1**	**3**	**–**
12.13	**Ice and Rain Protection (ATA 30)** Ice formation, classification and detection; Anti-icing and De-icing systems: electrical, hot air and chemical; Rain repellant and removal; Probe and drain heating.	**1**	**3**	**–**
12.14	**Landing Gear (ATA 32)** Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, Tyres, brakes; Steering; Skids, floats.	**2**	**3**	**–**

Module 12 (continued)

		Level A	B1	B2
12.15	**Lights (ATA 33)** External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	**2**	**3**	**–**
12.16	**Pneumatic/Vacuum (ATA 36)** System lay-out; Sources: engine, compressors, reservoirs, ground supply.; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	**1**	**3**	**–**

MODULE 13. AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS

		Level A	B1	B2
13.1	**Theory of Flight**			
	a) ***Aeroplane Aerodynamics and Flight Controls***	–	–	**1**
	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.			
	b) ***High Speed Flight***	–	–	**1**
	Speed of sound, subsonic flight, transonic flight, supersonic flight, Mach number, critical Mach number.			
	c) ***Rotary Wing Aerodynamics***	–	–	**1**
	Terminology; Operation and effect of cyclic, collective and anti-torque controls.			
13.2	**Structures – General Concepts**			
	a)	–	–	**1**
	Fundamentals of structural systems.			
	b)	–	–	**2**
	Zonal and station identification systems; Electrical bonding; Lightning strike protection provision.			
13.3	**Autoflight (ATA22)**	–	–	**3**
	Fundamentals of automatic flight control including working principles and current terminology; Command signal processing; Modes of operation: roll, pitch and yaw channels; Yaw dampers; Stability Augmentation System in helicopters; Automatic trim control; Autopilot navigation aids interface; Autothrottle systems; Automatic Landing Systems: principles and categories, modes of operation, approach, glideslope, land, go-around, system monitors and failure conditions.			
13.4	**Communication / Navigation (ATA23/34)**	–	–	**3**
	Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter; Working principles of following systems: – Very High Frequency (VHF)communication; – High Frequency (HF)communication; – Audio; – Emergency Locator Transmitters; – Cockpit Voice Recorder; – Very High Frequency omnidirectional range (VOR); – Automatic Direction Finding (ADF); – Instrument Landing System (ILS); – Microwave Landing System (MLS);			

Module 13.4 (continued)

		Level A	B1	B2
	– Flight Director systems; – Distance Measuring Equipment (DME); – Very Low Frequency and hyperbolic navigation (VLF/Omega); – Doppler navigation; – Area navigation, RNAV systems; – Flight Management Systems; – Global Positioning System (GPS), Global Navigation Satellite Systems (GNSS) ; – Inertial Navigation System; – Air Traffic Control transponder, secondary surveillance radar; – Traffic Alert and Collision Avoidance System (TCAS); – Weather avoidance radar; – Radio altimeter; – ARINC communication and reporting;			
13.5	**Electrical Power (ATA 24)** Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection; External/Ground power.	–	–	3
13.6	**Equipment and Furnishings (ATA 25)** Electronic emergency equipment requirements; Cabin entertainment equipment.	–	–	3
13.7	**Flight Controls (ATA 27)**			
	a) Primary controls: aileron, elevator, rudder, spoiler; Trim control; Active load control; High lift devices; Lift dump, speed brakes; System operation: manual, hydraulic, pneumatic; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks; Stall protection systems.	–	–	1
	b) System operation: electrical, fly by wire.	–	–	2
13.8	**Instrument Systems (ATA 31)** Classification; Atmosphere; Terminology; Pressure measuring devices and systems; Pitot static systems; Altimeters; Vertical speed indicators; Airspeed indicators; Machmeters;	–	–	2

Module 13.8 (continued)

		Level A	B1	B2
	Altitude reporting / alerting systems; Air data computers; Instrument pneumatic systems; Direct reading pressure and temperature gauges; Temperature indicating systems; Fuel quantity indicating systems; Gyroscopic principles; Artificial horizons; Slip indicators; Directional gyros; Ground Proximity Warning Systems; Compass systems; Flight Data Recording systems; Electronic Flight Instrument Systems; Instrument warning systems including master warning systems and centralised warning panels; Stall warning systems and angle of attack indicating systems; Vibration measurement and indication.			
13.9	**Lights (ATA 33)** External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	–	–	**3**
13.10	**On board Maintenance Systems (ATA 45)** Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	–	–	**2**

MODULE 14. PROPULSION

		Level A	B1	B2
14.1	**Turbine Engines**			
	a) Constructional arrangement and operation of turbojet, turbofan, turboshaft and turbopropeller engines.	–	–	**1**
	b) Electronic Engine control and fuel metering systems (FADEC);	–	–	**2**
14.2	**Engine Indicating Systems** Exhaust gas temperature / Interstage turbine temperature systems; Engine speed; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure, temperature and flow; Manifold pressure; Engine torque; Propeller speed.	–	–	**2**

MODULE 15. GAS TURBINE ENGINE

		Level A	B1	B2
15.1	**Fundamentals** Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; The relationship between force, work, power, energy, velocity, acceleration; Constructional arrangement and operation of turbojet, turbofan, turboshaft, turboprop.	**1**	**2**	**–**
15.2	**Engine Performance** Gross thrust, net thrust, choked nozzle thrust, thrust distribution, resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption; Engine efficiencies; By-pass ratio and engine pressure ratio; Pressure, temperature and velocity of the gas flow; Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations.	**–**	**2**	**–**
15.3	**Inlet** Compressor inlet ducts; Effects of various inlet configurations; Ice protection.	**2**	**2**	**–**
15.4	**Compressors** Axial and centrifugal types; Constructional features and operating principles and applications; Fan balancing; Operation; Causes and effects of compressor stall and surge; Methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades; Compressor ratio.	**1**	**2**	**–**
15.5	**Combustion Section** Constructional features and principles of operation.	**1**	**2**	**–**
15.6	**Turbine Section** Operation and characteristics of different turbine blade types; Blade to disk attachment; Nozzle guide vanes; Causes and effects of turbine blade stress and creep.	**2**	**2**	**–**
15.7	**Exhaust** Constructional features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers.	**1**	**2**	**–**
15.8	**Bearings and Seals** Constructional features and principles of operation.	**–**	**2**	**–**

Module 15 (continued)

		Level A	B1	B2
15.9	**Lubricants and Fuels** Properties and specifications; Fuel additives; Safety precautions.	**1**	**2**	**–**
15.10	**Lubrication Systems** System operation/lay-out and components.	**1**	**2**	**–**
15.11	**Fuel Systems** Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components.	**1**	**2**	**–**
15.12	**Air Systems** Operation of engine air distribution and anti - ice control systems, including internal cooling, sealing and external air services.	**1**	**2**	**–**
15.13	**Starting and Ignition Systems** Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements.	**1**	**2**	**–**
15.14	**Engine Indication Systems** Exhaust Gas Temperature/Interstage Turbine Temperature; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure and flow; Engine speed; Vibration measurement and indication; Torque; Power.	**1**	**2**	**–**
15.15	**Power Augmentation Systems** Operation and applications; Water injection, water methanol; Afterburner systems.	**–**	**1**	**–**
15.16	**Turbo-prop Engines** Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Overspeed safety devices.	**1**	**2**	**–**
15.17	**Turbo-shaft engines** Arrangements, drive systems, reduction gearing, couplings, control systems.	**1**	**2**	**–**
15.18	**Auxiliary Power Units (APUs)** Purpose, operation, protective systems.	**1**	**2**	**–**

Module 15 (continued)

		Level A	B1	B2
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 A	Level B1	Level B2
16.1	**Fundamentals** Mechanical, thermal and volumetric efficiencies; Operating cycles; 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**	**–**
16.5	**Starting and Ignition Systems** Starting 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 and engine cooling systems.	**1**	**2**	**–**
16.7	**Supercharging/Turbocharging** Principles and purpose of supercharging and its effects on engine parameters; Construction and operation of supercharging/turbocharging systems; System terminology; Control systems; System protection.	**1**	**2**	**–**
16.8	**Lubricants and Fuels** Properties and specifications; Fuel additives; Safety precautions.	**1**	**2**	**–**

Module 16 (continued)

		Level A	B1	B2
16.9	**Lubrication Systems** System operation/lay-out and components.	**1**	**2**	**–**
16.10	**Engine Indication Systems** Engine speed; Cylinder head 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 A	B1	B2
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 composite and metal propellers; Blade station, blade face, blade shank, blade back and hub assembly; Fixed pitch, controllable pitch, constant speeding propeller; Propeller/spinner installation.	1	2	–
17.3	**Propeller Pitch Control** Speed control and pitch change methods; 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	–

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