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## BCAR 66 Aircraft Maintenance Engineer Licence Knowledge and Experience Requirements

### References.

- International Civil Aviation Organisation Annex 1 chapter 4.2
- Botswana Civil Aviation (Air Operators Certification and Administration) Regulations 2013.
- Botswana Civil Aviation (Personnel Licensing)(Other Personnel) Regulations 2013.
- Botswana Civil Aviation (Personnel Licensing)(General) Regulations 2013.
- Botswana Civil Aviation (Airworthiness) Regulations 2012.
- Botswana Civil Aviation (Approved Maintenance Organisations) Regulations 2012.

### Overview

The purpose of this document is to clarify the regulation where there appears to be a conflict of requirements and rectify some anomalies distributed in the various regulations.

The document also introduces a definitive syllabus of the knowledge requirements for Aircraft Maintenance Engineer Licence (AMEL) issue and to detail the licence structure.

Guidance Material is produced in parallel with this document to amplify requirements and provide guidance in common language. The Guidance material will be amended by the authority on a regular basis to permit expansion of guidance where required.

### Definitions

The following definitions shall apply for the purposes of Engineer Licence Issue in accordance with Botswana Civil Aviation (Personnel Licensing)(Other Personnel) Regulation 2013.

Authority	Civil Aviation Authority Botswana. (CAAB)
Complex Aircraft	A multiple motor powered aeroplane with maximum certified operating altitude exceeding FL290, aircraft equipped with fly-by-wire and other aircraft requiring an aircraft type rating as defined by the Authority.
Aircraft Group 1	A multiple motor powered rotorcraft or any powered-lift aircraft.
Aircraft Group 2	Any complex aircraft as listed in the Civil Aviation Authority Botswana Aircraft Type List. (Appendix IV to this document)
Aircraft Group 3	A single turbo-propeller engine aeroplane, single turbine engine helicopter and single piston engine helicopter.
Type Rating	Piston engine aeroplanes other than those in Group 1. A rating designating a specific aircraft or group of aircraft.

## **Section 1**

### **1.1 Maintenance Engineer Licence Categories.**

- i. Basic Mechanical (A) - Non type rated basic licence limited to Airframe, Engine and Electrics.
- ii. Piston Powered Aeroplanes (B1) – A licence, which when type rated, permits certification of full aircraft in the disciplines of Airframe, Piston Engine, Electrics and Avionic extension.
- iii. Turbine Powered Aeroplanes (B2) – A licence, which when type rated, permits certification of full aircraft in the disciplines of Airframe, Turbine Engine, Electrics and Avionic extension.
- iv. Rotorcraft Piston Powered (B3P) – A licence, which when type rated, permits certification of full aircraft in the disciplines of Airframe, Engine, Electrics and Avionic extension on Piston powered rotorcraft.
- v. Rotorcraft Turbine Powered (B3T) – A licence, which when type rated, permits certification of full aircraft in the disciplines of Airframe, Engine, Electrics and Avionic extension on Turbine powered rotorcraft.
- vi. Avionics (B4) – A licence, which when type rated, permits certification of full aircraft in the disciplines of Electrics, Instruments, Auto-Flight, Radio Communication and Navigation and Radar systems on all piston and turbine powered aircraft.
- vii. Piston powered non-complex Aeroplanes, Airships and Balloons (B5) A non-type rated licence which permits certification of full aircraft in the disciplines of Airframe, Piston engines, Electrical Systems and Avionic Extension on piston powered non complex Aeroplanes, Airships and Balloons.
- viii. Avionics Light Aircraft (B6) A non-type rated licence which permits certification of a full aircraft in the disciplines of Electrical Systems and Avionic system appropriate to piston powered non complex Aircraft, Airships and Balloons.

### **1.2 Licence Privileges**

Botswana Civil Aviation (Personnel Licensing)(General) Regulations 2013 paragraph 89

#### **1.2(a) Basic Mechanical (A)**

An Aircraft Maintenance Engineer Licence (AMEL) which permits the holder to issue certificates of release to service following minor scheduled line maintenance and simple defect rectification within the limits of the tasks specifically endorsed on the certification authorisation issued by an Approved Maintenance Organisation. The certification privileges shall be restricted to work that the licence holder has personally performed in the approved maintenance organisation that issued the certification authorisation.

#### **1.2(b) Piston Powered Aeroplanes (B1)**

An Aircraft Maintenance Engineer Licence (AMEL) which when endorsed with a type rating, permits the holder to issue certificates of release to service following;

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

This licence also incorporates the privileges of a Basic Mechanical (A) licence and the Aeroplane

component of the Piston Powered non-complex Aeroplanes, Airships and Balloons (B5) licence.

#### **1.2(c) Turbine powered Aeroplanes (B2)**

An Aircraft Maintenance Engineer Licence (AMEL) which when endorsed with a type rating, permits the holder to issue certificates of release to service following;

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

This licence also incorporates the privileges of a Basic Mechanical (A) licence.

#### **1.2(d) Piston Rotorcraft (B3P)**

An Aircraft Maintenance Engineer Licence (AMEL) which when endorsed with a type rating, permits the holder to issue certificates of release to service following;

- Maintenance performed on aircraft structure, piston powerplant and mechanical and electrical systems.
- Work on avionic systems requiring only simple tests to prove their serviceability and not requiring fault diagnosis.

This licence also incorporates the privileges of a Basic Mechanical (A) licence.

#### **1.2(e) Turbine Rotorcraft (B3T)**

An Aircraft Maintenance Engineer Licence (AMEL) which when endorsed with a type rating, permits the holder to issue certificates of release to service following;

- Maintenance performed on aircraft structure, turbine powerplant and mechanical and electrical systems.
- Work on avionic systems requiring only simple tests to prove their serviceability and not requiring fault diagnosis.

This licence also incorporates the privileges of a Basic Mechanical (A) licence.

#### **1.2(f) Avionics (B4)**

An Aircraft Maintenance Engineer Licence (AMEL) which when endorsed with a type rating, permits the holder to issue certificates of release to service following;

- Maintenance performed on avionic and electrical systems.
- Electrical and avionic tasks within the powerplant and mechanical systems requiring only simple tests to prove their serviceability and not requiring fault diagnosis.

The Avionic (B4) licence incorporates the privileges of the Avionic and Electrical elements of the Avionic Light (B6) licence but does not incorporate the privileges of a Basic Mechanical (A) licence.

#### **1.2(g) Piston powered non-complex Aeroplanes, Airships and Balloons (B5)**

An Aircraft Maintenance Engineer Licence (AMEL) applicable to single piston engine, non pressurised aeroplanes of 2000kg MTOM and below which permits the holder to issue certificates of release to service following;

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

The privileges of the Basic Mechanical (A) licence are not incorporated in this licence.

### **1.2(h) Avionics Light Aircraft (B6)**

An Aircraft Maintenance Engineer Licence (AMEL) applicable to single piston engine, non pressurised aeroplanes of 2000kg MTOM and below plus Balloons and Airships which permits the holder to issue certificates of release to service following;

- Maintenance performed on avionic and electrical systems.
- Electrical and avionic tasks within the powerplant and mechanical systems requiring only simple tests to prove their serviceability and not requiring fault diagnosis.

## **Section 2**

### **2.0 QUALIFICATION FOR LICENCE ISSUE**

The qualifications for licence issue are detailed in Botswana Civil Aviation (Personnel Licensing)(General) Regulations 2013 paragraphs 86 and 87 and Botswana Civil Aviation (Personnel Licensing)(Other Personnel) Regulations 2013 paragraphs 8,12 and 13.

The qualifications comprise of two elements which may vary due to individual circumstances. The two elements are Knowledge requirements and Experience requirements.

#### **2.0 (a) Knowledge Requirements**

The knowledge requirements given in the regulations and generic in nature which are open to subjectivity and do not provide a reference for auditing purposes. A detailed syllabus (Appendix I to this document) has therefore been compiled to establish a training standard for use in Approved Training Organisations and provide guidance for those licence applicants who intend to study as self starters. This syllabus also provides the training standard for objective auditing purposes of Basic Training Organisations.

This syllabus has been modularised to permit examinations to be taken in subject areas pertinent to the students study material and to allow an element of flexibility for Training Organisations to develop training courses suitable to their requirements whilst remaining in compliance with the regulation.

#### **2.0(b) Experience Requirements**

Basic experience requirements are in accordance with the requirements of ICAO Annex I however, in order to clarify the requirements of Civil Aviation (Personnel Licensing)(Other Personnel) Regulations 2013 paragraph 13 (2) (b), and align with the new licensing structure the following experience and /or training requirements shall be adopted.

#### **2.1(a) Basic Mechanical (A)**

- a) Three years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR
- b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR
- c) One year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

#### **2.1(b) Piston Powered Aeroplanes (B1)**

- a) Four years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR
- b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR
- c) Two year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

**2.1(c) Turbine powered Aeroplanes (B2)**

- a) Four years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR
- b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR
- c) Two year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

**2.1(d) Piston Rotorcraft (B3P)**

- a) Four years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR
- b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR
- c) Two year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

**2.1(e) Turbine Rotorcraft (B3T)**

- a) Four years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR
- b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR
- c) Two year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

**2.1(f) Avionics (B4)**

- a) Four years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR
- b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR
- c) Two year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

**2.1(g) Piston powered non-complex Aeroplanes, Airships and Balloons (B5)**

- a) Three years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR
- b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR
- c) One year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

**2.1(h) Avionics Light Aircraft (B6)**

- a) Three years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR
- b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR
- c) One year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

## **Section 3**

### **3.0 Aircraft Type Ratings and Type Training**

For the larger or more complex aircraft, Basic Training and subsequent licence issue are not considered sufficient to permit the licence holder to certify the aircraft and issue a Maintenance Release Certificate. For these aircraft, type training is a pre-requisite prior to endorsement of the type on the licence and eligibility for issue of an authorisation in an Approved Maintenance Organisation.

The Aircraft Type list is given in Appendix IV to this document.

#### **3.0(a) Aircraft Group Ratings**

In order to permit a licence to be endorsed with a "Group" rating, the list is divided into three groups as given in the list of definitions to this document.

- Group 1           All aircraft in this group require type training and examination before endorsement on the licence as an individual type rating.
- Group 2           Aircraft in this group require type examination for the first two individual types. Once two types of the same subgroup are endorsed on the licence an application may be made to endorse the licence with the subgroup "group rating" which permits certification of any aircraft falling within the subgroup definition, without further training or examination.
- Group 3           Aircraft in this group require demonstration of practical experience only for individual types. Once three types are endorsed on the licence an application may be made to endorse the licence with the group rating which permits certification of any aircraft falling within the group definition.

## **Section 4**

### **4.0 Licence Conversion and Limitations**

All Aircraft Engineer Licences should meet with the above requirements by 1<sup>st</sup> April 2016.

Current licences will be converted on renewal or request as from May 2014, in accordance with the requirements detailed in Appendix VII to this document.

#### **4.1 Limitations**

Limitations will be applied where a shortfall exists between current knowledge and requirements for the new licence however there will be no change to any current authorisation or privilege where such authorisations and privileges were legally issued.

## **Knowledge and Experience Requirements**

### **Guidance Material**

#### **GM1. Licence Privileges**

##### **1.2(a) Basic Mechanical (A)**

An Aircraft Maintenance Engineer Licence (AMEL) which permits the holder to issue certificates of release to service following minor scheduled line maintenance and simple defect rectification within the limits of the tasks specifically endorsed on the certification authorisation issued by an Approved Maintenance Organisation. The certification privileges shall be restricted to work that the licence holder has personally performed in the approved maintenance organisation that issued the certification authorisation.

The licence itself DOES NOT confer certification privileges and may ONLY be used within an Approved Maintenance Organisation in conjunction with an authorisation issued by that organisation.

Should the licence holder leave the employment of the Approved Maintenance Organisation, the authorisation will lapse however the licence will remain valid.

Any authorisation issued by an Approved Maintenance Organisation requires Level 3 training and competency assessment appropriate to the task to be undertaken prior to endorsement on the authorisation document.

##### **1.2(b) Piston Powered Aeroplanes (B1)**

An Aircraft Maintenance Engineer Licence (AMEL) which when endorsed with a piston powered aeroplane type rating, permits the holder to issue certificates of release to service following;

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

This licence also incorporates the privileges of a Basic Mechanical (A) licence and the Aeroplane component of the Piston Powered non-complex Aeroplanes, Airships and Balloons (B5) licence. This licence when endorsed with the appropriate type rating may be used outside of an Approved Maintenance organisation to certify an aircraft in the PRIVATE Category.

Certification of aircraft in the Commercial Air Transport Category shall only be conducted in an Approved Maintenance Organisation and in accordance with the authorisation issued by that organisation. Such an authorisation will lapse should the licence holder leave the employment of the Approved Maintenance Organisation however the licence shall remain valid.

##### **1.2(c) Turbine powered Aeroplanes (B2)**

An Aircraft Maintenance Engineer Licence (AMEL) which when endorsed with a turbine powered aeroplane type rating, permits the holder to issue certificates of release to service following;

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

This licence also incorporates the privileges of a Basic Mechanical (A) licence.

This licence when endorsed with the appropriate type rating may be used outside of an Approved Maintenance organisation to certify an aircraft in the PRIVATE Category.

Certification of aircraft in the Commercial Air Transport Category shall only be conducted in an Approved Maintenance Organisation and in accordance with the authorisation issued by that organisation. Such an authorisation will lapse should the licence holder leave the employment of the Approved Maintenance Organisation however the licence shall remain valid.

### **1.2(d) Piston Rotorcraft (B3P)**

An Aircraft Maintenance Engineer Licence (AMEL) which when endorsed with a piston rotorcraft type rating, permits the holder to issue certificates of release to service following;

- Maintenance performed on aircraft structure, piston powerplant and mechanical and electrical systems.
- Work on avionic systems requiring only simple tests to prove their serviceability and not requiring fault diagnosis.

This licence also incorporates the privileges of a Basic Mechanical (A) licence.

This licence when endorsed with the appropriate type rating may be used outside of an Approved Maintenance organisation to certify an aircraft in the PRIVATE Category.

Certification of aircraft in the Commercial Air Transport Category shall only be conducted in an Approved Maintenance Organisation and in accordance with the authorisation issued by that organisation. Such an authorisation will lapse should the licence holder leave the employment of the Approved Maintenance Organisation however the licence shall remain valid.

### **1.2(e) Turbine Rotorcraft (B3T)**

An Aircraft Maintenance Engineer Licence (AMEL) which when endorsed with a turbine rotorcraft type rating, permits the holder to issue certificates of release to service following;

- Maintenance performed on aircraft structure, turbine powerplant and mechanical and electrical systems.
- Work on avionic systems requiring only simple tests to prove their serviceability and not requiring fault diagnosis.

This licence also incorporates the privileges of a Basic Mechanical (A) licence.

This licence when endorsed with the appropriate type rating may be used outside of an Approved Maintenance organisation to certify an aircraft in the PRIVATE Category.

Certification of aircraft in the Commercial Air Transport Category shall only be conducted in an Approved Maintenance Organisation and in accordance with the authorisation issued by that organisation. Such an authorisation will lapse should the licence holder leave the employment of the Approved Maintenance Organisation however the licence shall remain valid.

### **1.2(f) Avionics (B4)**

An Aircraft Maintenance Engineer Licence (AMEL) which when endorsed with an Aircraft Avionic type rating, permits the holder to issue certificates of release to service following;

- Maintenance performed on avionic and electrical systems.
- Electrical and avionic tasks within the powerplant and mechanical systems requiring only simple tests to prove their serviceability and not requiring fault diagnosis.

The Avionic (B4) licence incorporates the privileges of the Avionic and Electrical elements of the Avionic Light (B6) including for Balloons and Airships licence but does not incorporate the privileges of a Basic Mechanical (A) licence.

This licence when endorsed with the appropriate type rating may be used outside of an Approved Maintenance organisation to certify an aircraft in the PRIVATE Category.

Certification of aircraft in the Commercial Air Transport Category shall only be conducted in an Approved Maintenance Organisation and in accordance with the authorisation issued by that organisation. Such an authorisation will lapse should the licence holder leave the employment of the Approved Maintenance Organisation however the licence shall remain valid

### **1.2(g) Piston powered non-complex Aeroplanes, Airships and Balloons (B5)**

An Aircraft Maintenance Engineer Licence (AMEL) applicable to single piston engine, non pressurised aeroplanes of 2000kg MTOM and below which permits the holder to issue certificates of release to service following;

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

The privileges of the Basic Mechanical (A) licence are not incorporated in this licence.



This licence does not require a type rating but applies to all aeroplanes, balloons and airships meeting the definition of the licence and may be used outside of an Approved Maintenance organisation to certify an aircraft in the PRIVATE Category.

Certification of aircraft in the Commercial Air Transport Category shall only be conducted in an Approved Maintenance Organisation and in accordance with the authorisation issued by that organisation. Such an authorisation will lapse should the licence holder leave the employment of the Approved Maintenance Organisation however the licence shall remain valid.

The Basic Mechanical (A) licence is inappropriate to this licence as the (B5) operates in a similar manner to the (A) licence.

This licence is intentionally at a lower level to the full Piston Powered Aeroplanes (B1) licence to enable an easier and quicker path to licensing standard appropriate to the complexity of the aeroplanes involved.

### **1.2(h) Avionics Light Aircraft (B6)**

An Aircraft Maintenance Engineer Licence (AMEL) applicable to single piston engine, non pressurised aeroplanes of 2000kg MTOM and below plus Balloons and Airships which permits the holder to issue certificates of release to service following;

- Maintenance performed on avionic and electrical systems.
- Electrical and avionic tasks within the powerplant and mechanical systems requiring only simple tests to prove their serviceability and not requiring fault diagnosis.

The privileges of the Basic Mechanical (A) licence are not incorporated in this licence.

This licence does not require a type rating but applies to all aeroplanes, balloons and airships meeting the definition of the licence and may be used outside of an Approved Maintenance organisation to certify an aircraft in the PRIVATE Category.

Certification of aircraft in the Commercial Air Transport Category shall only be conducted in an Approved Maintenance Organisation and in accordance with the authorisation issued by that organisation. Such an authorisation will lapse should the licence holder leave the employment of the Approved Maintenance Organisation however the licence shall remain valid.

This licence is intentionally at a lower level to the full Avionic (B4) licence to enable an easier and quicker path to licensing standard appropriate to the complexity of the aeroplanes involved.

## **GM 2. Qualification for Licence Issue**

### **2.0 (a) Knowledge Requirements**

The knowledge requirements are modularised into "Subject Areas" which are further broken down into "topics" which are ascribed with a level pertinent to the individual licence. Certain subject areas are profiled specifically for "simpler aircraft" which permits a reduced training/examination requirement appropriate to these types of aircraft.

These Modules are 7A, 9A, 11A, 11B, 13A and 17A.

A matrix, (Appendix II to the document), details the modules pertinent to each licence which constitute the knowledge qualification for licence issue.

The modular examinations may be taken in any order but all examinations must be completed within a two year period. Any examination taken after the two year cut off date will necessitate the re-sitting of the initial examinations in order that all examination sittings fall within the two year period.

A period of 90 days must elapse before re-sitting a failed modular examination.

This 90 day period may be reduced to 30 days in an Approved Training Organisation (ATO) where a procedure is contained in the ATO Exposition defining how a period of re-training is implemented and the re-examination is conducted.

A maximum of three attempts at any individual module are permissible prior to regarding or dismissal from a training course.

No maximum numbers of attempts are prescribed for the self starter as a combination of the two year rule and the 90 day waiting period will apply a certain level of incentive to ensure an adequate level of study.

Basic examinations are Multi Choice Questions (MCQ) comprising a stem question, one correct

answer and two incorrect alternatives. The question level should replicate the level of knowledge expected for the subject area pertinent to the specific licence. There are additional Essay Questions required for Modules 7, 7A, 9, 9A and 10. These essay questions are specifically designed to test the ability of the candidate to write a clear explanation of a subject as would be required in a written hand-over at a shift change. They are NOT intended to examine further knowledge of the subject area however the answer should be reasonably correct. The marking of essay questions should be split 40% for knowledge content and 60% for language and grammar. The pass mark for both the MCQ and essay examinations is 70%. The question content and timings for each modular examination is given in Appendix IV to the document.

### **2.0(b) Record of Practical Experience**

The documented practical experience should be in the form of a log book or other such format acceptable to the authority and should cover all areas of the syllabus required appropriate to the licence requested in the application Form A.

There should be at least three tasks per subject area but it is not necessary to repeat individual tasks.

Each entry should include the description of the task, date of completion, aircraft type, the ATA chapter code, the maintenance reference where appropriate, and the signature or certification stamp of the authorised staff member who supervised the task.

The logbook or work record should be clearly identified with the owners' full name.

The logbook or work record should contain details of any training courses completed including dates of course, type of course, location or organisation delivering the course and the result/s obtained in all examinations or tests.

The logbook or work record should contain details of all employers including dates of employment and nature of post held.

The logbook or work record should include a statement, signed by the owner, that all work/task records are an accurate reflection of work and tasks completed by the owner.

The logbook or work record should include a separate statement, signed by the Quality Manager of the organisation employing the owner of the record, that all work/task records are an accurate reflection of work and tasks completed by the owner. Where the owner has had several employers, each organisations' Quality Manager should certify that element of experience gained whilst in the employ of his/her organisation.

### **2.1(a) Basic Mechanical (A)**

a) Three years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR

b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR

c) One year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

This exceeds the experience requirements for regulation under ICAO for restricted licences. With reference to item b) above an example of a "...skilled worker in a technical trade..." may include a person who has been employed in the motor industry and has completed a recognised course of training. Any such application for an accreditation of a qualification must be assessed by the Authority.

An Approved Training course for the Basic Mechanical licence should meet the requirements of the Basic Training syllabus, (Appendix I to the Knowledge and Experience requirements for issue of an Aircraft Maintenance Engineer Licence.) The course should be of 800 hours duration with a theoretical training ratio of 30 to 35% and practical training ratio of 65 to 70%.

### **2.1(b) Piston Powered Aeroplanes (B1)**

a) Four years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR

b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR

c) Two year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

With reference to item b) above an example of a "...skilled worker in a technical trade..." may include a person who has been employed in the motor industry and has completed a recognised course of training. Any such application for an accreditation of a qualification must be assessed by the Authority.

An Approved Training course for the Piston Powered Aeroplanes (B1) licence should meet the requirements of the Basic Training syllabus, (Appendix I to the Knowledge and Experience requirements for issue of an Aircraft Maintenance Engineer Licence.) The course should be of 2000 hours duration with a theoretical training ratio of 50 to 60% and practical training ratio of 40 to 50%.

Thirty percent of the practical element should be undertaken in an active Approved Maintenance Organisation.

### **2.1(c) Turbine powered Aeroplanes (B2)**

a) Four years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR

b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR

c) Two year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

With reference to item b) above an example of a "...skilled worker in a technical trade..." may include a person who has been employed in the motor industry and has completed a recognised course of training. Any such application for an accreditation of a qualification must be assessed by the Authority.

An Approved Training course for the Turbine Powered Aeroplanes (B1) licence should meet the requirements of the Basic Training syllabus, (Appendix I to the Knowledge and Experience requirements for issue of an Aircraft Maintenance Engineer Licence.) The course should be of 2400 hours duration with a theoretical training ratio of 50 to 60% and practical training ratio of 40 to 50%.

Thirty percent of the practical element should be undertaken in an active Approved Maintenance Organisation.

### **2.1(d) Piston Rotorcraft (B3P)**

a) Four years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR

b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR

c) Two year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

With reference to item b) above an example of a "...skilled worker in a technical trade..." may include a person who has been employed in the motor industry and has completed a recognised course of training. Any such application for an accreditation of a qualification must be assessed by the Authority.

An Approved Training course for the Piston Rotorcraft (B1) licence should meet the requirements

of the Basic Training syllabus, (Appendix I to the Knowledge and Experience requirements for issue of an Aircraft Maintenance Engineer Licence.) The course should be of 2400 hours duration with a theoretical training ratio of 50 to 60% and practical training ratio of 40 to 50%. Thirty percent of the practical element should be undertaken in an active Approved Maintenance Organisation.

**2.1(e) Turbine Rotorcraft (B3T)**

- a) Four years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR
- b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR
- c) Two year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

With reference to item b) above an example of a "...skilled worker in a technical trade..." may include a person who has been employed in the motor industry and has completed a recognised course of training. Any such application for an accreditation of a qualification must be assessed by the Authority.

An Approved Training course for the Turbine Rotorcraft (B1) licence should meet the requirements of the Basic Training syllabus, (Appendix I to the Knowledge and Experience requirements for issue of an Aircraft Maintenance Engineer Licence.) The course should be of 2400 hours duration with a theoretical training ratio of 50 to 60% and practical training ratio of 40 to 50%.

Thirty percent of the practical element should be undertaken in an active Approved Maintenance Organisation.

**2.1(f) Avionics (B4)**

- a) Four years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR
- b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR
- c) Two year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

With reference to item b) above an example of a "...skilled worker in a technical trade..." may include a person who has been employed in the motor industry and has completed a recognised course of training. Any such application for an accreditation of a qualification must be assessed by the Authority.

An Approved Training course for the Avionics (B4) licence should meet the requirements of the Basic Training syllabus, (Appendix I to the Knowledge and Experience requirements for issue of an Aircraft Maintenance Engineer Licence.) The course should be of 2400 hours duration with a theoretical training ratio of 50 to 60% and practical training ratio of 40 to 50%.

Thirty percent of the practical element should be undertaken in an active Approved Maintenance Organisation.

**2.1(g) Piston powered non-complex Aeroplanes, Airships and Balloons (B5)**

- a) Three years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR
- b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR
- c) One year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

With reference to item b) above an example of a "...skilled worker in a technical trade..." may include a person who has been employed in the motor industry and has completed a recognised course of training. Any such application for an accreditation of a qualification must be assessed by the Authority.

An Approved Training course for the Piston Aeroplanes, Airships and Balloons (B5) licence should meet the requirements of the Basic Training syllabus, (Appendix I to the Knowledge and Experience requirements for issue of an Aircraft Maintenance Engineer Licence.) The course should be of 1000 hours duration with a theoretical training ratio of 50 to 60% and practical training ratio of 40 to 50%.

Thirty percent of the practical element should be undertaken in an active Approved Maintenance Organisation.

### **2.1(h) Avionics Light Aircraft (B6)**

a) Three years of documented practical experience on operating aircraft if the applicant has no previous technical training; OR

b) Two years of documented practical experience on operating aircraft if the applicant completed previous technical training as a skilled worker in a technical trade, acceptable to the Authority; OR

c) One year of documented practical experience on operating aircraft and completion of an Approved Basic Training course.

With reference to item b) above an example of a "...skilled worker in a technical trade..." may include a person who has been employed in the motor industry and has completed a recognised course of training. Any such application for an accreditation of a qualification must be assessed by the Authority.

An Approved Training course for the Avionic Light Aircraft (B6) licence should meet the requirements of the Basic Training syllabus, (Appendix I to the Knowledge and Experience requirements for issue of an Aircraft Maintenance Engineer Licence.) The course should be of 1000 hours duration with a theoretical training ratio of 50 to 60% and practical training ratio of 40 to 50%.

Thirty percent of the practical element should be undertaken in an active Approved Maintenance Organisation.

## **GM 3 Aircraft Type Ratings and Type Training**

### **3.0 Type Training**

The requirements for type training are defined in Appendix V to the document.

The type training courses are designed to meet the requirements of the specific licence and detailed in the matrix in Appendix V. The courses are mainly knowledge based but a certain amount of actual aircraft visits are expected unless familiarisation can be achieved by an alternative means such use of simulators or computer simulation.

All type training courses shall be delivered by an Approved Engineer Training Organisation approved to deliver the appropriate type training course.

### **3.0(a) Aircraft Group Ratings**

In order to permit a licence to be endorsed with a "Group" rating, the list is divided into three groups as given in the list of definitions to this document.

Group 1           Applicable to B1, B2, B3, B4 licences.

All aircraft in this group require type training and examination before endorsement on the licence as an individual type rating.

Aircraft in this group are those meeting the definition of complex aircraft.

"A multiple motor powered aeroplane with maximum certified operating altitude exceeding FL290, aircraft equipped with fly-by-wire and other aircraft requiring an aircraft type rating as defined by the Authority.

A multiple motor powered rotorcraft or any powered-lift aircraft."

Aircraft meeting this definition are listed in Appendix IV to the advisory document.

Note that the Authority may include in this list any aircraft that they deem to require "type Training". It is therefore important that the type list is consulted prior to application for any type rating.

Group 2

Applicable to B2 and B3 licences only.

Aircraft in this group require type examination for the first two individual types. Once two types of the same subgroup are endorsed on the licence an application may be made to endorse the licence with the subgroup "group rating" which permits certification of any aircraft falling within the subgroup definition, without further training or examination.

Aircraft Group 2            A single turbo-propeller engine aeroplane, single turbine engine helicopter and single piston engine helicopter.

This group of aircraft is divided into three subgroups;

- 2(a) Single turbo-propeller powered aeroplanes
- 2(b) Single turbo-powered rotorcraft
- 2(c) Single piston-powered rotorcraft

These subgroups will define the "Group Type Rating" once an applicant has gained the necessary two individual type ratings.

FOR EXAMPLE.

An applicant has gained a Eurocopter EC 350 and Robinson R66 type ratings. He may now be issued with a "Single turbo-powered rotorcraft" type rating which permits certification of ANY single turbo powered rotorcraft.

Within an Approved Maintenance Organisation the requirements for issue of an authorisation must be met, therefore further specific training may be required within the Maintenance organisation prior to endorsement of the authorisation document.

With respect to the Airframe / Engine combination, it would be ideal to have two different airframe manufacturers and two different engine manufacturers.

However in certain circumstances such as light helicopters it must be recognised that there is limited range of engines available and a certain amount of flexibility should be employed when considering licence issue.

Group 2

Requirements for B4 licence.

For aircraft included in this group, the B4 licence holder does NOT require type training but shall submit documentary evidence of experience and undergo an examination as required by the authority.

The type rating in this instance should be defined by the equipment type rather than aircraft type and the rating shall apply across all aircraft in the group (Group 2).

For Example the ratings should be;

- a) Honeywell Autopilot systems.
- b) Rockwell Collins Autopilot systems
- c) Primus Radar systems

A B4 licence may be endorsed with a "Group Rating" (Group 2 Aircraft Autopilots) or (Group 2 Aircraft Radio/Radar) post completion of two individual ratings from different manufacturers' equipment. This group rating would include Group 3 aircraft.

**Group 3** Aircraft in this group require demonstration of practical experience only for individual types. Once two types are endorsed on the licence an application may be made to endorse the licence with the group rating which permits certification of any aircraft falling within the group definition.

**Aircraft Group 3** Piston engine aeroplanes other than those in Group 1.

This group applies to all piston powered aeroplanes other than those specified in Group 1 including aeroplanes appropriate for the B5 licence. However piston engine, non pressurised aeroplanes of 2000kg MTOM and below do not require further examination for issue of authorisation and therefore can be certified by B5 licence holders without endorsement on the licence. (A B1 licence shall be automatically endorsed with a B5)

For all other aeroplanes in this group type training is NOT required. An applicant for a type rating in this group shall submit documented evidence of experience and sit an examination as required by the authority.

Once two type ratings are endorsed on the licence, the applicant will become eligible for a "Group Rating".

There are two Group ratings available, *Manufacturers* and *Full*.  
**Manufacturers Group Rating.**

Two airframes types from the same manufacturer are required including examples with pressurisation and retractable undercarriage. (Not necessarily on the same aircraft type)

The application should also include at least two different engine manufacturers.

**Full Group Rating.**

Two airframes types from two different manufacturers are required including examples with pressurisation and retractable undercarriage. (Not necessarily on the same aircraft type)

The application should also include at least two different engine manufacturers.

## **Section 4 Licence Conversion and Limitations**

### **4.0 Licence Conversion**

All Aircraft Engineer Licences should meet with the above requirements by 1<sup>st</sup> April 2016. Current licences will be converted on renewal or request as from May 2014, in accordance with the requirements detailed in Appendix VII to this document.

### **4.1 Limitations**

Limitations will be applied where a shortfall exists between current knowledge and requirements for the new licence however there will be no change to any current authorisation or privilege where such authorisations and privileges were legally issued.

## Appendix I

### Syllabus of Basic Knowledge Requirements

1. For the purposes of this document the following definitions apply.
  - a) **Licence Categories.**
    - ix. Basic Mechanical (A) - Non type rated basic licence limited to Airframe, Engine and Electrics.
    - x. Piston powered Aeroplanes (B1) – A licence, which when type rated, permits certification of full aircraft in the disciplines of Airframe, Piston Engine, Electrics and Avionic extension.
    - xi. Turbine powered Aeroplanes (B2) – A licence, which when type rated, permits certification of full aircraft in the disciplines of Airframe, Turbine Engine, Electrics and Avionic extension.
    - xii. Piston Rotorcraft (B3P) – A licence, which when type rated, permits certification of full aircraft in the disciplines of Airframe, Engine, Electrics and Avionic extension on Piston powered rotorcraft.
    - xiii. Turbine Rotorcraft (B3T) – A licence, which when type rated, permits certification of full aircraft in the disciplines of Airframe, Engine, Electrics and Avionic extension on Turbine powered rotorcraft.
    - xiv. Avionics (B4) – A licence, which when type rated, permits certification of full aircraft in the disciplines of Electrics, Instruments, Auto-Flight, Radio Communication and Navigation and Radar systems on all piston and turbine powered aircraft.
    - xv. Piston powered non-complex Aeroplanes, Airships and Balloons (B5) A non-type rated licence which permits certification of full aircraft in the disciplines of Airframe, Piston engines, Electrical Systems and Avionic Extension on piston powered non complex Aeroplanes, Airships and Balloons.
    - xvi. Avionics Light Aircraft (B6) A non-type rated licence which permits certification of a full aircraft in the disciplines of Electrical Systems and Avionic system appropriate to piston powered non complex Aircraft, Airships and Balloons.

Note: A non-complex aircraft is defined as; A single Piston Engine non pressurised Aeroplane with manual controls (except for electrically operated flaps) and standard electro-mechanical flight instruments or a single engine helicopter with standard electro-mechanical flight instruments.

#### b) Knowledge Levels

Basic knowledge levels for categories A, B1, B2, B3, B4 and B5 are indicated by knowledge levels (1, 2 or 3) against each applicable subject.

The levels are defined as follows;

**Level 1** A familiarisation with 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 on 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 and measurements from various sources and apply corrective action where appropriate.

## 2. **Modularisation of subjects.**

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

SUBJECT	CAT A	CAT B1	CAT B2	CAT B3P	CAT B3T	CAT B4	CAT B5	CAT B6
1	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X
3	X	X	X	X	X	X	X	X
4		X	X	X	X	X	X	X
5	X	X	X	X	X	X	X	X
6	X	X	X	X	X	X	X	X
7	X	X	X	X	X	X		
7A							X	X
8	X	X	X	X	X	X	X	X
9	X	X	X	X	X	X		
9A							X	X
10	X	X	X	X	X	X	X	X
11	X		X					
11A		X						
11B							X	
12				X	X			
13						X		
13A								X
14						X		X
15	X		X		X			
16	X	X		X			X	
17	X	X	X					
17A							X	
18							X	X

Module 1 Mathematics							
	Level						
	A	B1	B2	B3	B4	B5	B6
<b>1.1 Arithmetic</b> Arithmetical terms and signs, methods of multiplication and division, fractions and decimals, factors and multiples, weights, measures and conversion factors, ratio and proportion, averages and percentages, areas and volumes, squares, cubes, square and cube roots.	1	2	2	2	2	2	2
<b>1.2 Algebra</b> a) Evaluating simple algebraic expressions, additions, subtraction, multiplication and division, use of brackets, simple algebraic	1	2	2	2	2	2	2

fractions. b) Linear equations and their solutions Indices and powers, negative and fractional indices; Binary and other applicable numbering systems; Simultaneous equations and second degree equations with one unknown; Logarithms.	-	1	1	1	1	1	1
<b>1.3 Geometry</b>							
a) Simple geometric constructions	-	1	1	1	1	1	1
b) Graphical representation; nature and uses of graphs, graphs of equations/functions;	2	2	2	2	2	2	2
c) Simple trigonometry; trigonometrical relationships, use of tables and rectangular and polar coordinates.	-	2	2	2	2	2	2
<b>Module 2. Physics</b>							
	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
<b>2.1 Matter</b>	1	1	1	1	1	1	1
a) Nature of matter: the chemical elements, structure of atoms, molecules;							
b) Chemical compounds;							
c) States: solid, liquid and gaseous;							
d) Changes between states.							
<b>Module 2 (continued)</b>							
	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
<b>2.2 Mechanics</b>							
<b>2.2.1 Statics</b>	1	2	2	2	1	1	1
a) Forces, moments and couples, representation as vectors;							
b) Centre of gravity;							
c) Elements of theory of stress, strain and elasticity: tension, compression, shear and torsion;							
d) Nature and properties of solid, fluid and gas;							
e) Pressure and buoyancy in liquids (barometers)							

<p><b>2.2.2 Kinetics</b></p> <p>a) Linear movement: uniform motion in a straight line, motion under constant acceleration (motion under gravity);</p> <p>b) Rotational movement: uniform circular motion (centrifugal/centripetal forces);</p> <p>c) Periodic motion: pendular movement;</p> <p>d) Simple theory of vibration, harmonics and resonance;</p> <p>e) Velocity ratio, mechanical advantage and efficiency.</p>	1	2	2	2	1	1	1
<p><b>2.2.3 Dynamics</b></p> <p>a) Mass;</p> <p>Force, inertia, work, power, energy (potential, kinetic, and total), heat, efficiency;</p> <p>b) Momentum,</p> <p>Conservation of momentum;</p> <p>Impulse;</p> <p>Gyroscopic principles;</p> <p>Friction: nature and effects, coefficient of friction (rolling resistance)</p>	1	2	2	2	2	1	1
<p>b) Momentum,</p> <p>Conservation of momentum;</p> <p>Impulse;</p> <p>Gyroscopic principles;</p> <p>Friction: nature and effects, coefficient of friction (rolling resistance)</p>	1	2	2	2	2	2	1
<p><b>2.2.4 Fluid dynamics</b></p> <p>a) Specific gravity and density;</p> <p>b) Viscosity, fluid resistance, effects of streamlining;</p> <p>Effects of compressibility on fluids;</p> <p>Static, dynamic and total pressure: Bernoulli's theorem, venture.</p>	2	2	2	2	2	2	2
<p>b) Viscosity, fluid resistance, effects of streamlining;</p> <p>Effects of compressibility on fluids;</p> <p>Static, dynamic and total pressure: Bernoulli's theorem, venture.</p>	1	2	2	2	1	1	1
<p><b>2.3 Thermodynamics</b></p> <p>a) Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin; Heat definition;</p> <p>b) Heat capacity, specific heat;</p> <p>Heat transfer: convection, radiation and</p>	2	2	2	2	2	2	2
<p>b) Heat capacity, specific heat;</p> <p>Heat transfer: convection, radiation and</p>	-	2	2	2	2	1	2
<b>Module 2 (Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
<p>conduction;</p> <p>Volumetric expansion;</p> <p>First and second laws of thermodynamics;</p> <p>Gases: ideal gas laws; specific heat at constant volume and constant pressure, work done by expanding gas;</p> <p>Isothermal, adiabatic expansion and compression, engine cycles, constant volume and constant pressure, refrigerators and heat pumps;</p>							

Latent heat of fusion and evaporation, thermal energy, heat of combustion.							
<b>2.4 Optics (Light)</b> a) Nature of light; speed of light; b) Laws of reflection and refraction: reflection at plane surfaces, reflection by spherical mirrors, refraction, lenses;	-	2	2	2	2	-	-
<b>2.5 Wave Motion and Sound</b> a) Wave motion: mechanical waves, sinusoidal wave motion, interference phenomena, standing waves; b) Sound: speed of sound, production of sound, intensity, pitch and quality, Doppler effect.	-	2	2	2	2	-	1
<b>Module 3 Electrical Fundamentals</b>							
	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
<b>3.1 Electron Theory</b> a) Structure and distribution of electrical charges within: atoms, molecules, ions, compounds; b) Molecular structure of conductors, semiconductors and insulators.	1	1	1	1	1	1	1
<b>3.2 Static Electricity and Conduction</b> a) Static electricity and distribution of electrostatic charges; b) Electrostatic laws of attraction and repulsion; c) Units of charge, Coulomb's Law; d) Conduction of electricity in solids, liquids, gases and a vacuum.	1	2	2	2	2	1	2
<b>3.3 Electrical Terminology</b> 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	2	2	1	1
<b>Module 3 (Continued)</b>							
	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
<b>3.4 Generation of Electricity</b> Production of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.	1	1	1	1	1	1	1
<b>3.5 DC sources of Electricity</b>	1	2	2	2	2	2	2

a) Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, other alkaline cells; b) Cells connected in series and parallel; c) Internal resistance and its effect on a battery; d) Construction, materials and operation of thermo-couples; e) Operation of photo-cells.							
<b>3.6 DC Circuits</b> a) Ohm's Law, Kirchoff's Voltage and Current Laws; b) Calculations using the above laws to find resistance, voltage and current; c) Significance of the internal resistance of a supply.	-	2	2	2	2	1	1
<b>3.7 Resistance/Resistor</b> a) Resistance and affecting factors; Specific resistance; Resistor colour code, values and tolerances, preferred values, wattage ratings; Resistors in parallel and series; Calculation of total resistance using series, parallel and series parallel combinations; Operation and use of potentiometers and rheostats; Operation of Wheatstone Bridge. b) Positive and negative temperature coefficient conductance; Fixed resistors, stability, tolerance and limitations, methods of construction; Variable resistors, thermistors, voltage dependent resistors; Construction of potentiometers and rheostats; Construction of Wheatstone Bridge.	-	2	2	2	2	1	2
<b>3.8 Power</b> a) Power, work and energy (kinetic and potential); b) Dissipation of power by a resistor; c) Power formula; Calculations involving power, work and energy.	-	2	2	2	2	1	1
<b>3.9 Capacitance/Capacitor</b> a) Operation and function of a capacitor; b) Factors affecting capacitance area of plates,	-	2	2	2	2	1	2
<b>Module 3 (Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>

<p>distance between plates, dielectric and dielectric constant, working voltage, voltage rating;</p> <p>c) Capacitor types, construction and function;</p> <p>d) Capacitor colour coding;</p> <p>e) Calculations of capacitance and voltage in series and parallel circuits;</p> <p>f) Exponential charge and discharge of a capacitor, time constants;</p> <p>g) Testing of capacitors.</p>							
<p><b>3.10 Magnetism</b></p> <p>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 principle of operation;  Hand clasp rule to determine magnetic field around a current carrying conductor.</p>	-	2	2	2	2	1	1
<p>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.</p>	-	2	2	2	2	1	1
<p><b>3.11 Inductance/Inductor</b></p> <p>a) Faraday's Law;</p> <p>b) Action of inducing a voltage in a conductor moving in a magnetic field;</p> <p>c) Induction principles;</p> <p>d) Effects of the following on the magnitude of an induced voltage: magnetic field strength, rate of change of flux, number of conductor turns;</p> <p>e) Mutual induction;</p> <p>f) The effect the rate of change of primary current and mutual inductance has on induced voltage;</p> <p>g) Factors affecting mutual inductance: number of turns in coil, physical size of coil, permeability of coil, position of coils with respect to each other;</p> <p>h) Lenz's Law and polarity determining rules;</p> <p>i) Back emf, self induction;</p> <p>j) Saturation point;</p> <p>k) Principle uses of inductors.</p>	-	2	2	2	2	1	2

Module 3 (Continued)	Level						
	A	B1	B2	B3	B4	B5	B6
<b>3.12 DC Motor/Generator Theory</b> a) Basic motor and generator theory; b) Construction and purpose of components in a DC generator; c) Operation of, and factors affecting output and direction of current flow in DC generators; d) ) Operation of, and factors affecting output power, torque, speed and direction of rotation of DC motors; e) Series wound, shunt wound and compound motors; f) Starter Generator construction.	-	2	2	2	2	1	1
<b>3.13 AC Theory</b> a) Sinusoidal waveform: phase, period, frequency, cycle; b) Instantaneous, average, root mean square, peak, peak to peak current values and calculations of these values in relation to voltage, current and power; c) Triangular/Square waves; d) Single/3 phase principles.	1	2	2	2	2	1	1
<b>3.14 Resistive (R), Capacitive (C) and Inductive (L) Circuits</b> a) Phase relationship of voltage and current in L, C and R circuits, in parallel, series and series parallel; b) Power dissipation in L, C and R circuits; c) Impedance, phase angle, power factor and current calculations; d) True power, apparent power and reactive power calculations.	-	2	2	2	2	1	2
<b>3.15 Transformers</b> a) Transformer construction principles and operation; b) Transformer losses and methods for covering them; c) Transformer action under load and no-load conditions; d) Power transfer, efficiency, polarity markings; e) Calculation of line and phase voltages and currents; f) Calculation of power in a three phase system; g) Primary and Secondary current, voltage, turns ratio, power, efficiency;	-	2	2	2	2	1	2



h) Auto transformers.							
<b>Module 3 (Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
<b>3.16 Filters</b> a) Operation, application and uses of the following filters: low pass, high pass, band pass and band stop.	-	1	1	1	1	-	1
<b>3.17 AC Generators</b> a) Rotation of loop in a magnetic field and waveform produced; b) Operation and construction of revolving armature and revolving field type AC generators; c) Single phase, two phase and three phase alternators; d) Three phase star and delta connections advantages and uses; Permanent Magnet Generators	-	2	2	2	2	1	1
<b>3.18 AC Motors</b> a) Construction, principles of operation and characteristics of: AC synchronous and induction motors both single and polyphase; b) Methods of speed control and direction of rotation; c) Methods of producing a rotating field: capacitor, inductor, shaded or split pole.	-	2	2	2	2	1	1
<b>Module 4 Electronic Fundamentals</b>							
	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
<b>4.1 Semiconductors</b>							
<b>4.1.1 Diodes</b> 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	2	2	1	2
b) Materials, electron configuration, electrical	-	-	-	-	2	-	2

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,							
<b>Module 4 (Continued)</b>							
	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
Operation and function of diodes in the following circuits: clipper, 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.							
<b>4.1.2 Transistors</b>							
a) Transistor symbols; Component description and orientation; Transistor characteristics and properties.	-	1	1	1	2	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, multi-vibrators, flip-flop circuits.	-	-	-	-	2	-	2
<b>4.1.3 Integrated Circuits</b>							
a) Description and operation of logic circuits and linear circuits/operational amplifiers;	-	1	1	1	-	1	-
b) Description and operation of logic and linear circuits;	-	-	-	-	2	-	2

<p>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.</p>							
<p><b>4.2 Printed Circuit Boards</b>          Description and use of printed circuit boards.</p>	-	1	1	1	2	-	1

**Module 4 (Continued)**

	A	B1	B2	B3	B4	B5	B6
<p><b>4.3 Servomechanisms</b>            a) Understanding of the following terms: Open and Closed loop systems, feedback, follow up, analogue transducer;            Principles of operation and use of the following synchro system components/features: resolvers, differential, control and torque, transformers, inductance and capacitance transmitters;</p>	-	1	1	1	-	-	-
<p>b) Understanding of the following terms: Open and Closed loop systems, follow up, servomechanism, analogue transducer, null, damping, feedback and deadband;            Construction and use of the following synchro system components: : resolvers, differential, control and torque, E and I transformers, inductance, capacitance and synchronous transmitters;            Servomechanism defects, reversal of synchro leads, hunting.</p>	-	-	-	-	2	-	2

**Module 5 Digital Techniques/Electronic Instrument Systems**

	Level						
	A	B1	B2	B3	B4	B5	B6
<b>5.1 Electronic Instrument Systems</b>	1	2	2	2	3	1	2

Typical system arrangements and cockpit layout of electronic instrument systems.							
<b>5.2 Numbering Systems</b> a) Numbering systems: binary, octal and hexadecimal; b) Demonstration of conversions between the decimal and binary, octal and hexadecimal systems and vice versa.	-	1	1	1	2	-	1
<b>5.3 Data Conversion</b> a) Analogue and Digital Data b) Operation and application of analogue to digital and digital to analogue converters, inputs and outputs, limitations of various types.	-	1	1	1	2	-	1
<b>5.4 Data Buses</b> a) Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications. b) Aircraft Network/Ethernet.	-	2	2	2	2	-	2
<b>Module 5 (Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
<b>5.5 Logic Circuits</b> a) Identification of common logic gate symbols, tables and equivalent circuits;  b) Interpretation of logic diagrams							
<b>5.6 Basic Computer Structure</b> 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).  b) Computer related terminology; Operation, layout and interface of the major components in a micro computer including their associated bus system; 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.	1	2	2	2	-	-	-
	-	-	-	-	2	-	2
<b>5.7 Microprocessors</b> a) Functions performed and overall operation of a	-	-	-	-	2	-	1

microprocessor; b) Basic operation of each of the following microprocessor elements: control and processing unit, clock, register, arithmetic logic unit.							
<b>5.8 Integrated Circuits</b> a) Operation and use of encoders and decoders; b) Function of encoder types; c) Uses of medium, large and very large scale integration.	-	-	-	-	2	-	1
	-	-	-	-	2	-	-
<b>5.9 Multiplexing</b> Operation, application and identification in logic diagrams of multiplexers and demultiplexers.	-	1	1	1	2	-	-
<b>5.10 Fibre Optics</b> a) Advantages and disadvantages of fibre optic data transmission with respect to electrical wire propagation; b) Fibre Optic data bus c) Fibre Optic related terms d) Terminations; e) Couplers, control terminals, remote terminals; f) Application of fibre optics in aircraft systems.							
<b>Module 5 (Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	
<b>5.11 Electronic Displays</b> Principals of operation of common types of displays used in modern aircraft, including Cathode Ray Tubes, Light Emitting Diodes and Liquid Crystal Display.	-	1	2	2	2	1	2
<b>5.12 Electrostatic Sensitive Devices</b> a) Special handling of components sensitive to electrostatic discharges; b) Awareness of risks and possible damage, component and personnel anti-static protection devices.	1	2	2	2	2	1	2
<b>5.13 Software Management Control</b> Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programmes.	-	1	2	2	2	1	2
<b>5.14 Electromagnetic Environment</b> a) Influence of the following phenomena on	-	2	2	2	2	1	2

<p>maintenance practices for electronic systems:  EMC – Electromagnetic Compatibility  EMI – Electromagnetic Interference  HIRF – High Intensity Radiated Field  Lightning/Lightning protection;</p> <p><b>5.15 Typical Electronic/Digital Aircraft Systems</b>  General arrangement of typical electronic/digital aircraft systems and associated BITE (Built in Test Equipment) such as:  <i>a) For B1, B2,B3, B4 and B6 only</i>  ACARS-ARINC Communication, Addressing and Reporting System;  EICAS- Engine Indication and Crew Alerting System  FBW- Fly By Wire  FMS- Flight Management System  IRS- Inertial Reference System</p> <p><i>b) For B1, B2, B3, B4, B5 and B6.</i>  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.</p>	-	2	2	2	2	1	2
<b>Module 6 Materials and Hardware</b>							
	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
<p><b>6.1 Aircraft Materials – Ferrous</b>  a) Characteristics, properties and identification of common alloy steels used in aircraft;  Heat treatment and application of alloy steels.</p> <p>b) Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.</p>	1	2	2	2	1	2	1
<p><b>6.2 Aircraft Materials – Non-Ferrous</b>  a) Characteristics, properties and identification of common non-ferrous materials used in aircraft;  Heat treatment and application of non-ferrous materials.</p>	1	2	2	2	1	2	1

b) Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.	-	1	1	1	1	1	1
<b>6.3 Aircraft Materials – Composite and Non Metallic</b>							
<i>6.3.1 Composite and metallic other than wood and fabric.</i>							
a) Characteristics, properties and identification of common composite and non-metallic materials, other than wood, used in aircraft; Sealing and bonding agents;	1	2	2	2	2	2	2
b) The detection of defects/deterioration in composite and non-metallic material; Repair of composite and non-metallic material.	1	2	2	2	-	2	-
<i>6.3.2 Wooden Structures</i>							
a) Construction methods of wooden airframe structures;	1	2	-	-	-	2	-
b) Characteristics, properties and types of wood and glue used in aeroplanes;							
c) Preservation and maintenance of wooden structure;							
d) Types of defect in wood material and wooden structures;							
e) The detection of defects in wooden structure;							
f) Repair of wooden structure.							
<b>Module 6 (Continued)</b>							
	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>

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



Module 6 (Continued)							
	Level						
	A	B1	B2	B3	B4	B5	B6
<b>6.6 Pipes and Unions</b>							
a) Identification and types of rigid and flexible pipes and their connectors used in aircraft.	2	2	2	2	2	2	2
b) Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes.	2	2	2	2	1	2	1
<b>6.7 Springs</b>							
Types of spring, materials, characteristics and applications.	-	2	2	2	1	1	1
<b>6.8 Bearings</b>							
a) Purpose of bearings, loads, material, construction;	1	2	2	2	2	1	1
b) Types of bearing and their application.							
<b>6.9 Transmission</b>							
a) Gear types and their application;	1	2	2	2	2	1	1
b) Gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns;							
c) Belts and pulleys, chains and sprockets.							
<b>6.10 Control Cables</b>							
a) Types and identification of cables;	1	2	2	2	1	2	1
b) End fittings, turnbuckles and compensation devices;							
c) Pulleys and cable system components;							
d) Bowden cables;							
e) Aircraft flexible control systems.							
<b>6.11 Electrical Cables and Connectors</b>							
a) Cable types, construction and characteristics;	1	2	2	2	2	2	2
b) High tension and co-axial cables;							
c) Crimping							
d) Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes.							

Module 7 Maintenance Practices							
Note: This module does not apply to B5 or B6. Relevant subject matter for B5 and B6 is defined in Module 7A.							
	Level						
	A	B1	B2	B3	B4		
<b>7.1 Safety Precautions- Aircraft and Workshops</b> a) Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals. b) Also, instruction in the remedial action to be taken in the event of a fire or other accident with one or more of these hazards including knowledge on extinguishing agents.	3	3	3	3	3		
<b>7.2 Workshop Practices</b> a) Care of tools, control of tools, use of workshop materials; b) Dimensions, allowances and tolerances, standards of workmanship; c) Calibration of tools and equipment, calibration standards.	3	3	3	3	3		
<b>7.3 Tools</b> a) Common hand tools types; b) Common power tool types; c) Operation and use of precise measuring tools; d) Lubrication equipment and methods. e) Operation, function and use of electrical general test equipment.	3	3	3	3	3		
<b>7.4 Avionic General Test Equipment</b> Operation, function and use of avionic general test equipment.	-	2	2	2	3		
<b>7.5 Engineering Drawings, Diagrams and Standards</b> a) Drawing types and diagrams, their symbols, dimensions, tolerances and projections; b) Identifying title block information; c) Microfilm, microfiche and computerised presentations; d) Specification 100 of the Air Transport Association (ATA) of America. e) Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL;	1	2	2	2	2		

f) Wiring diagrams and schematic diagrams.							
<b>Module 7 (Continued)</b>							
	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>		
<b>7.6 Fits and Clearances</b> a) Drill sizes for bolt holes, classes of fits; b) Common system of fits and clearances; c) Schedule of fits and clearances for aircraft and engines; d) Limits for bow, twist and wear; e) Standard methods for checking shafts, bearings and other parts.	1	2	2	2	1		
<b>7.7 Electrical Wiring Interconnection System (EWIS)</b> a) Continuity, insulation and bonding techniques and testing; b) Use of crimp tools: hand and hydraulic operated; c) Testing of crimp joints; d) Connector pin removal and insertion; e) Co-axial cables: testing and installation precautions; f) Identification of wire types, their inspection criteria and damage tolerance. g) Wiring protection techniques: Cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding. h) EWIS installations, inspection, repair, maintenance and cleanliness standards.	1	3	3	3	3		
<b>7.8 Riveting</b> a) Riveted joints, rivet spacing and pitch; b) Tools used for riveting and dimpling; c) Inspection of riveted joints.	1	2	2	2	-		
<b>7.9 Pipes and Hoses</b> a) Bending and belling/flaring aircraft pipes; b) Inspection and testing of aircraft pipes and hoses; c) Installation and clamping of pipes.	1	2	2	2	-		

7.10 <b>Springs</b> Inspection and testing of springs	1	2	2	2	-		
7.11 <b>Bearings</b> a) Testing, cleaning and inspection of bearings b) Lubrication requirements of bearings; c) Defects in bearings and their causes.	1	2	2	2	-		
<b>Module 7 (Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>		
7.12 <b>Transmissions</b> a) Inspection of gears. Backlash; b) Inspection of belts and pulleys, chains and sprockets; c) Inspection of screwjacks, lever devices, push-pull rod systems.	1	2	2	2	-		
7.13 <b>Control Cables</b> a) Swaging of end fittings; b) Inspection and testing of control cables; Bowden cables and aircraft flexible control systems.	1	2	2	2	-		
7.14 <b>Material Handling</b> 7.14.1 <i>Sheet Metal</i> a) Marking out and calculation of bend allowance; b) Sheet metal working including bending and forming; c) Inspection of sheet metal work.	-	2	2	2	-		
7.14.2 <i>Composite and non-metallic</i> a) Bonding practices; b) Environmental conditions; c) Inspection methods.	-	2	2	2	-		
7.15 <b>Welding, Brazing, Soldering and Bonding</b> a) Soldering methods and inspection of soldered joints.	-	2	2	2	2		
b) Welding and brazing methods; Inspection of welded and brazed joints; Bonding methods and inspection of bonded joints.	-	2	2	2	-		
7.16 <b>Aircraft Weight and Balance</b> a) Centre of Gravity/Balance limits calculation: Use of relevant documents	-	2	2	2	2		

b) Preparation of aircraft for weighing; Weighing of aircraft.	-	2	2	2	-		
<b>Module 7 (Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>		
<b>7.17 Aircraft Handling and Storage</b>	2	2	2	2	2		
a) Aircraft taxiing/towing and associated safety precautions;							
b) Aircraft jacking, chocking, securing and associated safety precautions;							
c) Aircraft Storage methods;							
d) Refuelling/Defuelling procedures;							
e) De-icing/Anti-icing procedures;							
f) Electrical, hydraulic and pneumatic ground supplies;							
g) Effects of environmental conditions on aircraft handling and operation.							
<b>7.18 Disassembly, Inspection, Repair and Assembly Techniques</b>							
a) Types of defects and visual inspection techniques; Corrosion removal, assessment and re-protection;	2	3	3	3	3		
b) General repair methods, Structural Repair Manual; Ageing, fatigue and corrosion control programmes;	-	2	2	2	-		
c) Non-destructive testing techniques including, penetrant, radiographic, eddy current ultrasonic and boroscope methods;	-	2	2	2	1		
d) Disassembly and re-assembly techniques;	2	2	2	2	2		
e) Trouble shooting techniques	-	2	2	2	2		

<b>7.19 Abnormal Events</b>							
a) Inspection following lightning strikes and HIRF penetration;	2	2	2	2	2		
b) Inspections following abnormal events such as heavy landings and flight through turbulence.	2	2	2	2	-		
<b>7.20 Maintenance Procedures</b>	1	2	2	2	2		
a) Maintenance planning;							
b) Modification Procedure							
c) Stores Procedures;							
d) Certification/release procedures;							
e) Interface with aircraft operation;							
f) Quality assurance of Maintenance Inspection and Control;							
g) Additional maintenance procedures;							
h) Control of life limited components.							

### Module 7A Maintenance Practices

Note: The scope of this module shall reflect the technology of aeroplanes relevant to the B5 and B6.

	Level						
						B5	B6
<b>7.1 Safety Precautions- Aircraft and Workshops</b>						3	3
a) Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals.							
b) Also, instruction in the remedial action to be taken in the event of a fire or other accident with one or more of these hazards including knowledge on extinguishing agents.							
<b>7.2 Workshop Practices</b>						3	3
a) Care of tools, control of tools, use of workshop materials;							
b) Dimensions, allowances and tolerances, standards of workmanship;							
c) Calibration of tools and equipment, calibration standards.							
<b>7.3 Tools</b>						3	3
a) Common hand tools types;							

<p>b) Common power tool types;  c) Operation and use of precise measuring tools;  d) Lubrication equipment and methods.  e) Operation, function and use of electrical general test equipment.</p> <p><b>7.4 Avionic General Test Equipment</b>  Operation, function and use of avionic general test equipment.</p> <p><b>7.5 Engineering Drawings, Diagrams and Standards</b>  a) Drawing types and diagrams, their symbols, dimensions, tolerances and projections;  b) Identifying title block information;  c) Microfilm, microfiche and computerised presentations;  d) Specification 100 of the Air Transport Association (ATA) of America.  e) Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL;  f) Wiring diagrams and schematic diagrams.</p>						-	3
<b>Module 7A (Continued)</b>	<b>Level</b>						
						<b>B5</b>	<b>B6</b>
<p><b>7.6 Fits and Clearances</b>  a) Drill sizes for bolt holes, classes of fits;  b) Common system of fits and clearances;  c) Schedule of fits and clearances for aircraft and engines;  d) Limits for bow, twist and wear;  e) Standard methods for checking shafts, bearings and other parts.</p> <p><b>7.7 Electrical Cables and Connectors</b>  a) Continuity, insulation and bonding techniques and testing;  b) Use of crimp tools: hand and hydraulic operated;  c) Testing of crimp joints;  d) Connector pin removal and insertion;  e) Co-axial cables: testing and installation precautions;  f) Wiring protection techniques: Cable looming and loom support, cable clamps, protective</p>					2	2	1
					2	3	3

<p>sleeving techniques including heat shrink wrapping, shielding.</p> <p><b>7.8 Riveting</b>  a) Riveted joints, rivet spacing and pitch;  b) Tools used for riveting and dimpling;  c) Inspection of riveted joints.</p> <p><b>7.9 Pipes and Hoses</b>  a) Bending and belling/flaring aircraft pipes;  b) Inspection and testing of aircraft pipes and hoses;  c) Installation and clamping of pipes.</p> <p><b>7.10 Springs</b>  Inspection and testing of springs</p> <p><b>7.11 Bearings</b>  a) Testing, cleaning and inspection of bearings  b) Lubrication requirements of bearings;  c) Defects in bearings and their causes.</p> <p><b>7.12 Transmissions</b>  a) Inspection of gears, backlash;  b) Inspection of belts and pulleys, chains and sprockets;  c) Inspection of screw jacks, lever devices, push-pull rod systems.</p>						2	-
<p><b>Module 7A (Continued)</b></p>	Level						
						B5	B6
<p><b>7.13 Control Cables</b>  a) Swaging of end fittings;  b) Inspection and testing of control cables; Bowden cables and aircraft flexible control systems.</p>						2	-
<p><b>7.14 Material Handling</b>  <b>7.14.1 Sheet Metal</b>  a) Marking out and calculation of bend allowance;  b) Sheet metal working including bending and forming;  c) Inspection of sheet metal work.</p>						2	-
<p><b>7.14.2 Composite and non-metallic</b>  a) Bonding practices;  b) Environmental conditions;</p>						2	-



<p>c) Inspection methods.</p> <p><b>7.15 Welding, Brazing, Soldering and Bonding</b></p> <p>a) Soldering methods and inspection of soldered joints.</p> <p>b) Welding and brazing methods; Inspection of welded and brazed joints; Bonding methods and inspection of bonded joints.</p> <p><b>7.16 Aircraft Weight and Balance</b></p> <p>a) Centre of Gravity/Balance limits calculation: Use of relevant documents</p> <p>b) Preparation of aircraft for weighing; Weighing of aircraft.</p> <p><b>7.17 Aircraft Handling and Storage</b></p> <p>a) Aircraft taxiing/towing and associated safety precautions;</p> <p>b) Aircraft jacking, chocking, securing and associated safety precautions;</p> <p>c) Aircraft Storage methods;</p> <p>d) Refuelling/Defuelling procedures;</p> <p>e) De-icing/Anti-icing procedures;</p> <p>f) Electrical, hydraulic and pneumatic ground supplies;</p> <p>g) Effects of environmental conditions on aircraft handling and operation.</p>						2	2
Module 7A (Continued)	Level						
						B5	B6
<p><b>7.18 Disassembly, Inspection, Repair and Assembly Techniques</b></p> <p>a) Types of defects and visual inspection techniques; Corrosion removal, assessment and re-protection;</p> <p>b) General repair methods, Structural Repair Manual; Ageing, fatigue and corrosion control programmes;</p>						3	3
						2	-

c) Non-destructive testing techniques including, penetrant, radiographic, eddy current ultrasonic and boroscope methods; d) Disassembly and re-assembly techniques; e) Trouble shooting techniques <b>7.19 Abnormal Events</b> a) Inspection following lightning strikes and HIRF penetration; b) Inspections following abnormal events such as heavy landings and flight through turbulence. <b>7.20 Maintenance Procedures</b> a) Maintenance planning; b) Modification Procedure c) Stores Procedures; d) Certification/release procedures; e) Interface with aircraft operation; f) Quality assurance of Maintenance Inspection and Control; g) Additional maintenance procedures; h) Control of life limited components.						2	1
						2	2
						2	2
						2	2
						2	-
						2	2
<b>Module 8 Basic Aerodynamics</b>							
	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
<b>8.1 Physics of the Atmosphere</b> International Standard Atmosphere (ISA), application to aerodynamics.	1	2	2	2	2	1	2
<b>8.2 Aerodynamics</b>	1	2	2	2	2	1	1

<p>a) Airflow around a body;  b) Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, upwash and downwash, vortices, stagnation;  c) The terms: camber, chord, mean aerodynamic chord, profile (parasite) drag, induced drag, centre of pressure, angle of attack, wash in and wash out, fineness ration, wing shape and aspect ratio;  d) Thrust, Weight, Aerodynamic Resultant;  e) Generation of Lift and Drag: Angle of Attack, Lift coefficient, Drag coefficient, polar curve, stall;  f) Aerofoil contamination including ice, snow and frost.</p> <p><b>8.3 Theory of Flight</b>  a) Relationship between lift, weight, thrust and drag;  b) Glide ratio;  c) Steady state flight and performance;  d) Theory of the turn;  e) Influence of load factor: stall, flight envelope and structural limitations;  f) Lift augmentation</p> <p><b>8.4 Flight Stability and Dynamics</b>  Longitudinal, lateral and directional stability (active and passive).</p>							
	1	2	2	2	2	1	1
	1	2	2	2	2	1	1

### Module 9. Human Factors

Note: This module does not apply to B5 and B6. Relevant subject matter for B5 and B6 is defined in Module 9A.

	Level							
	A	B1	B2	B3	B4			
<b>9.1 General</b>	1	2	2	2	2			
a) The need to take Human Factors into account;								

b) Incidents attributable to human factors/human error; c) "Murphy's" Law.							
<b>9.2 Human Performance and Limitations</b> a) Vision; b) Hearing; c) Information Processing; d) Attention and Perception; e) Memory; f) Claustrophobia and physical access.	1	2	2	2	2		
<b>9.3 Social Psychology</b> a) Responsibility: individual and group; b) Motivation and de-motivation c) Peer pressure; d) "Culture" issues; e) Team working; f) Management, supervision and leadership.	1	1	1	1	1		
<b>9.4 Factors Affecting Performance</b> a) Fitness/Health; b) Stress: domestic and work related; c) Time pressure and deadlines; d) Workload: overload and under load; e) Sleep and fatigue, shift work; f) Alcohol, medication, drug abuse.	2	2	2	2	2		
<b>9.5 Physical Environment</b> a) Noise and Fumes; b) Illumination; c) Climate and Temperature; d) Motion and Vibration; e) Working Environment.	1	1	1	1	1		
<b>9.6 Tasks</b> a) Physical work; b) Repetitive tasks; c) Visual Inspection; d) Complex systems.	1	1	1	1	1		
<b>9.7 Communication</b> a) Within and between teams; b) Work logging and recoding; c) Keeping up to date, currency; d) Dissemination of information.	2	2	2	2	2		
<b>Module 9 (continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>		
<b>9.8 Human Error</b>	1	2	2	2	2		

a) Error models and theories; b) Types of error in maintenance tasks; c) Implications of errors (i.e. accidents) d) Avoiding and managing errors.							
<b>9.9 Hazards in the workplace</b> a) Recognising and avoiding hazards; b) Dealing with emergencies.	1	2	2	2	2		

### Module 9A. Human Factors

Note: The scope of this module shall reflect the less demanding environment of maintenance for B5 and B6 licence holders.

	Level						
						B5	B6
<b>9.1 General</b> a) The need to take Human Factors into account; b) Incidents attributable to human factors/human error; c) "Murphy's" Law.						2	2
<b>9.2 Human Performance and Limitations</b> a) Vision; b) Hearing; c) Information Processing; d) Attention and Perception; e) Memory; f) Claustrophobia and physical access.						2	2
<b>9.3 Social Psychology</b> a) Responsibility: individual and group; b) Motivation and de-motivation c) Peer pressure; d) "Culture" issues; e) Team working; f) Management, supervision and leadership.						1	1
<b>9.4 Factors Affecting Performance</b> a) Fitness/Health; b) Stress: domestic and work related; c) Time pressure and deadlines; d) Workload: overload and under load; e) Sleep and fatigue, shift work; f) Alcohol, medication, drug abuse.						2	2
<b>9.5 Physical Environment</b> a) Noise and Fumes; b) Illumination; c) Climate and Temperature; d) Motion and Vibration; e) Working Environment.						1	1

Module 9A (Continued)	Level						
						B5	B6
<b>9.6 Tasks</b> a) Physical work; b) Repetitive tasks; c) Visual Inspection; d) Complex systems.						1	1
<b>9.7 Communication</b> a) Within and between teams; b) Work logging and recoding; c) Keeping up to date, currency; d) Dissemination of information.						2	2
<b>9.8 Human Error</b> a) Error models and theories; b) Types of error in maintenance tasks; c) Implications of errors (i.e. accidents) d) Avoiding and managing errors.						2	2
<b>9.9 Hazards in the workplace</b> a) Recognising and avoiding hazards; b) Dealing with emergencies.						2	2
<b>Module 10 Aviation Legislation</b>							
	Level						
	A	B1	B2	B3	B4	B5	B6
<b>10.1 Regulatory Framework</b> a) Role of the International Civil Aviation Organisation (ICAO); b) Regulation appropriate to Civil Aviation Authority Botswana.	1	1	1	1	1	1	1
<b>10.2 Certifying Staff- Maintenance</b> Detailed understanding of Civil Aviation (Personnel Licensing) (General)Regulation.	2	2	2	2	2	2	2
<b>10.3 Approved Maintenance Organisation</b> a) Detailed understanding of Civil Aviation (Airworthiness) Regulations; b) Detailed understanding of Civil Aviation (Approved Maintenance Organisation) Regulations.	2	2	2	2	2	2	2
<b>10.4 Air Operations</b>	1	1	1	1	1	1	1

a) General understanding of Civil Aviation (Air Operator Certification & Administration) Regulation b) Air Operators Certificates c) Operator's Responsibilities, in particular regarding continuing Airworthiness and							
<b>Module 10 (Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>B6</b>
Maintenance; d) Aircraft Maintenance Programme; e) MEL/CDL; f) Documents to be carried on board; g) Aircraft placards and marking.							
<b>10.5 Certification of Aircraft Parts and Appliances</b>							
a) General understanding of certification of aircraft.	-	1	1	1	1	1	1
b) Documents Certificate of Airworthiness; restricted Certificate of Airworthiness and Permit to Fly; Certificate of Registration; Noise Certificate; Weight Schedule Radio Station Licence and Approval.	-	2	2	2	2	2	2
<b>10.6 Continuing Airworthiness</b> Detailed understanding of the provisions related to Continuing Airworthiness.	2	2	2	2	2	2	2
<b>10.7 Applicable National and International Requirements.</b>							
a) Maintenance Programmes, Maintenance checks and inspections; Airworthiness Directives; Service Bulletins, manufacturers service information; Modification and Repairs; Maintenance Documentation: Maintenance Manuals, Structural Repair Manual, Illustrated Parts Catalogue, etc. Master Minimum Equipment Lists, Minimum Equipment List, Dispatch Deviation List.	1	2	2	2	2	2	2
b) <b>Continuing Airworthiness</b> Minimum Equipment Requirements- Test Flights.	-	1	1	1	1	1	1

<b>Module 11 Turbine Aeroplane Aerodynamics, Structures and Systems</b>							
	<b>Level</b>						
	<b>A</b>		<b>B2</b>				
<b>11.1 Theory of Flight</b>							
<p>11.1.1 <i>Aeroplane Aerodynamics and Flight Controls</i></p> <p>a) operation and effect of :</p> <ul style="list-style-type: none"> <li>- roll control: ailerons and spoilers;</li> <li>- pitch control: elevators, stabilators, variable incidence stabilisers and canards;</li> <li>- yaw control: rudder and rudder limiters;</li> </ul> <p>b) Control using elevons, ruddervators;</p> <p>c) High lift devices, slots, slats, flaps, flaperons;</p> <p>d) Drag inducing devices, spoilers, lift dumpers, speed brakes;</p> <p>e) Effects of wing fences, saw tooth leading edges;</p> <p>f) Boundary layer control using, vortex generators, stall wedges or leading edge devices;</p> <p>g) Operation and effect of trim tabs, balance and anti-balance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels.</p>	1		2				
<p>11.1.2 <i>High Speed Flight</i></p> <p>a) Speed of sound, subsonic, transonic and supersonic flight;</p> <p>b) Mach number, critical Mach number, compressibility buffet, shock wave, aerodynamic heating, area rule;</p> <p>c) Factors affecting airflow in engines intakes of high speed aircraft;</p> <p>d) Effects of sweepback on critical Mach number.</p>	1						
<p><b>11.2 Airframe Structures – General Concepts</b></p> <p>a) Airworthiness requirements for structural strength: Structural classification, primary, secondary</p>	2		2				



<p>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.</p>							
<b>Module 11 (Continued)</b>	<b>Level</b>						
	<b>A</b>		<b>B2</b>				
<p>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.</p> <p><b>11.3 Airframe Structures – Aeroplanes</b></p> <p>11.3.1 <i>Fuselage (ATA 52/53/56)</i></p> <p>a) Construction and pressurisation sealing;  b) Wing, stabiliser, pylon and undercarriage attachments;  c) Seat installation and cargo loading system;  d) Doors and emergency exits: construction, mechanisms, operation and safety devices;  e) Windows and windscreen construction and mechanisms.</p> <p>11.3.2 <i>Wings (ATA 57)</i></p> <p>a) Construction;  b) Fuel storage;  c) Landing gear, pylon, control surface and high lift attachments.</p> <p>11.3.3 <i>Stabilisers (ATA 55)</i></p> <p>a) Construction;</p>	1		2				
	1		2				
	1		2				
	1		2				

b) Control surface attachment.							
11.3.4 <i>Flight Control Surfaces (ATA 55/57)</i> a) Construction and attachment; b) Balancing – mass and aerodynamic.	1		2				
11.3.5 <i>Nacelles / Pylons (ATA 54)</i> a) Construction; b) Firewalls; c) Engine mounts.	1		2				
<b>Module 11 (Continued)</b>	<b>Level</b>						
	<b>A</b>		<b>B2</b>				
<b>11.4 Air Conditioning and Cabin Pressurisation (ATA 21)</b>							
11.4.1 <i>Air Supply</i> Sources of air supply including engine bleed, APU and ground cart.	1		2				
11.4.2 <i>Air Conditioning</i> a) Air conditioning systems; b) Air cycle and vapour cycle machines; c) Distribution systems; d) Flow, temperature and humidity control system.	1		3				
11.4.3 <i>Pressurisation</i> a) Pressurisation systems; b) Control and indication including control and safety valves; c) Cabin pressure controllers.	1		3				
11.4.4 <i>Safety and Warning Devices</i> Protection and Warning devices.	1		3				
<b>11.5 Instrument / Avionic Systems</b>							
11.5.1 <i>Instrument systems (ATA 31)</i> a) Pitot static: altimeter, air speed indicator,	1		2				

vertical speed indicator; b) Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn indicator; c) Compasses: direct reading, remote reading; d) Angle of attack indication, stall warning systems; e) Glass cockpit; f) Other aircraft system indication.							
11.5.2 <i>Avionic Systems</i> Fundamentals of system layout and operation of: - Auto Flight (ATA 22) - Communications (ATA 23) - Navigation Systems (ATA 34)	1		1				
11.6 <b>Electrical Power (ATA 24)</b> a) Batteries Installation and operation; b) DC power generation; c) AC power generation; d) Emergency power generation e) Voltage regulation; f) Power distribution g) Inverters, transformers, rectifiers; h) Circuit protection; i) External / ground power.	1		3				
<b>Module 11 (Continued)</b>	<b>Level</b>						
	<b>A</b>		<b>B2</b>				
11.7 <b>Equipment and Furnishings (ATA 25)</b> a) Emergency equipment requirements; Seats, harnesses and belts	2		2				
b) Cabin lay-out Equipment lay-out Cabin Furnishing Installation; Cabin Entertainment equipment; Galley Installation Cargo Handling and restraining equipment; Airstairs.	1		1				
11.8 <b>Fire Protection (ATA 26)</b> a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.	1		3				
b) Portable fire extinguisher.	1		1				
11.9 <b>Flight Controls (ATA 27)</b> a) Primary Controls: aileron, elevator, rudder,	1		3				

<p>spoiler;  b) Trim control;  c) High lift devices;  d) Lift dump, speed brakes;  e) System operation: manual, hydraulic, pneumatic, electrical, fly-by-wire;  f) Artificial feel, yaw damper, Mach trim, rudder limiter, gust lock systems;  g) Balancing and rigging;  h) Stall protection / warning system.</p> <p><b>11.10 Fuel Systems (ATA 28)</b>  a) System lay-out;  b) Fuel tanks;  c) Supply systems;  d) Dumping, venting and draining;  e) Cross-feed and transfer;  f) Indication and warnings;  g) Refuelling and Defuelling;  h) Longitudinal Balance fuel systems.</p>	1		3				
<b>Module 11 (Continued)</b>	<b>Level</b>						
	<b>A</b>		<b>B2</b>				
<p><b>11.11 Hydraulic Power (ATA 29)</b>  a) System lay-out;  b) Hydraulic fluids;  c) Hydraulic reservoirs and accumulators;  d) Pressure generation: electric, mechanical, pneumatic;  e) Emergency pressure generation;  f) Filters;  g) Pressure control;  h) Power distribution;  i) Indication and warning systems;  j) Interface with other systems.</p> <p><b>11.12 Ice and Rain Protection (ATA 30)</b>  a) Ice formation, classification and detection;  b) Anti-icing systems: electrical, hot air, chemical;  c) De-icing systems: electrical, hot air, pneumatic, chemical;</p>	1		3				

d) Rain repellent; e) Probe and drain heating; f) Wiper systems.							
<b>11.13 Landing Gear (ATA 32)</b> a) Construction, shock absorbing; b) Extension and retraction systems: normal and emergency; c) Indications and warnings; d) Wheels, brakes, anti-skid and auto-braking; e) Tyres; f) Steering; g) Air-ground sensing.	2		3				
<b>11.14 Lights (ATA 33)</b> a) External: navigation, anti-collision, landing, taxiing, ice; b) Internal: cabin, cockpit, cargo; c) Emergency.	2		3				
<b>11.15 Oxygen (ATA 35)</b> a) System lay-out: cockpit, cabin; b) Sources, storage, charging and distribution; c) Supply regulation; d) Indications and warnings.	1		3				
<b>11.16 Pneumatic / Vacuum (ATA 36)</b> a) System lay-out; b) Sources: engine/APU, compressors, reservoirs, ground supply; c) Pressure control; d) Distribution; e) Indication and Warnings; d) Interfaces with other systems.	1		3				
<b>Module 11 (Continued)</b>	<b>Level</b>						
	<b>A</b>		<b>B2</b>				
<b>11.17 Water / Waste (ATA 38)</b> a) Water system lay-out, supply, distribution, servicing and draining; b) Toilet system lay-out, flushing and servicing; c) Corrosion aspects.	2		3				
<b>11.18 On Board Maintenance Systems (ATA 45)</b> a) Central Maintenance Computers; b) Data loading system; c) Electronic library system; d) Printing;	1		2				

<p>e) Structure monitoring (damage tolerance monitoring).</p>							
<p><b>11.19 Integrated Modular Avionics (ATA 42)</b>  a) Functions that may be typically integrated in the Integrated Modular Avionics (IMA) modules are, among others;  Bleed management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit ventilation control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature monitoring, etc.  b) Core System, Network Components.</p>	1		2				
<p><b>11.20 Cabin Systems (ATA 44)</b></p> <p>The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service). Includes voice, data, music and video transmissions.</p> <p>The Cabin Intercommunication Data System provides an interface between cockpit / crew and cabin systems. These systems support data exchange of the different related LRU's and they are typically operated via Flight Attendant Panel.</p> <p>The cabin Network Service typically consists of a server, interfacing with, among others, the following systems:</p> <ul style="list-style-type: none"> <li>- Data/Radio Communication,</li> <li>- In Flight Entertainment systems.</li> </ul>	1		2				
<p><b>Module 11 (Continued)</b></p>	<b>Level</b>						
	<b>A</b>		<b>B2</b>				
<p>The Cabin Network Service may host functions such as:</p> <ul style="list-style-type: none"> <li>- Access to pre-departure/departure reports</li> <li>- E-mail / intranet / Internet access</li> <li>- Passenger database</li> </ul>	1		2				

<p>Cabin core system;  In-flight Entertainment System;  External Communication System;  Cabin Mass Memory System;  Cabin Monitoring System;  Miscellaneous Cabin System</p>							
<p><b>11.21 Information Systems (ATA 46)</b></p>	<p>1</p>		<p>2</p>				
<p>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.</p>							
<p>Typical examples include  Air Traffic and Information Management Systems and Network Server Systems;  Aircraft General Information Systems;  Flight Deck Information Systems;  Maintenance Information System;  Passenger Cabin Information System;  Miscellaneous Information System.</p>							
<p><b>Module 11A Piston Aeroplane Aerodynamics, Structures and Systems</b></p>							

Note 1 This module does NOT apply to category B5. The relevant subject matters for category B5 are defined in module 11C.  
 Note 2 The scope of this module shall reflect the technology of aeroplanes pertinent to category B1

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



Module 11A (Continued)	Level						
	A	B1					
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					
<b>11.3 Airframe Structures – Aeroplanes</b>							
11.3.1 <i>Fuselage (ATA 52/53/56)</i> a) Construction and pressurisation sealing; b) Wing, stabiliser, pylon and undercarriage attachments; c) Seat installation; d) Doors and emergency exits: construction, mechanisms, operation and safety devices; e) Windows and windscreen construction and mechanisms.	1	2					
11.3.2 <i>Wings (ATA 57)</i> a) Construction; b) Fuel storage; c) Landing gear, pylon, control surface and high lift attachments.	1	2					
11.3.3 <i>Stabilisers (ATA 55)</i> a) Construction; b) Control surface attachment.	1	2					
11.3.4 <i>Flight Control Surfaces (ATA 55/57)</i> a) Construction and attachment; b) Balancing – mass and aerodynamic.	1	2					
11.3.5 <i>Nacelles / Pylons (ATA 54)</i> a) Construction; b) Firewalls; c) Engine mounts.	1	2					
<b>11.4 Air Conditioning and Cabin</b>	1	3					

<b>Pressurisation (ATA 21)</b> a) Pressurisation and air conditioning systems; b) Cabin pressure controllers, protection and warning devices; c) Heating systems.							
<b>Module 11A (Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>					
<b>11.5 Instrument / Avionic Systems</b>							
<b>11.5.1 Instrument systems (ATA 31)</b> a) Pitot static: altimeter, air speed indicator, vertical speed indicator; b) Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn indicator; c) Compasses: direct reading, remote reading; d) Angle of attack indication, stall warning systems; e) Glass cockpit; f) Other aircraft system indication.	1	2					
<b>11.5.2 Avionic Systems</b> Fundamentals of system layout and operation of: <ul style="list-style-type: none"> <li>- Auto Flight (ATA 22)</li> <li>- Communications (ATA 23)</li> <li>- Navigation Systems (ATA 34)</li> </ul>	1	1					
<b>11.6 Electrical Power (ATA 24)</b> a) Batteries Installation and operation; b) DC power generation; c) Voltage regulation; d) Power distribution e) Inverters, transformers; f) Circuit protection; g) External / ground power.	1	3					
<b>11.7 Equipment and Furnishings (ATA 25)</b> a) Emergency equipment requirements; Seats, harnesses and belts	2	2					
b) Cabin lay-out Equipment lay-out Cabin Furnishing Installation.	1	1					
<b>11.8 Fire Protection (ATA 26)</b> a) Fire and smoke detection and warning systems;	1	3					

Fire extinguishing systems; System tests.							
b) Portable fire extinguisher.	1	3					
<b>Module 11A (Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>					
<b>11.9 Flight Controls (ATA 27)</b> a) Primary Controls: aileron, elevator, rudder, spoiler; b) Trim tabs and control; c) High lift devices; d) System operation: manual; e) Gust locks; f) Balancing and rigging; g) Stall warning system.	1	3					
<b>11.10 Fuel Systems (ATA 28)</b> a) System lay-out; b) Fuel tanks; c) Supply systems; d) Cross-feed and transfer; e) Indication and warnings; f) Refuelling and De-fuelling;	1	3					
<b>11.11 Hydraulic Power (ATA 29)</b> a) System lay-out; b) Hydraulic fluids; c) Hydraulic reservoirs and accumulators; d) Pressure generation: electric, mechanical; e) Filters; f) Pressure control; g) Power distribution; h) Indication and warning systems.	1	1					
<b>11.12 Ice and Rain Protection (ATA 30)</b> a) Ice formation, classification and detection; b) De-icing systems: electrical, hot air, pneumatic, chemical; c) Probe and drain heating; d) Wiper systems.	1	3					
<b>11.13 Landing Gear (ATA 32)</b>	2	3					

<p>a) Construction, shock absorbing;  b) Extension and retraction systems: normal and emergency;  c) Indications and warnings;  d) Wheels, brakes, anti-skid and auto-braking;  e) Tyres;  f) Steering.</p> <p><b>11.14 Lights (ATA 33)</b>  a) External: navigation, anti-collision, landing, taxiing, ice;  b) Internal: cabin, cockpit, cargo;  c) Emergency.</p>	2	3					
<b>Module 11A (Continued)</b>	<b>Level</b>						
	A	B1					
<p><b>11.15 Oxygen (ATA 35)</b>  a) System lay-out: cockpit, cabin;  b) Sources, storage, charging and distribution;  c) Supply regulation;  d) Indications and warnings.</p>	1	3					
<p><b>11.16 Pneumatic / Vacuum (ATA 36)</b>  a) System lay-out;  b) Sources: engine, compressors, reservoirs, ground supply;  c) Pressure control;  d) Distribution;  e) Indication and Warnings;  d) Interfaces with other systems.</p>	1	3					
<p><b>11.17 Water / Waste (ATA 38)</b>  a) Water system lay-out, supply, distribution, servicing and draining;  b) Toilet system lay-out, flushing and servicing;  c) Corrosion aspects.</p>	2	3					
<p><b>Module 11B. Piston Aero-plane Aerodynamics, Structures and Systems</b>  Note. The scope of this module shall reflect the technology of aero-planes pertinent to the category B5.</p>							
	<b>Level</b>						
						B5	
<p><b>11.1 Theory of Flight</b>   11.1.1 <i>Aero-plane Aerodynamics and Flight Controls</i>  a) operation and effect of :</p>						1	

<ul style="list-style-type: none"> <li>- roll control: ailerons</li> <li>- pitch control: elevators, stabilators, variable incidence stabilisers and canards;</li> <li>- yaw control: rudder and rudder limiters;</li> <li>b) Control using elevons, ruddervators;</li> <li>c) High lift devices, slots, slats, flaps, flaperons;</li> <li>d) Drag inducing devices, lift dumpers, speed brakes;</li> <li>e) Effects of wing fences, saw tooth leading edges;</li> <li>f) Boundary layer control using, vortex generators, stall wedges or leading edge devices;</li> <li>g) Operation and effect of trim tabs, balance and anti-balance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels.</li> </ul>						
<b>Module 11B (Continued)</b>	<b>Level</b>					
					<b>B5</b>	
<p><b>11.2 Airframe Structures – General Concepts</b></p> <p>a) Airworthiness requirements for structural strength:</p> <ul style="list-style-type: none"> <li>Structural classification, primary, secondary and tertiary;</li> <li>Fail safe, safe life, damage tolerance concepts;</li> <li>Zonal and station identification systems;</li> <li>Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue;</li> <li>Drains and ventilation provisions;</li> <li>System installation provisions;</li> <li>Lightning strike protection provision;</li> <li>Aircraft bonding.</li> </ul> <p>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.</p> <ul style="list-style-type: none"> <li>Structure assembly techniques: riveting, bolting, bonding;</li> <li>Methods of surface protection, such as</li> </ul>					2	
					2	

<p>chromating, anodising, painting; Surface cleaning; Airframe symmetry: methods of alignment and symmetry checks.</p> <p><b>11.3 Airframe Structures – Aeroplanes</b></p> <p>11.3.1 <i>Fuselage (ATA 52/53/56)</i> a) Construction; b) Wing, tail plane, pylon and undercarriage attachments; c) Seat installation; d) Doors and emergency exits: construction and operation; e) Windows and windscreen attachment.</p> <p>11.3.2 <i>Wings (ATA 57)</i> a) Construction; b) Fuel storage; c) Landing gear, pylon, control surface and high lift / drag attachments.</p> <p>11.3.3 <i>Stabilisers (ATA 55)</i> a) Construction; b) Control surface attachment.</p>						1	
						1	
						1	
<b>Module 11B (Continued)</b>	<b>Level</b>						
						<b>B5</b>	
<p>11.3.4 <i>Flight Control Surfaces (ATA 55/57)</i> a) Construction and attachment; b) Balancing – mass and aerodynamic.</p> <p>11.3.5 <i>Nacelles / Pylons (ATA 54)</i> a) Construction; b) Firewalls; c) Engine mounts.</p> <p><b>11.4 Air Conditioning (ATA 21)</b> Heating and venting systems.</p> <p><b>11.5 Instrument / Avionic Systems</b></p> <p>11.5.1 <i>Instrument systems (ATA 31)</i> a) Pitot static: altimeter, air speed indicator, vertical speed indicator; b) Gyroscopic: artificial horizon, attitude director,</p>						1	
						1	
						1	
						1	

<p>direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator;  c) Compasses: direct reading, remote reading;  d) Angle of attack indication, stall warning systems;  e) Glass cockpit;  f) Other aircraft system indication.</p> <p><b>11.5.2 Avionic Systems</b>  Fundamentals of system layout and operation of:  - Auto Flight (ATA 22)  - Communications (ATA 23)  - Navigation Systems (ATA 34)</p> <p><b>11.6 Electrical Power (ATA 24)</b>  a) Batteries Installation and operation;  b) DC power generation;  c) Voltage regulation;  d) Power distribution  e) Inverters, transformers;  f) Circuit protection;  g) External / ground power.</p> <p><b>11.7 Equipment and Furnishings (ATA 25)</b>  Emergency equipment requirements;  Seats, harnesses and belts.</p> <p><b>11.8 Fire Protection (ATA 26)</b>  Portable fire extinguisher.</p>						1	
						2	
						2	
						2	
<b>Module 11B (Continued)</b>	<b>Level</b>						
						<b>B5</b>	
<p><b>11.9 Flight Controls (ATA 27)</b>  a) Primary Controls: aileron, elevator, rudder;  b) Trim tabs and control;  c) High lift devices;  d) System operation: manual;  e) Gust locks;  f) Balancing and rigging;  g) Stall warning system.</p> <p><b>11.10 Fuel Systems (ATA 28)</b>  a) System lay-out;  b) Fuel tanks;  c) Supply systems;</p>						3	
						2	

<p>d) Cross-feed and transfer;  e) Indication and warnings;  f) Refuelling and De-fuelling;</p> <p><b>11.11 Hydraulic Power (ATA 29)</b>  a) System lay-out;  b) Hydraulic fluids;  c) Hydraulic reservoirs and accumulators;  d) Pressure generation: electric, mechanical;  e) Filters;  f) Pressure control;  g) Power distribution;  h) Indication and warning systems;</p> <p><b>11.12 Ice and Rain Protection (ATA 30)</b>  a) Ice formation, classification and detection;  b) De-icing systems: electrical, hot air, pneumatic, chemical;  c) Probe and drain heating;  d) Wiper systems.</p> <p><b>11.13 Landing Gear (ATA 32)</b>  a) Construction, shock absorbing;  b) Extension and retraction systems: normal and emergency;  c) Indications and warnings;  d) Wheels, brakes, anti-skid and auto-braking;  e) Tyres;  f) Steering.</p> <p><b>11.14 Lights (ATA 33)</b>  a) External: navigation, anti-collision, landing, taxiing, ice;  b) Internal: cabin, cockpit, cargo;  c) Emergency.</p>						2	
						1	
						2	
						2	
<b>Module 11B (Continued)</b>					<b>Level</b>		
						<b>B5</b>	
<p><b>11.15 Oxygen (ATA 35)</b>  a) System lay-out: cockpit, cabin;  b) Sources, storage, charging and distribution;  c) Supply regulation;  d) Indications and warnings.</p> <p><b>11.16 Pneumatic / Vacuum (ATA 36)</b>  a) System lay-out;  b) Sources: engine, compressors, reservoirs,</p>						2	
						2	



ground supply; c) Pressure and vacuum pumps; d) Pressure control; e) Distribution; f) Indication and Warnings; g) Interfaces with other systems.							
<b>Module 12 Helicopter Aerodynamics, Structures and Systems</b>							
	<b>Level</b>						
	<b>A</b>			<b>B3</b>			
<b>12.1 Theory of Flight- Rotary Wing Aerodynamics</b> Terminology a) Effects of gyroscopic precession; b) torque reaction and directional control; c) Dissymmetry of lift, blade tip stall; d) Translating tendency and its correction; e) Coriolis effect and compensation; f) Vortex ring state, power settling, over-pitching; g) Auto-rotation; h) Ground effect.	1			2			
<b>12.2 Flight Control Systems</b> a) Cyclic control; b) Collective control; c) Swashplate; d) Yaw control: Anti- torque control, tail rotor, fenestron, NOTAR, bleed air. e) Main Rotor Head: design and operation features; f) Blade dampers: function and construction; g) Rotor blades: Main and tail rotor blade construction and attachment; h) Trim control, fixed and adjustable stabilisers; i) System operation: manual, hydraulic, electrical and fly-by-wire; j) Artificial feel; k) Balancing and rigging.	2			3			
<b>Module 12 (Continued)</b>							
	<b>Level</b>						
	<b>A</b>			<b>B3</b>			
<b>12.3 Blade Tracking and Vibration Analysis</b> a) Rotor alignment; b) Main and tail rotor tracking; c) Static and dynamic balancing; d) Vibration types, vibration reduction methods;	1			3			

e) Ground resonance.							
<b>12.4 Transmission</b> a) Gear boxes, main and tail rotors; b) Clutches, free wheel units and rotor brake; c) Tail rotor drive shafts, flexible couplings, bearings, vibration dampers and bearing hangers;	1			3			
<b>12.5 Airframe Structures</b>  a) Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision;	2			2			
b) Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning, 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			
<b>Module 12 (Continued)</b>	<b>Level</b>						
	A			B3			

<b>12.6 Air Conditioning (ATA 21)</b>						
12.6.1 <i>Air supply</i> Sources of air supply including engine bleed, APU and ground cart;	1			2		
12.6.1 <i>Air Conditioning</i> a) Air conditioning systems; b) Distribution systems; c) Flow and Temperature control systems; d) Protection and warning devices.	1			3		
<b>12.7 Instrument / Avionic Systems</b>						
12.7.1 <i>Instrument systems (ATA 31)</i> a) Pitot static: altimeter, air speed indicator, vertical speed indicator; b) Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; c) Compasses: direct reading, remote reading; d) Vibration Indicating Systems - HUMS; e) Glass cockpit; f) Other aircraft system indication.	1			2		
12.7.2 <i>Avionic Systems</i> Fundamentals of system layout and operation of: - Auto Flight (ATA 22) - Communications (ATA 23) - Navigation Systems (ATA 34)	1			1		
<b>12.8 Electrical Power (ATA 24)</b> a) Batteries Installation and operation; b) DC power generation, AC power generation; c) Emergency power generation; d) Voltage regulation, circuit protection; e) Power distribution f) Inverters, transformers, rectifiers; g) External / ground power.	1			3		
<b>12.9 Equipment and Furnishings (ATA 25)</b> a) Emergency equipment requirements; Seats, harnesses and belts; Lifting Systems;	2			2		
b) Cabin lay-out, cargo retention; Equipment lay-out; Cabin Furnishing Installation; Emergency floatation systems.	1			1		

Module 12 (Continued)		Level					
	A			B3			
<b>12.10 Fire Protection (ATA 26)</b> a) Fire and smoke detection and warning systems; b) Fire extinguishing systems; c) System tests.	1			3			
<b>12.11 Fuel Systems (ATA 28)</b> a) System lay-out; b) Fuel tanks; c) Supply systems; d) Dumping, venting and draining; e) Cross-feed and transfer; f) Indication and warnings; g) Refuelling and De-fuelling.	1			3			
<b>12.12 Hydraulic Power (ATA 29)</b> a) System lay-out; b) Hydraulic fluids; c) Hydraulic reservoirs and accumulators; d) Pressure generation: electric, mechanical; e) Emergency pressure generation; f) Filters; g) Pressure control; h) Power distribution; i) Indication and warning systems; j) Interface with other systems.	1			3			
<b>12.13 Ice and Rain Protection (ATA 30)</b> a) Ice formation, classification and detection; b) Anti-icing and De-icing systems: electrical, hot air and chemical; c) Rain repellent and removal; d) Probe and drain heating; e) Wiper systems.	1			3			
<b>12.14 Landing Gear (ATA 32)</b> a) Construction, shock absorbing; b) Extension and retraction systems: normal and emergency; c) Indications and warnings; d) Wheels, tyres, brakes; e) Steering; f) Air-ground sensing; g) Skids, anti settling equipment, floats.	2			3			
<b>12.15 Lights (ATA 33)</b> a) External: navigation, anti-collision, landing,	2			3			

taxiing, ice; b) Internal: cabin, cockpit, cargo; c) Emergency.							
<b>Module 12 (Continued)</b>	<b>Level</b>						
	<b>A</b>			<b>B3</b>			
<b>12.16 Pneumatic / Vacuum (ATA 36)</b> a) System lay-out; b) Sources: engine/APU, compressors, reservoirs, ground supply; c) Pressure control; d) Distribution; e) Indication and Warnings; d) Interfaces with other systems.	1			3			
<b>12.17 Integrated Modular Avionics (ATA 42)</b> a) Functions that may be typically integrated in the Integrated Modular Avionics (IMA) modules are, among others; Bleed management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit ventilation control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature monitoring, etc. b) Core System, Network Components.	1			2			
<b>12.18 On Board Maintenance Systems (ATA 45)</b> a) Central Maintenance Computers; b) Data loading system; c) Electronic library system; d) Printing; e) Structure monitoring (damage tolerance monitoring).	1			2			
<b>12.19 Information Systems (ATA 46)</b>  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	1			2			

components installed for other uses and shared with other systems, such as flight deck printer or general use display.  Typical examples include;							
<b>Module 12 (Continued)</b>	<b>Level</b>						
	A			B3			
Air Traffic and Information Management Systems and Network Server Systems; Aircraft General Information Systems; Flight Deck Information Systems; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.							
<b>Module13 Aircraft Aerodynamics, structures and Systems</b> N/A for B6 licence.							
	<b>Level</b>						
					B4		
<b>13.1 Theory of Flight</b>  a) <i>Aeroplane Aerodynamics and Flight Controls</i> Operation and effect of : - roll control: ailerons and spoilers; - pitch control: elevators, stabilators, variable incidence stabilisers and canards; - yaw control: rudder and 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) <i>High Speed Flight</i> Speed of sound, subsonic, transonic, supersonic flight; Mach number, critical Mach number.  c) <i>Rotary Wing Aerodynamics</i> Terminology;					1		
					1		
					1		

<p>Operation and effect of cyclic, collective and anti-torque controls.</p> <p><b>13.2 Structures – General Concepts</b></p> <p>a) Fundamentals of structural systems;</p> <p>b) Zonal and station identification systems; Electrical bonding; Lightning strike protection provision.</p>					1		
					2		
<b>Module 13 (Continued)</b>	<b>Level</b>						
					<b>B4</b>		
<p><b>13.3 Auto-flight (ATA 22)</b></p> <p>a) Fundamentals of automatic flight control including working principles and current terminology;</p> <p>b) Command signal processing;</p> <p>c) Modes of operation: roll, pitch and yaw channels;</p> <p>d) Stability Augmentation Systems in helicopters;</p> <p>e) Automatic trim control;</p> <p>f) Autopilot navigation aids interface;</p> <p>g) Four axis auto-pilot systems</p> <p>h) Automatic landing systems: principles and categories, modes of operation, approach, glide-slope, land, go-around, system monitors and failure conditions.</p> <p><b>13.4 Communication and Navigation</b></p> <p>Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter;</p> <p>Working principles of the following systems;</p> <ul style="list-style-type: none"> <li>- Very High Frequency (VHF) communication;</li> <li>- High Frequency (HF) communication;</li> <li>- Audio;</li> <li>- Emergency Locator Transmitter (ELT);</li> <li>- Cockpit Voice Recorder (CVR)</li> <li>- Very High Frequency omnidirectional range (VOR)</li> <li>- Distance Measuring Equipment (DME);</li> <li>- Automatic Direction Finding (ADF);</li> <li>- Instrument Landing System (ILS)</li> <li>- Microwave Landing System (MLS)</li> <li>- Flight Director Systems,</li> <li>- Doppler Navigation;</li> </ul>					3		
					3		

<ul style="list-style-type: none"> <li>- Area navigation, RNAV systems,</li> <li>- Flight Management Systems</li> <li>- Global Positioning System (GPS), Global Navigation Satellite Systems (GNSS)</li> <li>- Inertial Navigation System (INAS)</li> <li>- Air Traffic Control transponder (ATC), secondary surveillance radar.</li> <li>- Traffic Alert and Collision Avoidance System (TCAS).</li> <li>- Weather avoidance radar.</li> <li>- Radio Altimeter (RADALT).</li> <li>- ARINC communication and reporting.</li> </ul>						
<b>Module 13 (Continued)</b>	<b>Level</b>					
				<b>B4</b>		
<p><b>13.5 Electrical Power (ATA 24)</b>  a) Batteries Installation and operation;  b) DC power generation;  c) AC power generation;  d) Emergency power generation  e) Voltage regulation;  f) Power distribution  g) Inverters, transformers, rectifiers;  h) Circuit protection;  i) External / ground power.</p> <p><b>13.6 Equipment and Furnishings (ATA 25)</b>  a) Emergency equipment requirements;  b) Cabin entertainment equipment.</p> <p><b>13.7 Flight Controls (ATA 27)</b>  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 lock systems;  Stall protection.</p> <p>b) System operation: electrical, fly-by-wire.</p> <p><b>13.8 Instruments (ATA 31)</b></p>				3		
				3		
				2		
				3		
				3		



<ul style="list-style-type: none"> <li>a) Classification;</li> <li>b) Atmosphere;</li> <li>c) Terminology;</li> <li>d) Pressure measuring devices and systems;</li> <li>e) Pitot static systems;</li> <li>f) Altimeters;</li> <li>g) Vertical speed Indicators;</li> <li>h) Airspeed indicators;</li> <li>i) Machmeters;</li> <li>j) Altitude reporting/alerting systems;</li> <li>k) Air data computers;</li> <li>l) Instrument pneumatic systems;</li> <li>m) Direct reading pressure and temperature gauges;</li> <li>n) Temperature indicating Systems;</li> <li>o) Fuel quantity indicating systems;</li> <li>p) Gyroscopic principles;</li> <li>q) Artificial horizons;</li> <li>r) Slip indicators;</li> <li>s) Directional gyros</li> <li>t) Ground Proximity Warning Systems (GPWS);</li> </ul>						
<b>Module 13 (Continued)</b>	<b>Level</b>					
					B4	
<ul style="list-style-type: none"> <li>u) Compass systems;</li> <li>v) Flight data recording systems;</li> <li>w) Electronic Flight Instrument systems</li> <li>x) Instrument warning systems including master warning systems and centralised warning panels;</li> <li>y) Stall warning systems and Angle of Attack indicating systems</li> <li>z) Vibration measuring and indication</li> <li>a1) Glass cockpit.</li> </ul> <p><b>13.9 Lights (ATA 33)</b></p> <ul style="list-style-type: none"> <li>a) External: navigation, anti-collision, landing, taxiing, ice;</li> <li>b) Internal: cabin, cockpit, cargo;</li> <li>c) Emergency.</li> </ul> <p><b>13.10 On Board Maintenance Systems (ATA 45)</b></p> <ul style="list-style-type: none"> <li>a) Central Maintenance Computers;</li> <li>b) Data loading system;</li> <li>c) Electronic library system;</li> <li>d) Printing;</li> <li>e) Structure monitoring (damage tolerance monitoring).</li> </ul>					3	
					3	

<p><b>13.11 Air Conditioning and Cabin Pressurisation (ATA 21)</b></p> <p>13.11.1 <i>Air Supply</i> Sources of air supply including engine bleed, APU and ground cart.</p> <p>13.11.2 <i>Air Conditioning</i> a) Air conditioning systems; b) Air cycle and vapour cycle machines; c) Distribution systems; d) Flow, temperature and humidity control system.</p> <p>13.11.3 <i>Pressurisation</i> a) Pressurisation systems; b) Control and indication including control and safety valves; c) Cabin pressure controllers.</p> <p>13.11.4 <i>Safety and Warning Devices</i> Protection and Warning devices.</p>					2		
<b>Module 13 (Continued)</b>	<b>Level</b>						
					<b>B4</b>		
<p><b>13.12 Fire Protection (ATA 26)</b></p> <p>a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.</p> <p>b) Portable fire extinguisher.</p> <p><b>13.13 Fuel Systems (ATA 28)</b></p> <p>a) System lay-out; b) Fuel tanks; c) Supply systems; d) Dumping, venting and draining; e) Cross-feed and transfer; f) Indication and warnings; g) Refuelling and Defuelling; h) Longitudinal Balance fuel systems.</p>					3		

<p><b>13.14 Hydraulic Power (ATA 29)</b>  a) System lay-out;  b) Hydraulic fluids;  c) Hydraulic reservoirs and accumulators;  d) Pressure generation: electric, mechanical, pneumatic;  e) Emergency pressure generation;  f) Filters;  g) Pressure control;  h) Power distribution;  i) Indication and warning systems;  j) Interface with other systems.</p> <p><b>13.15 Ice and Rain Protection (ATA 30)</b>  a) Ice formation, classification and detection;  b) Anti-icing systems: electrical, hot air, chemical;  c) De-icing systems: electrical, hot air, pneumatic, chemical;  d) Rain repellent;  e) Probe and drain heating;  f) Wiper systems.</p> <p><b>13.16 Landing Gear (ATA 32)</b>  a) Construction, shock absorbing;  b) Extension and retraction systems: normal and emergency;  c) Indications and warnings;  d) Wheels, brakes, anti-skid and auto-braking;  e) Tyres;  f) Steering;  g) Air-ground sensing.</p>					1 1 1 3 3 1 3 1 3 3  2 2 3 1 3 1  1 3  3 3 1 3 3		
<b>Module 13 (Continued)</b>	<b>Level</b>						
					<b>B4</b>		
<p><b>13.17 Oxygen (ATA 35)</b>  a) System lay-out: cockpit, cabin;  b) Sources, storage, charging and distribution;  c) Supply regulation;  d) Indications and warnings.</p> <p><b>13.18 Pneumatic / Vacuum (ATA 36)</b>  a) System lay-out;  b) Sources: engine/APU, compressors, reservoirs, ground supply;  c) Pressure control;  d) Distribution;  e) Indication and Warnings;  d) Interfaces with other systems.</p> <p><b>13.19 Water / Waste (ATA 38)</b>  a) Water system lay-out, supply, distribution,</p>					3 3 3 3  2 2 3 1 3 3  2		

<p>servicing and draining; b) Toilet system lay-out, flushing and servicing;</p> <p><b>13.20 Integrated Modular Avionics (ATA 42)</b> a) Functions that may be typically integrated in the Integrated Modular Avionics (IMA) modules are, among others; Bleed management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit ventilation control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature monitoring, etc. Core System; Network Components.</p> <p><b>13.21 Cabin Systems (ATA 44)</b> The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service). Includes voice, data, music and video transmissions.</p> <p>The Cabin Intercommunication Data System provides an interface between cockpit / crew and cabin systems. These systems support data exchange of the different related LRU's and they are typically operated via Flight Attendant Panel.</p>					3		
<p><b>Module 13 (Continued)</b></p>	Level						
					B4		
<p>The cabin Network Service typically consists of a server, interfacing with, among others, the following systems:</p> <ul style="list-style-type: none"> <li>- Data/Radio Communication,</li> <li>- In Flight Entertainment systems.</li> </ul> <p>The Cabin Network Service may host functions such as:</p> <ul style="list-style-type: none"> <li>- Access to pre-departure/departure reports</li> <li>- E-mail / intranet / Internet access</li> <li>- Passenger database</li> </ul> <p>Cabin core system;</p>							

<p>In-flight Entertainment System;  External Communication System;  Cabin Mass Memory System;  Cabin Monitoring System;  Miscellaneous Cabin System.</p> <p><b>13.22 Information Systems (ATA 46)</b>  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.</p> <p>Typical examples include  Air Traffic and Information Management Systems and Network Server Systems;  Aircraft General Information Systems;  Flight Deck Information Systems;  Maintenance Information System;  Passenger Cabin Information System;  Miscellaneous Information System.</p>					3				
<b>Module13 A Aircraft Aerodynamics, structures and Systems</b> Applicable to the B6 licence only									
				Level					
									B6
<b>13.1 Theory of Flight</b>  a) <i>Aeroplane Aerodynamics and Flight Controls</i> Operation and effect of : <ul style="list-style-type: none"> <li>- roll control: ailerons and spoilers;</li> <li>- pitch control: elevators, stabilators, variable incidence stabilisers and canards;</li> </ul>									1

<p>- yaw control: rudder and 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.</p> <p>b) <i>Rotary Wing Aerodynamics</i> Terminology; Operation and effect of cyclic, collective and anti-torque controls.</p> <p><b>13.2 Structures – General Concepts</b> a) Fundamentals of structural systems;  b) Zonal and station identification systems; Electrical bonding; Lightning strike protection provision.</p> <p><b>13.3 Autoflight (ATA 22)</b> a) Fundamentals of automatic flight control including working principles and current terminology; b) Command signal processing; c) Modes of operation: roll, pitch and yaw channels; d) Stability Augmentation Systems in helicopters; e) Automatic trim control; f) Autopilot navigation aids interface;</p> <p><b>13.4 Communication and Navigation</b> Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter; Working principles of the following systems; - Very High Frequency (VHF) communication; - Emergency Locator Transmitter (ELT); - Very High Frequency omnidirectional range (VOR) - Distance Measuring Equipment (DME); - Flight Director Systems,</p>							<p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>2</p>
<b>Module 13A (Continued)</b>	<b>Level</b>						
							<b>B6</b>
<ul style="list-style-type: none"> <li>- Area navigation, RNAV systems,</li> <li>- Global Positioning System (GPS), Global Navigation Satellite Systems (GNSS)</li> <li>- Air Traffic Control transponder (ATC), secondary surveillance radar.</li> </ul>							

<ul style="list-style-type: none"> <li>- Traffic Alert and Collision Avoidance System (TCAS).</li> <li>- Weather avoidance radar.</li> <li>- Radio Altimeter (RADALT).</li> </ul> <p><b>13.5 Electrical Power (ATA 24)</b>  a) Batteries Installation and operation;  b) DC power generation;  c) Voltage regulation;  d) Power distribution  e) Inverters, transformers;  f) Circuit protection;  g) External / ground power.</p> <p><b>13.6 Equipment and Furnishings (ATA 25)</b>  Emergency equipment requirements;</p> <p><b>13.7 Flight Controls (ATA 27)</b>  Primary Controls: aileron, elevator, rudder, spoiler;  Trim tabs;  High lift devices;  Lift dump, speed brakes;  System operation: manual;  Gust locks;  Stall warning system.</p> <p><b>13.8 Instruments (ATA 31)</b>  a) Classification;  b) Atmosphere;  c) Terminology;  d) Pressure measuring devices and systems;  e) Pitot static systems;  f) Altimeters;  g) Vertical speed Indicators;  h) Airspeed indicators;  i) Altitude encoder /Encodeing Altimeter  j) Instrument pneumatic systems;  k) Direct reading pressure and temperature gauges;  l) Temperature indicating Systems;  m) Fuel quantity indicating systems;  n) Gyroscopic principles;  o) Artificial horizons;  p) Slip indicators;  q) Directional gyros  r) Ground Proximity Warning Systems (GPWS);</p>							<p>3</p> <p>2</p> <p>1</p> <p>2</p>
<b>Module 13A (Continued)</b>	<b>Level</b>						
							<b>B6</b>
s) Compass systems;							

t) Electronic Flight Instrument systems u) Instrument warning systems including master warning systems and centralised warning panels; v) Stall warning systems w) Glass cockpit.							
<b>13.9 Lights (ATA 33)</b> a) External: navigation, anti-collision, landing, taxiing, ice; b) Internal: cabin, cockpit, cargo; c) Emergency.							2
<b>13.10 Air Conditioning (ATA 21)</b> Heating and ventilation systems.							2
<b>13.11 Fire Protection (ATA 26)</b> Portable fire extinguisher.							1
<b>13.12 Fuel Systems (ATA 28)</b> a) System lay-out; b) Fuel tanks; c) Supply systems; d) Cross-feed and transfer; e) Indication and warnings; f) Refuelling and Defuelling;							1 1 1 1 2 1
<b>13.13 Hydraulic Power (ATA 29)</b> a) System lay-out; b) Hydraulic reservoirs and accumulators; c) Pressure generation: electric, mechanical; d) Filters; e) Pressure control; f) Power distribution; g) Indication and warning systems.							1 1 2 1 1 1 2
<b>13.14 Ice and Rain Protection (ATA 30)</b> a) Ice formation, classification and detection; b) De-icing systems: electrical, hot air, pneumatic, chemical; c) Probe and drain heating; d) Wiper systems.							2 2 2 1
<b>13.15 Landing Gear (ATA 32)</b> a) Construction, shock absorbing; b) Extension and retraction systems: normal and emergency; c) Indications and warnings; d) Wheels, brakes; e) Tyres; f) Steering.							1 1 2 1 1 1



Module 13A (Continued)				Level			
							B6
<b>13.16 Oxygen (ATA 35)</b> a) System lay-out: cockpit, cabin; b) Sources, storage, charging and distribution; c) Supply regulation; d) Indications and warnings.							1 1 1 2
<b>13.17 Pneumatic / Vacuum (ATA 36)</b> a) System lay-out; b) Sources: engine, compressors, reservoirs, ground supply; c) Pressure and vacuum pumps; d) Pressure control; e) Distribution; f) Indication and Warnings; g) Interfaces with other systems.							1 1 1 1 1 2 2
Module 14. Propulsion (Avionics)							
				Level			
					B4		B6
<b>14.1 Turbine Engines</b> a) Constructional arrangement and operation of turbojet, turbofan, turbo-shaft and turbo-propeller engines;  b) Electronic Engine control and fuel metering system. (FADEC).							1 2
<b>14.2 Engine Indicating Systems</b> a) Exhaust gas temperature / Inter-stage turbine temperature systems; b) Engine speed; Engine Thrust Indication: Engine Pressure Ratio (EPR), engine turbine discharge pressure and/or jet pipe pressure systems; c) Oil pressure and temperature; d) Fuel pressure, temperature and flow; e) Manifold pressure; f) Engine torque; Propeller speed.							2

<b>14.3 Starting and Ignition Systems</b> a) Operation of engine start systems and components; b) Ignition systems and components; Maintenance safety requirements.					2		2
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<b>Module 15. Gas Turbine Engines</b>							
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	Level						
	A		B2	B3			
<b>15.1 Fundamentals</b> a) Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; b) The relationship between force, work, power, energy, velocity, acceleration; c) Construction arrangement and operation of turbojet, turbofan, turbo-shaft, turbo-prop.	1		2	2			
<b>15.2 Engine Performance</b> a) Gross thrust, net thrust, choked nozzle thrust, thrust distribution, resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption; b) Engine efficiencies; c) By-pass ratio and engine pressure ratio; d) Pressure, temperature and velocity of the gas flow; e) Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations.	-		2	2			
<b>15.3 Inlet</b> a) Compressor inlet ducts; b) Effects of various inlet configurations; c) Ice protection.	2		2	2			
<b>15.4 Compressors</b> a) Axial and centrifugal compressor types; b) Constructional features and operating principles and applications; c) Fan balancing; d) Operation; e) Causes and effects of compressor stall and surge;	1		2	2			

f) Methods of air flow control: bleed valves. Variable inlet guide vanes, variable stator vanes, rotating stator blades; g) Compressor ratio.						
<b>15.5 Combustion Section</b> Construction features and principles of operation.	1		2	2		
<b>15.6 Turbine Section</b> a) Operation and characteristics of different turbine blade types; b) Blade to disk attachment; c) Nozzle guide vanes; d) Causes and effects of turbine blade stress and creep.	2		2	2		
<b>Module 15 (Continued)</b>	<b>Level</b>					
	<b>A</b>		<b>B2</b>	<b>B3</b>		
<b>15.7 Exhaust</b> a) Constructional features and principles of operation; b) Convergent, divergent and variable area nozzles; c) Engine noise reduction; d) Thrust reversers.	1		2	2		
<b>15.8 Bearings and Seals</b> Constructional features and principles of operation.	-		2	2		
<b>15.9 Lubricants and Fuels</b> a) Properties and specifications; b) Fuel additives; c) Safety precautions.	1		2	2		
<b>15.10 Lubrication Systems</b> Systems operation/lay-out and components.	1		2	2		
<b>15.11 Fuel Systems</b> a) Operation of engine control and fuel metering systems including electronic engine control (FADEC). b) System lay-out and components.	1		2	2		
<b>15.12 Air Systems</b> Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.	1		2	2		
<b>15.13 Starting and Ignition Systems</b>	1		2	2		

<p>a) Operation of engine start systems and components;  b) Ignition systems and components;  c) Maintenance safety requirements.</p> <p><b>15.14 Engine Indication Systems</b>  a) Exhaust Gas Temperature/Inter-stage Turbine Temperature;  b) Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems;  c) Oil pressure and temperature;  d) Fuel pressure and flow;  e) Engine speed;  f) Vibration measurement and indication;  g) Torque;  h) Power.</p>	1		2	2				
<b>Module 15 (Continued)</b>	<b>Level</b>							
	<b>A</b>		<b>B2</b>	<b>B3</b>				
<p><b>15.15 Power Augmentation Systems</b>  a) Operation and applications;  b) Water injection, water methanol;  c) Afterburner systems.</p>	-		1	1 2				
<p><b>15.16 Turbo-prop Engines</b>  a) Gas coupled/free turbine and gear coupled turbines;  b) Reduction gears;  c) Integrated engine and propeller controls;  d) Over speed safety devices.</p>	1		2	-				
<p><b>15.17 Turbo shaft Engines</b>  Arrangements, drive systems, reduction gearing, couplings, control systems.</p>	1		2	2				
<p><b>15.18 Auxiliary Power Units (APUs)</b>  Purpose, operation, protective systems.</p>	1		2	2				
<p><b>15.19 Power plant Installation</b>  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.</p>	1		2	2				

<p><b>15.20 Fire Protection Systems</b> Operation of detection and extinguishing systems.</p>	1		2	2			
<p><b>15.21 Engine Monitoring and Ground Operation</b> a) Procedures for starting and ground run-up; b) Interpretation of engine power output and parameters; c) Trend (including oil analysis, vibration and boroscope) monitoring; d) Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer; e) Compressor washing/cleaning; f) Foreign Object Damage.</p>	1		3	3			
<p><b>15.22 Engine Storage and Preservation</b> Preservation and de-preservation of engine, accessories and systems.</p>	-		2	2			

**Module 16. Piston Engine**

	Level						
	A	B1		B3		B5	
<p><b>16.1 Fundamentals</b> a) Mechanical, thermal and volumetric efficiencies; b) Operating principles – 2 stroke, 4 stroke, Otto and Diesel cycle; c) Piston displacement and compression ratio; d) Engine configuration and firing order.</p> <p><b>16.2 Engine Performance</b> a) Power calculation and measurement; b) Factors affecting engine power; c) Mixtures/leaning, pre-ignition.</p> <p><b>16.3 Engine Construction</b> a) Crank case, crank shaft, cam shafts, sumps; b) Accessory gearbox; c) Cylinder and piston assemblies; d) Connecting rods, inlet and exhaust manifolds; e) Valve mechanisms;</p>	1	2		2		2	

<p>f) Propeller reduction gearboxes.</p> <p><b>16.4 Engine Fuel Systems</b></p> <p>16.4.1 <i>Carburettors</i>  a) Types, construction and principles of operation;  b) Icing and heating.</p> <p>16.4.2 <i>Fuel Injecting Systems</i>  Types, construction and principles of operation.</p> <p>16.4.3 <i>Electronic engine control</i>  a) Operation of engine control and fuel metering systems including electronic engine control (FADEC);  b) Systems lay-out and components.</p> <p><b>16.5 Starting and Ignition Systems</b>  a) Starting systems, pre-heat systems;  b) Magneto types, construction and principles of operation;  c) Ignition harnesses, spark plugs;  d) Low and High tension systems.</p> <p><b>16.6 Induction, Exhaust and Cooling Systems</b>  a) construction and operation of induction systems including alternate air systems;  b) Exhaust systems, engine cooling systems- air and liquid.</p>							
<b>Module 16 (Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>		<b>B3</b>		<b>B5</b>	
<p><b>16.5 Starting and Ignition Systems</b>  a) Starting systems, pre-heat systems;  b) Magneto types, construction and principles of operation;  c) Ignition harnesses, spark plugs;  d) Low and High tension systems.</p>	1	2		2		2	
<p><b>16.6 Induction, Exhaust and Cooling Systems</b>  a) construction and operation of induction systems including alternate air systems;  b) Exhaust systems, engine cooling systems- air and liquid.</p>	1	2		2		2	
<p><b>16.7 Supercharging/Turbo-charging</b>  a) Principles and purpose of super-charging and its effects on engine parameters;  b) Construction and operation of super-</p>	1	2		2		2	

charging/turbo-charging systems; c) System terminology; d) Control systems; e) System protection.						
<b>16.8 Lubricants and Fuels</b> a) Properties and specifications; b) Fuel additives; c) Safety precautions.	1	2		2		2
<b>16.9 Lubrication Systems</b> System operation/lay-out and components.	1	2		2		2
<b>16.10 Engine Indication Systems</b> a) Engine speed; b) Cylinder head temperature; c) Coolant Temperature; d) Oil Pressure and Temperature; e) Exhaust Gas Temperature; f) Fuel Pressure and flow; g) Manifold pressure.	1	2		2		2
<b>16.11 Power plant Installations</b> Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.	1	2		2		2
<b>Module 16 (Continued)</b>	<b>Level</b>					
	<b>A</b>	<b>B1</b>		<b>B3</b>		<b>B5</b>
<b>16.12 Engine Monitoring and Ground Operation</b> a) Procedures for starting and ground run-up; b) Interpretation of engine power output and parameters; c) Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer.	1	3		3		2
<b>16.13 Engine Storage and Preservation</b> Preservation and de-preservation of engine,	-	2		2		2

accessories and systems.							
<b>Module 17. Propeller</b>							
Note: This module does not apply to Category B5. Relevant subject matter for Category B5 is defined in Module 17A.							
	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>				
<b>17.1 Fundamentals</b> a) Blade element theory b) High / low blade angle, reverse angle, angle of attack, rotational speed; c) Propeller slip; d) Torque; e) Relative airflow on blade angle of attack; f) Vibration and resonance.	1	2	2				
<b>17.2 Propeller Construction</b> a) Construction methods and material used in wooden, composite and metal propellers; b) Blade station, blade face, blade shank, blade back and hub assembly; c) Fixed pitch, controllable pitch, constant speed propeller; d) Propeller/spinner installation.	1	2	2				
<b>17.3 Propeller Pitch Control</b> a) Speed control and pitch change methods, mechanical and electrical/electronic; b) Feathering and reverse pitch; c) Over-speed protection.	1	2	2				
<b>17.4 Propeller Synchronisation</b> Synchronising and sychrophasing equipment.	-	2	2				
<b>17.5 Propeller Ice Protection</b> Fluid and electrical de-icing equipment.	1	2	2				
<b>Module 17 ( Continued)</b>	<b>Level</b>						
	<b>A</b>	<b>B1</b>	<b>B2</b>				
<b>17.6 Propeller Maintenance</b> a) Static and dynamic balancing; b) Blade tracking; c) Assessment of blade damage, erosion, corrosion, impact damage, delamination; d) Propeller treatment/repair schemes;	1	3	3				



e) Propeller engine running, 17.7 <b>Propeller Storage and Preservation</b> Propeller preservation and de-preservation.	1	2	2				
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**Module 17A. Propeller**

Note: The scope of this Module shall reflect the propeller technology of aeroplanes pertinent to the B5 category.

	Level						
						B5	
<b>17.1 Fundamentals</b> a) Blade element theory b) High / low blade angle, reverse angle, angle of attack, rotational speed; c) Propeller slip; d) Torque; e) Relative airflow on blade angle of attack; f) Vibration and resonance.						2	
<b>17.2 Propeller Construction</b> a) Construction methods and material used in wooden, composite and metal propellers; b) Blade station, blade face, blade shank, blade back and hub assembly; c) Fixed pitch, controllable pitch, constant speeding propeller; d) Propeller/spinner installation.						2	
<b>17.3 Propeller Pitch Control</b> a) Speed control and pitch change methods, mechanical and electrical/electronic; b) Feathering and reverse pitch; c) Over-speed protection.						2	
<b>17.4 Propeller Synchronisation</b> Synchronising and sychrophasing equipment;						2	
<b>17.5 Propeller Ice Protection</b> Fluid and electrical de-icing equipment.						2	
Module 17A (Continued)	Level						
						B5	
<b>17.6 Propeller Maintenance</b> a) Static and dynamic balancing;						2	

b) Blade tracking; c) Assessment of blade damage, erosion, corrosion, impact damage, delamination; d) Propeller treatment/repair schemes; e) Propeller engine running,  <b>17.7 Propeller Storage and Preservation</b> Propeller preservation and de-preservation.						2	
<b>Module 18 Balloons and Airships</b>							
						<b>Level</b>	
						<b>B5</b>	<b>B6</b>
<b>18.1 Hot Air Balloons and Airships</b>							
a) Basic principles of construction and configuration						3	3
b) Assembly and Individual parts						3	
c) Envelope						3	
1) Fabrics							
2) Load tape and rip stoppers							
3) Load cables							
4) Parachute							
5) Ripping panels							
6) Turning valve							
7) Scoop / Skirt							
8) Roller / Pulley							
9) Control and Shroud lines							
10) Temperature control strip, envelope thermometers							3
11) Flying wires							
d) Burner and Fuel system						3	
1) Frames and stations							
2) Burner coils							
3) Blast, liquid & pilot valves							
4) Burners & Nozzles							
5) Pilot burners & Nozzles							
6) Fuel lines & hoses							
7) Fuel cylinders/tanks/valves and fittings							
e) Baskets(including alternative devices)						3	
1) Types of basket							
2) Basket cables							
3) Carabineer, shackles & pins							
4) Burner support rods							
5) Fuel Cylinder Straps							
6) Accessories & packing diagrams							
f) Equipment						3	
1) Fire Extinguisher & fire blanket							
2) Instruments (single or combined)							3
<b>Module 18 Balloons and Airships</b>							

	Level						
						B5	B6
<b>18.1 Hot Air Balloons and Airships (cont)</b>							
g) Maintenance						3	
1) Stitching							
2) Bonding							
<b>18.2 Gas Balloons and Airships</b>							
a) Basic principles of construction and configuration						3	3
b) Assembly and Individual parts						3	
c) Envelope						3	
1) Fabrics							
2) Poles and reinforcements							
3) Ripping panels & cord							
4) Parachute & shroud lines							
5) Valves and cords							
6) Filler neck, paschal-ring and cords							
7) Electro-static discharge path							
d) Rigid Gas Valve						3	
1) Springs							
2) Gasket							
3) Screwed Joints							
4) Control Lines							
5) Electro-static discharge path							
e) Flexible Gas Valve (parachute)						3	
f) Netting or Rigging (Netless)						3	
1) Types of net & other lines							
2) Mesh sizes and angles							
3) Net Ring							
4) Knotting methods							
5) Electro-static discharge path							
g) Load ring						3	
h) Basket and Accessories						3	
1) Types of Basket or alternative device							
2) Strops & Toggles							
3) Ballast systems (Bags and supports)							
4) Electro-static discharge path							
i) Ripping cord and valve cord						3	
j) Mooring and drag rope						3	
k) Minor repairs						3	
1) Bonding							
2) Slicing hemp ropes							
l) Equipment						3	
1) Instruments (single or combined)							3
m) Tether cable (TGB only)						3	
1) Types of cable							
2) Damage limits							
3) Cable swivel							
4) Cable clamps							

<b>Module 18 Balloons and Airships</b>							
	<b>Level</b>						
						<b>B5</b>	<b>B6</b>
<b>18.2 Gas Balloons and Airships (cont)</b>							
n) Winches						3	
1) Types of winches							
2) Mechanical systems							
3) Electrical systems							
4) Emergency system							
5) Grounding/Ballasting of winch							
<b>18.3 Airships</b>							
a) Basic principles of construction and configuration						3	3
b) Envelope						3	
1) Fabrics							
2) Ripping panel and cords							
3) Valves							
4) Catenary system							
c) Gondola						3	
1) Type of Gondola							
2) Airframe							
d) Electrical Systems						3	3
1) Power sources							
2) Electrical circuits							
3) External power source							
4) Energy Balance							
e) Engine						3	
1) Types used							
2) Installation							
3) Performance							
4) Maintenance							
f) Fuel Systems						3	
1) Storage and venting							
2) Supply and transfer							
g) Propeller						3	
1) Types used							
2) Performance appropriate to airships							
h) Instrumentation						3	
1) Layout of all flight and engine instruments							3
i) Fire Equipment						3	
j) Flight and Maintenance Manuals						3	
k) Rigging and launch preparation						3	
<b>18.4 Avionics</b>							
a) Radio –Comm						3	3
1) Channel spacing							

2) Length of antenna and counterweight 3) Radio shielding-interference b) Transponder 1) Typical installation and locations 2) Modes A, C, S 3) Testing equipment and typical defects.							3	
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## Appendix II Matrix of Modular Basic Examination

### 1.0 General

The examination requirement for each licence category is divided into a series of modular examinations. This format has two advantages;

- 1) Allows candidates to sit individual modules either singly or in combination to suit their individual style or needs.
- 2) Where it is desired to gain an additional licence category post qualifying for and gaining a different category, only those examinations that examine a different technical content are required to be sat.

Where a module is common to, but at a different level from, that gained for a previous licence category, an examination covering those elements not previously covered must be taken.

### 1.1 Matrix for applicable examinations.

SUBJECT	CAT A	CAT B1	CAT B2	CAT B3P	CAT B3T	CAT B4	CAT B5	CAT B6
1	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X
3	X	X	X	X	X	X	X	X
4		X	X	X	X	X	X	X
5	X	X	X	X	X	X	X	X
6	X	X	X	X	X	X	X	X
7	X	X	X	X	X	X		
7A							X	X
8	X	X	X	X	X	X	X	X
9	X	X	X	X	X	X		
9A							X	X
10	X	X	X	X	X	X	X	X
11	X		X					
11A		X						
11B							X	
12				X	X			
13						X		
13A								X
14						X		X
15	X		X		X			

16	X	X		X			X	
17	X	X	X					
17A							X	
18							X	X

## Appendix III Basic Licence Examination Requirements.

### 1.0 General

1.1 All written examinations should take the form of Multi Choice Questions (MCQ) comprising a stem question, one fully correct answer and two “confuser” answers which are incorrect with respect to technical content.

1.2 Each question shall have a value of ONE mark.

1.3 All questions and answers should be grammatically correct to eliminate confusion with respect to use of language.

1.4 Modules 7, 9 and 10 shall contain an essay examination element in addition to the MCQ paper. The essay is intended to test the ability of the candidate to read and write in the language required by the Authority and express his/her self clearly and concisely in technical terms appropriate to the subject under discussion. The essay paper shall have 60% of the marks awarded against the technical content of the answer and 40% of the mark allocated against grammar and language. The essay answers should be written in essay format and not include lists or diagrams/sketches. Where a diagram or sketch has been used to amplify an answer, the candidate should not be negatively marked providing that the text fully explains the subject under discussion without the aid of the sketch.

1.5 The pass mark for both MCQ and Essay shall be 75%.

1.6 Negative marking shall not be used.

### 2.0 Multi Choice Question Papers.

Each question paper shall be strictly aligned to the licence category and the knowledge level requirement detailed in the Knowledge Requirements Syllabus given in Appendix I. The number of question allocated to the respective papers and the time allowed for each examination are detailed below. Each essay question has a time allocation of 20 minutes.

Due to the large content of the Module 13 paper, it is acceptable for this paper to be subdivided into two elements providing that the same total number of questions are asked and the complete time allowed is equal to that listed in the table below.

#### 2.1 Module 1

<b>A</b>	16 Multi-choice questions	0 Essay Question	Time allowed 20 minutes
<b>B1</b>	32 Multi-choice questions	0 Essay Question	Time allowed 40 minutes
<b>B2</b>	32 Multi-choice questions	0 Essay Question	Time allowed 40 minutes
<b>B3P</b>	32 Multi-choice questions	0 Essay Question	Time allowed 40 minutes
<b>B3T</b>	32 Multi-choice questions	0 Essay Question	Time allowed 40 minutes
<b>B4</b>	32 Multi-choice questions	0 Essay Question	Time allowed 40 minutes
<b>B5</b>	28 Multi-choice questions	0 Essay Question	Time allowed 35 minutes
<b>B6</b>	28 Multi-choice questions	0 Essay Question	Time allowed 35 minute

#### 2.2 Module 2

<b>A</b>	32 Multi-choice questions	0 Essay Question	Time allowed 40 minutes
<b>B1</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes
<b>B2</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes

<b>B3P</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes
<b>B3T</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes
<b>B4</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes
<b>B5</b>	28 Multi-choice questions	0 Essay Question	Time allowed 35 minutes
<b>B6</b>	28 Multi-choice questions	0 Essay Question	Time allowed 35 minutes

### 2.3 Module 3

<b>A</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B1</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes
<b>B2</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes
<b>B3P</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes
<b>B3T</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes
<b>B4</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes
<b>B5</b>	24 Multi-choice questions	0 Essay Question	Time allowed 30 minutes
<b>B6</b>	24 Multi-choice questions	0 Essay Question	Time allowed 30 minutes

### 2.4 Module 4

<b>A</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B1</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B2</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B3P</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B3T</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B4</b>	40 Multi-choice questions	0 Essay Question	Time allowed 50 minutes
<b>B5</b>	8 Multi-choice questions	0 Essay Question	Time allowed 10 minutes
<b>B6</b>	8 Multi-choice questions	0 Essay Question	Time allowed 10 minutes

### 2.5 Module 5

<b>A</b>	16 Multi-choice questions	0 Essay Question	Time allowed 20 minutes
<b>B1</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B2</b>	40 Multi-choice questions	0 Essay Question	Time allowed 50 minutes
<b>B3P</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B3T</b>	40 Multi-choice questions	0 Essay Question	Time allowed 50 minutes
<b>B4</b>	72 Multi-choice questions	0 Essay Question	Time allowed 90 minutes
<b>B5</b>	16 Multi-choice questions	0 Essay Question	Time allowed 20 minutes
<b>B6</b>	40 Multi-choice questions	0 Essay Question	Time allowed 50 minutes

### 2.6 Module 6

<b>A</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes
<b>B1</b>	72 Multi-choice questions	0 Essay Question	Time allowed 90 minutes
<b>B2</b>	72 Multi-choice questions	0 Essay Question	Time allowed 90 minutes
<b>B3P</b>	72 Multi-choice questions	0 Essay Question	Time allowed 90 minutes
<b>B3T</b>	72 Multi-choice questions	0 Essay Question	Time allowed 90 minutes
<b>B4</b>	60 Multi-choice questions	0 Essay Question	Time allowed 75 minutes
<b>B5</b>	60 Multi-choice questions	0 Essay Question	Time allowed 75 minutes
<b>B6</b>	60 Multi-choice questions	0 Essay Question	Time allowed 75 minutes

### 2.7 Module 7

<b>A</b>	72 Multi-choice questions	2 Essay Question	Time allowed 90 minutes
<b>B1</b>	80 Multi-choice questions	2 Essay Question	Time allowed 100 minutes
<b>B2</b>	80 Multi-choice questions	2 Essay Question	Time allowed 100 minutes
<b>B3P</b>	80 Multi-choice questions	2 Essay Question	Time allowed 100 minutes
<b>B3T</b>	80 Multi-choice questions	2 Essay Question	Time allowed 100 minutes
<b>B4</b>	60 Multi-choice questions	2 Essay Question	Time allowed 75 minutes
<b>B5</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B6</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes

### 2.8 Module 7A

<b>A</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B1</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B2</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes

<b>B3P</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B3T</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B4</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B5</b>	60 Multi-choice questions	2 Essay Question	Time allowed 75 minutes
<b>B6</b>	60 Multi-choice questions	2 Essay Question	Time allowed 75 minute

### 2.9 Module 8

<b>A</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B1</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B2</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B3P</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B3T</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B4</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B5</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B6</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes

### 2.10 Module 9

<b>A</b>	20 Multi-choice questions	1 Essay Question	Time allowed 25 minutes
<b>B1</b>	20 Multi-choice questions	1 Essay Question	Time allowed 25 minutes
<b>B2</b>	20 Multi-choice questions	1 Essay Question	Time allowed 25 minutes
<b>B3P</b>	20 Multi-choice questions	1 Essay Question	Time allowed 25 minutes
<b>B3T</b>	20 Multi-choice questions	1 Essay Question	Time allowed 25 minutes
<b>B4</b>	20 Multi-choice questions	1 Essay Question	Time allowed 25 minutes
<b>B5</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B6</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes

### 2.11 Module 9A

<b>A</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B1</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B2</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B3P</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B3T</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B4</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B5</b>	16 Multi-choice questions	1 Essay Question	Time allowed 20 minutes
<b>B6</b>	16 Multi-choice questions	1 Essay Question	Time allowed 20 minutes

### 2.12 Module 10

<b>A</b>	32 Multi-choice questions	1 Essay Question	Time allowed 40 minutes
<b>B1</b>	40 Multi-choice questions	1 Essay Question	Time allowed 50 minutes
<b>B2</b>	40 Multi-choice questions	1 Essay Question	Time allowed 50 minutes
<b>B3P</b>	40 Multi-choice questions	1 Essay Question	Time allowed 50 minutes
<b>B3T</b>	40 Multi-choice questions	1 Essay Question	Time allowed 50 minutes
<b>B4</b>	40 Multi-choice questions	1 Essay Question	Time allowed 50 minutes
<b>B5</b>	32 Multi-choice questions	1 Essay Question	Time allowed 40 minutes
<b>B6</b>	32 Multi-choice questions	1 Essay Question	Time allowed 40 minutes

### 2.13 Module 11

<b>A</b>	108 Multi-choice questions	0 Essay Question	Time allowed 135 minutes
<b>B1</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B2</b>	140 Multi-choice questions	0 Essay Question	Time allowed 175 minutes
<b>B3P</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B3T</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B4</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B5</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B6</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes

### 2.14 Module 11A

<b>A</b>	72 Multi-choice questions	0 Essay Question	Time allowed 90 minutes
<b>B1</b>	100 Multi-choice questions	0 Essay Question	Time allowed 125 minutes
<b>B2</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes





<b>B3P</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B3T</b>	92 Multi-choice questions	0 Essay Question	Time allowed 115 minutes
<b>B4</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B5</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B6</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes

### 2.21 Module 16

<b>A</b>	52 Multi-choice questions	0 Essay Question	Time allowed 65 minutes
<b>B1</b>	72 Multi-choice questions	0 Essay Question	Time allowed 90 minutes
<b>B2</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B3P</b>	72 Multi-choice questions	0 Essay Question	Time allowed 90 minutes
<b>B3T</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B4</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B5</b>	68 Multi-choice questions	0 Essay Question	Time allowed 85 minutes
<b>B6</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes

### 2.22 Module 17

<b>A</b>	20 Multi-choice questions	0 Essay Question	Time allowed 25 minutes
<b>B1</b>	32 Multi-choice questions	0 Essay Question	Time allowed 40 minutes
<b>B2</b>	32 Multi-choice questions	0 Essay Question	Time allowed 40 minutes
<b>B3P</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B3T</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B4</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B5</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B6</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes

### 2.23 Module 17A

<b>A</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B1</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B2</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B3P</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B3T</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B4</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B5</b>	28 Multi-choice questions	0 Essay Question	Time allowed 35 minutes
<b>B6</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes

### 2.24 Module 18

<b>A</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B1</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B2</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B3P</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B3T</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B4</b>	0 Multi-choice questions	0 Essay Question	Time allowed 0 minutes
<b>B5</b>	56 Multi-choice questions	0 Essay Question	Time allowed 70 minutes
<b>B6</b>	16 Multi-choice questions	0 Essay Question	Time allowed 20 minutes

## Appendix IV Aircraft Type List

### Introduction

The following list is divided into the various groups that detail the training and/or examination requirements for Aircrew and Engineer Licence Issue. It should be noted that a type rating is

designated by an “Airframe/Engine” combination rather than simply an “Airframe” type which more clearly defines the variants appropriate to the rating stated on the licence.

## Group 1

Those aircraft that require Approved Type Training and Examination for licence endorsement. (Note that a licence extended with a type rating does NOT entitle the holder to certify or fly an aircraft for Commercial Air Transport until the appropriate authorisation is issued by the Approved Organisation.)

Aircraft Type Rating	Reference TCDS	Type Variants
ATR 42 – 200/300/ ATR 72-100/200 (PWC PW120)	EASA.A.084	ATR 42-200/300/320 ATR 72-101/102/201/202/211/212
ATR 42-400/500 / ATR 72-212A (PWC PW120)	EASA.A.084	ATR 42- 400/500/600 ATR 72-212A(500)/212A(600)
BAe/Avro-146 (Honeywell ALF 500 series)	EASA.A.182	BAe 146-100/200/300 RJ70/RJ85/RJ100/RJ115
Beechcraft 200/300 series (PWC PT6)	A24CE	1900C/1900C-12J/1900D 200/C/T/CT 300/300LW A100-1(U-21J) A200(C-12A)/C-12C) A200C(UC-12B)/A200CT(C-12D)/ (C-12F)/(FWC-12D)/RC-12D)/ (RC-12G)/(RC-12H)/(RC-12K) (RC-12P)/(RC-12Q) B200/C/T/CT/GT B200C(C-12F)/_C-12R)/(UC-12F)/ (UC-12M) B300/C B300C(MC-12W)/(UC-12W)
Beechcraft 400 series (PWC JT15D) (Hawker 400 Series)	A16SW	400/400A/400T MU-300-10
Beechcraft 65-90 Series (PWC PT6)	3A20	65-90/A90/C90/C90A/C90GT/C90GTi 65-A90-1(JU-21A)/(U-21A)/(RU-21A)/ (RU-21D)/(U-21G)/(RU-21H) 65-A90-2(RU-21B) 65-A90-3(RU-21C) 65-A90-4(RU-21E)/(RU-21H) B90/E90/H90(T-44A)
Boeing B737-100/200 (PW JT8D)	A16WE	B737-100/200/200C
Aircraft Type Rating	Reference TCDS	Type Variants
Cessna 411/414/421 series (Continental)	A7CE	411/411A/414/414A/421/A/B/C
Cessna 425 (PWC PT6)	A7CE	Sole variant
Cessna 500 (PWC JT15D)	A22CE	Sole variant
Cessna 550/560 series (PWC 500 series)	A22CE	550/552/560/s550/560XL
Hawker 750/800/1000 series (Honeywell TFE 731)	A3EU	750/800/800XP/800(U-125A)/850XP/ 900XP/1000.
Hawker Beechcraft F90 (PWC PT6)	A31CE	Sole variant.

## Group 2

Those aircraft that require Approved Type Examination and satisfactory evidence of the required experience for endorsement of a licence. (Approved type training may be accepted in lieu of the above requirement.)

The aircraft listed in this Group may be added to the licence as a “group” rating once the necessary individual type rating requirements have been met. (Note that a licence extended with a type or group rating does NOT entitle the holder to certify or fly an aircraft for Commercial Air Transport until the appropriate authorisation is issued by the Approved Organisation.)

Aircraft Type Rating	Reference TCDS	Type Variants
<b>Aeroplanes</b>		
Cessna 208 (PWC PT6)	A37CE	208/208B
Kodiak 100 (PWC PT6)	A00007SE	Sole variant
PAC 750XL (PWC PT6)	EASA.IM.A.081 NZ TC A-14	Sole variant
Pilatus PC-12 series (PWC PT6)	A78EU)	PC-12/PC-12-45/ PC-12-47/ PC-12-47E.
<b>Rotorcraft</b>		
Agusta A119 (PWC PT6)	H7EU	A119/A119MkII
Bell 206 series (RR Corp 250)	H2SW	206/A/B/L 206A(OH-58A) 206B-1 206L-1/206L-3/206L-4 407
MD (Hughes) 369/500/600series (RR Corp 250)	H3WE	369H/369HM/369HE/369D/369E/369F/ 369FF/500N/600N.
Robinson R22/R44 series (Lycoming)	R22- H10WE R44-H11NM	R22/R22Alpha/R22Beta/R22Mariner R44/R44II
Robinson R66 (RR Corp 250)	R00015LA	Sole variant.
Sikorsky 269 series (Lycoming)	4H12	269A/269A-1/269B/C/D/269C-1.
<b>Auto Gyros</b>		
Magni Gyro (Rotax)	N/A	M-16/M-22/M-24
RAF 2000 GTX series (Subaru)	N/A	RAF 2000 GTX SE/SE F1/SE F1 2.5.

### Group 3

Those aircraft that require Approved Type Examination and satisfactory evidence of the required experience. (Approved type training may be accepted in lieu of the above requirement.) The aircraft listed in this Group may be added to the licence as a "full group" rating once the necessary demonstration of practical experience covering a representative cross section of maintenance activities relevant to the licence category has been met. These group ratings may be subject to the following limitations where experience cannot be demonstrated.

- 1) Pressurised aeroplanes
- 2) Metal Structured Aeroplanes
- 3) Composite Structured Aeroplanes
- 4) Wooden Structured Aeroplanes
- 5) Fabric covered Metal Structured Aeroplanes

(Note that a licence extended with a type or group rating does NOT entitle the holder to certify or fly an aircraft for Commercial Air Transport)

Aircraft Type Rating	Reference TCDS	Type Variants
<b>Piston Aircraft NOT eligible for B5 &amp; B6 AMEL</b>		
Beechcraft 35 Series (Continental)	3A15	35-33/A33/B33/C33/C33A E33/A/C F33/A/C G33 H35/J35/K35/M35/N35/P35/S35/V35/ V35A/V35B 36/A36/A36TC/B36TC/G36.
Beechcraft 55/95 Series (Continental)	3A16	D55/D55A/E55/E55A 58/58A/G58 95-55/95-A55/95-B55/95-B55A 95-B55B(T-42)/95-C55/95-C55A
Beechcraft 55/95 Series (Lycoming)	3A16	56TC/A56TC

		95/B95/B95A/D95A/E95
Britten Norman BN2 Series (Lycoming)	EASA.A.388	BN2A-8/-9/-20/-21/-26/-27 BN2B-20/-21/-26/-27
Cessna 310 Series (Continental)	3A10	310/A/B/C/D/E/F/G/H/I/J/K/L/N/P/Q/R E310H/E310J/T310P/T310Q/T310R
Cirrus 20 Series (Continental)	A00009CH	SR20/SR22/SR22T
Lockwood Air Cam (Rotax)	N/A	Sole variant
Piper PA-23 Series (Lycoming)	1A10	PA-23/-160/-235/-250 PA-E23-250
Piper PA-30/39/40 (Lycoming)	A1EA	No further variants
Piper PA-34 200T/220T (Continental)	A7SO	No further variants
Twin Commander 500 series (Lycoming)	6A1	500/B/U/S 520 560/A/E
Twin Commander 500A (Continental)	6A1	No further variants
<b>Piston engine aircraft &lt; 2000kg eligible for B5 &amp; B6 AMEL certification</b>		
Aerotrike (Rotax) (MICROLIGHT)	N/A	Cobra/Naked Cobra/Scout/Safari/Spirit
Aviat A series (Lycoming)	A22NM	A-1/A-1A/A-1B/A-1C-180/A-1C-200
Beaver RX series (Rotax) (MICROLIGHT)	N/A	RX-28/RX-35/RX-550/RX-650
Cessna 150 series (Lycoming)	3A19	150/A/B/C/D/E/F/G/H/J/K/L/M A150L/150M 152/A152
<b>Aircraft Type Rating</b>	<b>Reference TCDS</b>	<b>Type Variants</b>
Cessna 172 series (Continental)	3A12	172/A/B/C/D/E/F/G/H/I/J/K/L/M/N/P/Q/R/S/T
Cessna 172 series (Thielert)	3A12	Sole variant
Cessna F172 series (Continental)	A4EU	F172D/E/F/G/H/J/K/L/M/N/P
Cessna 175 series (Lycoming)	3A17	175/A/B/C
Cessna 177RG series (Lycoming)	A20CE	Sole variant
Cessna 182 series (Continental)	3A13	182/A/B/C/D/E/F/G/H/J/K/L/M/N/P/Q/R/S/T T182/T182T
Cessna 182 series (Lycoming)	3A13	R182/TR182
Cessna F182 series (Continental)	A42EU	F182P/F182Q FR182
Cessna 185 series (Continental)	3A24	185/A/B/C/D/E
Cessna 206 series (Continental)	A4CE	206/206H P206/A/B/C/D/E T206H TP206/A/B/C/D/E TU206/A/B/C/D/E/F/G U206/A/B/C/D/E/F/G
Cessna 207 series (Continental)	A16CE	207/207A/T207/T207A
Cessna 210 series (Continental)	3A21	210/A/B/C/D/E/F/G/H/J/K/L/M/N/R T210F/G/H/J/K/L/M/N/R P210N/P210R 210-5(205)/210-5A(205A)
Champion 8 (Bellanca) (Lycoming)	A21CE	8KCAB/8GCBC
Cosmos Chronus (Rotax) (MICROLIGHT)	N/A	No variant
De-Havilland DH82 (De-Havilland Gipsy series)	N/A	DH-82/A/B/C/C-2/C-4
Extreme Air XA42 (Lycoming)	EASA.A.507	No variants
GA8 Airvan series (Lycoming)	A00011LA	GA8/GAS-TC320
Glasair 1 RG (Lycoming) (Kit Aircraft)	N/A	No Variants
Jabiru series (Jabiru)	N/A	Factory J120/J160C/J170D/J230C

		Kit J160/J170/J230/J430
Kolb MkIII (Rotax) (Ultralight)	N/A	MarkIII Xtra
Partenavia P64 series (Lycoming)	N/A	P64B Oscar B/180/200 P66B Oscar 100/150 P66C Charlie P66D Delta P66T Charlie AFIC RSA 200 Falcon
Piper PA-28 Series (Lycoming)	2A13	PA-28- 140/150/151/160/161/180/181/235/236/201T PA-28S-160/180 PA-28R-180/200/201/201T PA-28RT-201/201T
Piper PA-32 Series (Lycoming)	A3SO	PA-32-260/-300/-32R-300/-RS-300 PA-32-301/-301FT/-301XTC PA-32R-300
Piper PA-38-112 (Lycoming)	A18SO	No variant
Piper J-3 Series (Continental)	A-691	J3C-40/50/50S/65/65S
Sling series Aircraft (Rotax) (Kit Aircraft)	N/A	Factory Sling LSA Kit 2kit/4kit
Thunderbird series (Rotax)	N/A	MkII/MkV/MkVI
Vans Aircraft RV series (Continental) (Kit Aircraft)	N/A	RV-3/4/7/7A/8/8A/9/9A/10/12/14/14A
Vans Aircraft RV series (Lycoming) (Kit Aircraft)	N/A	RV-3/4/7/7A/8/8A/9/9A/10/12/14/14A
<b>Aircraft Type Rating</b>	<b>Reference TCDS</b>	<b>Type Variants</b>
Windlass Trike (Rotax) (Ultra Light Aircraft)	N/A	Aquila Trike
Zenith STOL series (Continental) (Kit Aircraft)	N/A	CH701/CH750/CH801
<b>Glider</b>		
SZD-30 Pirat (Wooden construction)	N/A	SZD-30/SZD-30C
<b>Balloons</b>		
Thunder AX S1 series	BB15	AX5-41S1 AX6-56S1 AX7-65S1 / AX7-77S1 AX8-84S1 / AX8-90S1 / AX8-105S1 AX9-120S1 AX10-160S1 / AX10-180S1

END