

BRITISH CIVIL AIRWORTHINESS REQUIREMENTS

CAP 468

Section L Licensing –
Aircraft Maintenance Engineers

Issue 13

CIVIL AVIATION AUTHORITY, LONDON, OCTOBER 1997

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ISBN 0 86039 348 8

Issue 8, April 1986

Amendment No 1 to Issue 8, March 1987

Issue 9, July 1988

Issue 10, May 1991

Issue 11, April 1992

Reprinted June 1992

Issue 12, April 1993

Reprinted January 1996

Reprinted January 1997

Issue 13, October 1997

Reprinted December 1998

Reprinted March 1999

Reprinted May 2000 (incorporating Amendment No. 1 to Issue 13, October 1998)

Printed and distributed by

Westward documedia Limited, 37 Windsor Street, Cheltenham, England

SECTION L LICENSING – AIRCRAFT MAINTENANCE ENGINEERS

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SECTION L

FOREWORD

- 1 **PURPOSE** British Civil Airworthiness Requirements of which Section L is a constituent part, are published by the Civil Aviation Authority (hereinafter referred to as the 'CAA'). Section L covers the grant, extension and renewal of Aircraft Maintenance Engineers' Licences and the approval and recognition of training applicable thereto.
- 2 **INTERNATIONAL STANDARDS** The requirements of this Section L recognise the Standards prescribed by the International Civil Aviation Organisation for the grant and extension of licences.
- 3 **INTERPRETATION**
 - 3.1 Where reference is made to a Statutory Instrument or document, e.g. the Air Navigation Order or other Sections of British Civil Airworthiness Requirements (BCAR), such reference shall be taken to refer to the current issue (with amendments) of the Statutory Instrument or document.
 - 3.2 Where reference is made to Airworthiness Notices, such reference shall be taken as a reference to the current issue of the particular Notice.
 - 3.3 Mandatory clauses are invariably denoted by the use of 'shall' or 'must' whereas 'should' or 'may' are used in the text to introduce permissive or recommended clauses.
 - 3.4 It is implicit in requirements expressed qualitatively (e.g. 'acceptable') that the CAA will adjudicate in cases where doubt exists.
- 4 **EDITORIAL PRESENTATION**
 - 4.1 It is the intention that Section L will serve as a comprehensive guide to licensing procedures as a whole, related information having been included. The Chapters and their subject matter are arranged in a progressive sequence, supplemented by a series of Appendices.
 - 4.2 Related subject matter is highlighted by cross-referencing between Chapters and Appendices.
 - 4.3 The examination syllabus in subject modules is one of the series of Appendices. The modules appropriate to the licence Categories are set out in tabular form.
 - 4.4 A list of the subjects covered by the Chapters and of all Appendices is given in the CONTENTS.
 - 4.5 A system of progressive paragraph numbering is used, but the number of digits is kept to a maximum of three by associating the system with the paragraph headings. A paragraph heading applies to all succeeding paragraphs until another titled paragraph with the same, or a smaller, number of digits occurs.

FOREWORD (continued)

5 ISSUE AND AMENDMENT

- 5.1 The printed version of the Section, which is identified by an Issue No. and date (e.g. Issue 8, dated 1 March 1987) will be deemed to be amended by each BCAR Amendment which is issued subsequent to the date of Issue of the printed version. The effective date of each BCAR Amendment is indicated at the bottom of each page. (See also 6.)
- 5.2 The marginal lines in BCAR Amendments indicate material differences between them and the text in the previous version of the Section.
- 5.3 In the printed version, all Chapters revised after 5 April, 1993, have marginal lines to indicate material differences between the text of the current Chapters, Appendices and Supplements and those dated previously.

6 EFFECTIVE DATE New requirements and amendments promulgated in BCAR Amendments are effective from the date printed on them. Thus for any application made on or after the date of issue of the printed version of the Section, the effective requirements will be made up of those in the printed version of the Section including any Amendments incorporated at the time the application is made.

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CHAPTER L1 LICENCES AND CATEGORIES**1 GENERAL**

- 1.1 Under Article 13 of the Air Navigation Order (ANO) the Civil Aviation Authority may grant an Aircraft Maintenance Engineer's Licence 'subject to such conditions as it thinks fit, upon its being satisfied that an applicant is a fit person to hold the Licence, and has furnished such evidence and passed such examinations and tests as the CAA may require for the purpose of establishing that the applicant has sufficient knowledge, experience, competence and skill in aeronautical engineering'.
- 1.2 Licences are granted and extended within the defined Categories given in Table 1. Generally, there are two parts to each Category –
 - (a) Licence Without Type Rating (LWTR).
 - (b) Type Ratings.

2 LICENCE WITHOUT TYPE RATING (LWTR) (see Table 1)

- 2.1 (a) This Licence does not in itself confer any certification responsibilities or privileges. It is, however, a prerequisite for the grant of the relevant Type Ratings which confer the privileges of certification appropriate to that Type Rating.
- (b) CAA Approval of Organisations under JAR-145 and UK national requirements are described in Airworthiness Notice No 14. In general these approvals require at least an appropriate LWTR to be held before authorisation for maintenance certification may be granted. For further information reference should be made to the latest issue of that Airworthiness Notice.

3 TYPE RATINGS (See Table 2 and Airworthiness Notice No. 10)

- 3.1 General. Type Ratings confer on the holder of a Licence privileges and certification responsibilities in respect of certain aircraft registered in the United Kingdom. The certification responsibilities are described in Airworthiness Notice No. 3.
- 3.2 Type Ratings granted in Category 'C' Engines – Aeroplanes cannot be used to certify engines in rotorcraft or airships.

4 VALIDITY OF LICENCES

- 4.1 Licences are issued for a period of 2 years and renewed for a period of 5 years.
- 4.2 Use of a Licence with a Type Rating to issue a certification requires that, during the 24 months preceding the date of the certification, the holder has been engaged for periods totalling at least 6 months on work affording experience comparable with that required for the grant of the Licence.
- 4.3 The Licence holder shall be satisfied that the Licence Ratings are correct.
- 4.4 The Licence is not valid until signed in ink by the holder.
- 4.5 Under Article 13 of the ANO, Licence holders may not exercise the privileges of a Licence whilst medically unfit or under the influence of drink or drugs. Advice on this subject is given in Airworthiness Notice No 47.

5 OBSOLETE LICENCE RATINGS

Holders of Licences granted under issue 7 of BCAR Section L may continue to exercise the privileges of these ratings. However they may find that they are unable to apply for the full range of Type Ratings appropriate to the Category held and may need first to apply for the appropriate LWTRs of this issue of Section L. Information on upgrading these ratings is given in Airworthiness Notice No 46.

TABLE 1
LICENCE CATEGORIES, LWTRs and TYPE RATINGS

CATEGORIES	LICENCE WITHOUT TYPE RATING SUB-DIVISIONS	TYPE RATINGS AS DEFINED IN THE FOLLOWING PARAGRAPHS OF AIRWORTHINESS NOTICE No. 10
'A' – Aeroplanes	Aeroplanes 1* Aeroplanes 2*	Paras 5.0, 5.1, 5.5.1, 5.5 Para 5.6
'B' – Aeroplanes – Rotorcraft	Granted concurrently with a Category 'B' Type Rating only and requires a relevant Category 'A' Type Rating	Paras 5.1, 5.5.1 and 5.5 (less pressurised types and aeroplanes over 5700 kg) Paras 7.1, 7.3
'C' – Engines	Piston Engines – Aeroplanes Turbine Engines – Aeroplanes	Paras 6.3 Paras 6.4, 6.5, 6.6
'A' & 'C' – Rotorcraft	Piston-engined Rotorcraft Turbine-engined Rotorcraft	Para 7.1 Paras 7.3, 7.4
'A' & 'C' – Airships	Piston-engined Airships Turbine-engined Airships	Not granted. See para 14 of Airworthiness Notice No. 10
'D' – Piston Engines	(Granted concurrently with a Type Rating only)	Para 6.3
'X' – Electrical	Electrical	Paras 9.1, 9.2, 9.3 and 9.4
'X' – Instruments	Instruments	Paras 8.1, 8.2, 8.3 and 8.4
'X' – Automatic Pilots	Automatic Pilots – Aeroplanes Automatic Pilots – Rotorcraft	Paras 13.1, 13.2 and 13.3 Paras 13.4 and 13.5
'X' – Combined Category	Combined Category Instruments/Automatic Pilots	Paras 10.1.4, 10.1.5, and 10.1.6
'X' – Compass Compensation	Compass Compensation and Adjustment	Para 15
'R' – Radio	Communication and Navigation Radar	Para 12.2 Para 12.3

* Aeroplanes 1: Unpressurised types of any weight or pressurised types not exceeding 5700 kg.

Aeroplanes 2: Pressurised types exceeding 5700 kg.

TABLE 2

TYPE RATINGS

CATEGORY	PARAGRAPH OF NOTICE No. 10	TYPES/SYSTEMS COVERED
'A' – Aeroplanes 1	5.0+	Composite Material Aeroplanes (see NOTE below).
	5.1+	Wooden and Combined Wood and Metal Aeroplanes.
	5.5.1+	Metal Aeroplanes not exceeding 2730 kg MTWA.
	5.5+	Pressurised Metal Aeroplanes not exceeding 5700 kg MTWA and all Unpressurised Metal Aeroplanes.
'B' – Aeroplanes	5.1+	Wooden and Combined Wood and Metal Aeroplanes.
	5.5.1+	Unpressurised Metal Aeroplanes not exceeding 2730 kg MTWA.
	5.5+	Unpressurised Metal Aeroplanes not exceeding 5700 kg MTWA.
'A' – Aeroplanes 2	5.6*	Pressurised Aeroplanes exceeding 5700kg MTWA.
'C' – Engines	6.3+	Piston Engines in Aeroplanes.
	6.4+	Jet-turbine engines not exceeding a power rating of 22.25 kN (5000 lbf) in aeroplanes including, where so endorsed, the associated APU.
	6.5*	Propeller-turbine engines in aeroplanes including, where so endorsed, the associated APU.
	6.6*	Jet-turbine engines exceeding a power rating of 22.25 kN (5000 lbf) in aeroplanes including where so endorsed, the associated APU.
'D' – Engines	6.3+	Piston engines not exceeding 500KW (670bhp) in aeroplanes/rotorcraft/airships.
'A' & 'C' – Rotorcraft	7.1+	Piston-engined rotorcraft.
	7.3+	Turbine-engined rotorcraft not exceeding 2730 kg MTWA.
	7.4*	Turbine-engined rotorcraft exceeding 2730 kg MTWA.
'B' – Rotorcraft	7.1+	Piston-engined rotorcraft.
	7.3+	Turbine-engined rotorcraft not exceeding 2730 kg MTWA.

NOTES:

- (i) Aeroplanes of composite material are those in which the primary structure is of reinforced plastic/epoxy manufacture.
- (ii) A Category B licence will not be granted for composite material aeroplanes in paragraph 5.0

(Table continued)

+ Available as a complete paragraph

* Available as specific types only within the paragraph

TABLE 2 (continued)

CATEGORY	PARAGRAPH OF NOTICE No. 10	TYPES/SYSTEMS COVERED
'X' – Instruments	8.1	Aircraft having installed:- General aircraft instruments (excluding any aircraft which has installed a Flight Director)
	8.2	Smiths Flight Systems. Sperry Zero Reader ZL1, ZL2 Flight Director System.
	8.3	Flight Director Systems employing air-driven gyroscopes (attitude).
	8.4	Flight Director Systems employing electrically-driven gyroscopes (attitude) excluding those systems defined in paragraph 8.2.
'X' – Electrical	9.1	Aircraft in which the main generation system output is d.c. (including alternators having a self-contained rectifier system) and in which secondary alternators having an individual power rating not exceeding 1.5 kVA may be fitted.
	9.2	Aircraft in which the main generation system output is d.c. and which have installed 'frequency wild' alternators with an individual power rating exceeding 1.5 kVA for auxiliary services
	9.3	Aircraft in which the main generation system output is 'frequency wild' a.c. and d.c. power is supplied from transformer rectifier units.
	9.4	Aircraft in which the main generation system output is 'constant frequency' a.c. from alternators driven by constant speed drive units or variable speed constant frequency (VSCF) generator/converter systems, and d.c. power is supplied from transformer rectifier units.
'X' Combined Category (Instruments and Automatic Pilots)	10.1.4	Includes all the general instrumentation, flight director, automatic pilot, inertial navigation, compasses (excluding compensation) and ground proximity warning systems installed in aircraft listed in the relevant sub-paragraph of Notice No. 10.
	10.1.5	
	10.1.6	
'R' – Radio	12.2	Airborne Communication and Navigation Systems.
	12.3	Airborne Radar Systems.

(Table continued)

TABLE 2 (continued)

CATEGORY	PARAGRAPH OF NOTICE No. 10	TYPES/SYSTEMS COVERED
'X' –Automatic Pilots – Aeroplanes	13.1 13.2 13.3	Aeroplanes having installed:– Non radio-coupled Automatic Pilots. Radio-coupled Automatic Pilots excluding ILS coupled (LOC and GS) Automatic pilots. ILS Coupled (LOC and GS) Automatic Pilots.
– Rotorcraft	13.4 13.5	Rotorcraft having installed:– Non radio-coupled Automatic Pilots. Radio-coupled Automatic Pilots.
'X' –Compass Compensation and Adjustment	15	Compass compensation and adjustment.

CHAPTER L2 APPLICATION FOR THE GRANT OR EXTENSION OF A LICENCE**1 GENERAL**

- 1.1 This Chapter prescribes the minimum age and experience requirements, including any courses required or accepted as part of the process of determining whether a Licence be granted or extended.
- 1.2 The applicant's experience of maintenance of aircraft will be required to be of an extent and recency according to the application being made.
- 1.3 Military aircraft maintenance experience will be accepted only if gained whilst serving within the UK armed forces.
- 1.4 Satisfactory completion of a CAA-Approved ab-initio training course may vary these requirements (see Chapter L6).
- 1.5 The charges payable for the grant and extension of Licences are set out in the CAA Scheme of Charges and are summarised in Airworthiness Notice No. 25.
- 1.6 Some LWTRs may not be available after 1 June 2001 as they will be superseded by the requirements of JAR-66.

2 ELIGIBILITY

- 2.1 Prior to the grant/extension of a Licence an applicant shall be not less than:
 - (a) 20 years of age for a LWTR;
 - (b) 21 years of age for a Type Rating.An application may be made no more than three months in advance of these ages.
- 2.2 An applicant for the grant/extension of a Licence shall:
 - (a) submit an application which is acceptable in content and presentation;
 - (b) provide evidence of acceptable experience and any training course requirements relevant to the application;
 - (c) be able to read, write, interpret technical reports and carry out technical discussions in the English language;
 - (d) reach a satisfactory standard in any examinations required;
 - (e) pay the appropriate fee.

3 APPLICATION FOR A LICENCE WITHOUT TYPE RATING (LWTR)

- 3.1 An application for the grant or extension of a Licence Without Type Rating should be made on Form AD 300, an example of which is shown in Appendix 3. Applicants should ensure that they use forms of the current version. These are available from the CAA, Engineer Licensing, Aviation House, Gatwick Airport South, West Sussex RH6 0YR or any CAA UK Regional Office (see Airworthiness Notice No. 29).
- 3.2 Section 5 of the Form AD 300 requires information on the nature of experience, the periods during which the experience has been gained and the signatures required in confirmation. Documents pertaining to service in the UK Armed Forces, completion of aeronautical engineering courses, foreign licences and professional qualifications should be submitted to the CAA in support of the application when relevant. If copy documents are submitted these shall be countersigned by the

person who confirms the experience on the Form AD 300. For certain certificates and qualifications, the CAA may grant partial exemption from the licence examinations. Details of these are given in the Guidance Notes for the Form AD 300.

3.3 If the application is acceptable the applicant will be advised, in the case of a written examination, of the venue and time of the sitting. In the case of an oral examination, the applicant will normally be asked to contact the appropriate CAA UK Regional Office and make arrangements for the examination on a mutually convenient date.

3.4 LWTR Sub-Divisions may be applied for in any order with the exception of:

- (a) Category 'A' Aeroplanes 1 which will be granted only in combination with either Category 'C' Piston Engines – Aeroplanes or Category 'C' Turbine Engines – Aeroplanes, as requested and according to experience.
- (b) Category 'C' Piston Engines – Aeroplanes which will be granted only in combination with Category 'A' Aeroplanes 1 or, where experience has been gained on piston-engined aeroplanes which fall within the classification of Aeroplanes 2, in combination with Category 'A' – Aeroplanes 2.
- (c) Category 'R' which requires that the LWTR Sub-Division Radio Communication and Navigation is held before the Licence can be extended to include Category 'R' Radio Radar.
- (d) Category 'X' – Compass Compensation and Adjustment Category 'X' which requires an applicant to hold any LWTR in Categories 'A', 'C', 'X' or 'R'. The applicant is required to have a minimum of 6 months engineering experience relating to the maintenance of operating aircraft in the 2 years preceding the date of application.
- (e) Category 'B' (see paragraph 4.2.2).

4 EXPERIENCE REQUIREMENTS – LWTR

4.1 Categories – A, C, X and R

Applications for the grant or extension of a Licence in any of these Categories (except Category 'X' – Compass Compensation and Adjustment, for which see paragraph 3.4) must show confirmed minimum specific periods of aviation maintenance engineering experience totalling 4 years.

4.1.1 Applications must also show the following minimum experience, which must have been gained whilst maintaining operating aircraft and not in component workshops or on static or non-flying aircraft:

- (a) for a Category 'A' and/or 'C' LWTR, 36 months relating to Airframe and/or Engine maintenance, 12 months of which must be in the 2 years immediately preceding the date of application.
- (b) for any Category 'R' and/or 'X' LWTR (excluding Category 'X' – Compass Compensation and Adjustment), 36 months related to avionic systems, 12 months of which must be in the 2 years immediately preceding the date of application.
- (c) 6 months, within the 12 months referred to in (a) and (b), relevant to the specific LWTR for which application is being made.

4.1.2 Where an applicant for Category 'X' Electrical holds a valid Licence which includes both Category 'A' and Category 'C' LWTR sub divisions, the experience in paragraph 4.1.1(b) above need not be complied with and the applicant need

show only the 6 months experience relevant to the LWTR required in paragraph (c).

4.1.3 Any of the periods specified in this paragraph may be concurrent.

4.2 Category 'B'

4.2.1 Applications for Category 'B' Aeroplanes or Rotorcraft must show confirmed minimum specific periods of:-

- (a) 12 months, within the 2 years immediately preceding the date of application, major maintenance/major repair/overhaul activity on aircraft in paragraphs 5.1, 5.5.1, 5.5, 7.1 or 7.3 of Airworthiness Notice No. 10,
or
- (b) 2 years, within the 3 years immediately preceding the date of application, maintenance management of aircraft in paragraphs 5.1, 5.5.1, 5.5, 7.1, 7.3 of Airworthiness Notice No. 10, including some major maintenance/major repair/overhaul activity.

These alternative experience requirements will be additional to, but may have been obtained concurrently with, the experience required for the prerequisite Category 'A' Licence.

4.2.2 An applicant for the grant or extension of a Licence to include Category 'B' must hold the equivalent LWTR in Category 'A' Aeroplanes or Category 'A/C' Rotorcraft, together with the equivalent Type Rating(s).

4.2.3 Category 'B' LWTR is only granted concurrently with an appropriate Type Rating.

4.3 Category 'D'

4.3.1 Applications for grant/extension of a Licence in Category 'D' must show confirmed minimum periods of:-

- (a) 4 years overhaul of aircraft piston engines, 12 months of which must be in the 2 years immediately preceding the date of application,
or
- (b) 2 years use of a Category 'C' Type Rated Licence on piston engines in aircraft and 12 months, within the 2 years immediately preceding the date of application, overhaul of aircraft piston engines.

4.3.2 Category 'D' LWTR is only granted concurrently with an appropriate Type Rating.

4.4 Where in a particular case, the LWTR or Sub-Division syllabus covers systems or subjects which may not be encountered necessarily by an applicant, specific practical experience on that subject or system will not be required, provided that the general area of the LWTR/Sub-Division is supported by experience; for example in the case of:-

- (a) LWTR Turbine Engines-Aeroplanes, experience of propellers may not have been gained;
- (b) LWTR Instruments, experience of INS may not have been gained;
- (c) LWTR Electrical, experience of a.c. power may not have been gained.

However acceptance of an application lacking experience in these subjects will not exclude these subjects from the examination.

5 APPLICATION FOR A TYPE RATING

- 5.1 Type Ratings are designated within paragraphs of Airworthiness Notice No. 10 and the paragraphs relate to the various Licence Categories. For the purpose of this Chapter, the Types/Systems covered by the Type Ratings are summarised in Table 2 (Chapter L1).
- 5.2 An application for a Type Rating in respect of the type of aircraft, engine or system will be considered provided that:—
- (a) the appropriate LWTR is held or is being applied for simultaneously (see Table 1 Chapter L1). In the latter case the Type Rating will not be granted until the appropriate LWTR is held;
 - (b) the aircraft is of a type, or the engine or system is installed in a type that is registered in the United Kingdom and in respect of which a United Kingdom Certificate of Airworthiness is in force or has been applied for;
 - (c) the application is **not**:
 - (i) for an aircraft type, engine or system described in, or considered by the Authority to fall within the description of paragraph 14 of Airworthiness Notice No. 10;
 - (ii) in Category 'B', for
 - (A) a pressurised Aeroplane, or
 - (B) an Aeroplane in which the primary structure is of reinforced plastic/epoxy manufacture, or
 - (C) an Aeroplane having a MTWA exceeding 5700 kg (12,500 lb), or
 - (D) a Rotorcraft having a MTWA exceeding 2730 kg (6,000 lb);
 - (iii) in Category 'D', for Piston Engines with a power rating exceeding 670 BHP (500 kW) or for any jet or propeller turbine engine.
 - (d) notwithstanding any exclusion by paragraph (b) or c(i) above, the application may be considered where a JAR-145 approved organisation in the UK can show a requirement for a type rating to permit certification authorisation under JAR-145.
- 5.3 For Type Ratings indicated '+' in Table 2 Chapter L1, an application may be made for the paragraph itself or for specific types of Aeroplanes, Rotorcraft or Engines within the paragraph.
- 5.4 The Type Ratings within paragraphs 5.6, 6.5, 6.6 and 7.4 of Airworthiness Notice No. 10 are available only as specific types of Aeroplane, Rotorcraft or Engine and therefore are not available as a paragraph.
- 5.5 The assessment procedure for the grant of a Type Rating varies according to the particular Type Rating required and may take the form of an oral examination, completion of a CAA Recognised Course or assessment of experience alone. Where satisfactory completion of a CAA Recognised Course is required normally, the CAA may decide in a particular circumstance that an oral examination should be carried out either in lieu of the course or in addition to it.
- 5.6 The application procedure to extend a licence to include a Type Rating is similar to that described in paragraph 3, except that the application Form AD 300 must be accompanied by a Form AD 301 Type Rating Record of Experience (see Appendix 4).

5.6.1 The certification required in Section 10 of Form AD 300 shall be made by an engineer, acceptable to the CAA, who shall normally have had regular professional contact with the applicant and who has held a United Kingdom Licence, in the discipline for which application is made, for a minimum period of 24 months. The Licence must be valid. The signatory may be an experienced person other than an appropriately licensed engineer with the prior agreement of the CAA Engineer Licensing Department.

5.6.2 Where the applicant is required to undergo a CAA Recognised Course, the applicant must give details on the Form AD 300 and submit a copy of the appropriate Certificate.

6 EXPERIENCE REQUIREMENTS – TYPE RATINGS

6.1 Subject to paragraph 6.2, extension of a Licence to include a Type Rating does not normally require a period of general experience additional to that required for the relevant LWTR, which must be held before a Type Rating will be granted (see Table 1 Chapter L1). However a satisfactory Record of Experience appropriate to the Type applied for must be submitted as part of the application for a Type Rating (see paragraph 5.6 and Appendix 4). The experience shown on it must have been gained within the three years before the application.

6.2 An application for a Type Rating from a holder of an LWTR which was gained following successful completion of an Approved Ab initio Course must show confirmed evidence that he or she has obtained at least 12 months relevant aircraft engineering experience with an organisation engaged upon the maintenance of operational aircraft in addition to that gained during the Course.

6.3 Category 'A', 'B', 'C' and 'D' Type Ratings

6.3.1 For:

Category 'A' – Aeroplanes in paragraphs 5.0, 5.1, 5.5.1, or 5.5 of Airworthiness Notice No. 10;

Category 'B' – Aeroplanes in paragraphs 5.1, 5.5.1 or 5.5 of Airworthiness Notice No. 10 which are not over 5700 kg or not pressurised;

Category 'B' – Rotorcraft in paragraphs 7.1 or 7.3 of Airworthiness Notice No. 10;

Category 'C' – Engines in paragraph 6.3 of Airworthiness Notice No. 10;

Category 'D' – Engines not more than 500 kW (670 BHP) in paragraph 6.3 of Airworthiness Notice No. 10;

Categories 'A/C' – Rotorcraft in paragraph 7.1 of Airworthiness Notice No. 10.

(a) A Type Rating will normally be granted subject to a satisfactory oral examination on those items in the modular syllabus applicable to the Category/Type Rating.

(b) Where application is made for the paragraph itself, the Record of Experience referred to in paragraph 6.1 must provide satisfactory evidence of relevant experience of at least 1 year on a minimum of two types of aeroplanes, rotorcraft and/or engines, as appropriate, of different manufacturers within that paragraph. The types must be representative of those within the paragraphs and one type must satisfy the following criteria:

For paragraph 5.5.1: Aeroplanes having retractable landing gear but not necessarily pressurised.

For paragraph 5.5: Aeroplanes over 2730 kg and having retractable landing gear, but not necessarily pressurised.

For paragraph 6.3: Engines that are supercharged/turbocharged.

Where application is made for a specific type only, the Record of Experience (see Appendix 4) need only cover that specific type.

6.3.2 For:

Category 'A' – Aeroplanes in paragraph 5.6 of Airworthiness Notice No. 10.

Category 'C' – Engines in paragraphs 6.4, 6.5 and 6.6 of Airworthiness Notice No. 10.

Category 'A' and 'C' – Rotorcraft in paragraphs 7.3 and 7.4 of Airworthiness Notice No. 10.

- (a) A Type Rating will normally be granted subject to evidence of satisfactory completion either of a CAA Recognised Course (See Chapter L5) covering the Type Rating or of a type training course to ATA 104 level 3 covering the Type Rating and carried out by a suitably approved JAR-147 Approved Maintenance Training Organisation approved by a JAA full member Authority. In either case the course should have been completed within the 3 years immediately preceding the date of application.
- (b) Application may be made only for specific types of Aeroplanes, Rotorcraft and/or Engines listed in paragraphs 5.6, 6.5, 6.6 and 7.4 and not for the paragraph itself.
- (c) Applications will be considered for paragraphs 6.4 and 7.3 or for specific types of Engine or Rotorcraft covered by the paragraph. Where application is made for the paragraph, the Record of Experience must provide satisfactory evidence of relevant experience of at least 1 year on a minimum of two types of Engines and/or Rotorcraft by different manufacturers within that paragraph. The types must be representative of the paragraph. Where application is made for a specific type only, the Record of Experience need only cover that specific type.

6.3.3 Application for one of the paragraphs 5.0 (Category A only), 5.1, 5.5.1, 5.5, 6.3, 6.4, 7.1 or 7.3, may be accepted without examination for the paragraph itself, or without a training course for the paragraph itself, provided that:

- (a) The applicant has obtained two Type Ratings of aircraft and/or engines of different manufacturers, representative of types within the paragraph, and
 - (i) For paragraphs 5.5.1, 5.5 and 6.3, one of the Type Ratings must satisfy requirement (c) below.
 - (ii) For paragraph 7.3, engine types by two different manufacturers is required.
- (b) The applicant must show confirmed experience of 2 years maintenance of aircraft and/or engines within the paragraph. For paragraphs 5.5.1, 5.5 and 6.3, 1 year must be on types satisfying requirement (c).
- (c) For paragraph 5.5.1: Aeroplanes having retractable landing gear but not necessarily pressurised.

For paragraph 5.5: Aeroplanes over 2730 kg, and having retractable landing gear, but not necessarily pressurised.

For paragraph 6.3: Engines that are supercharged/turbocharged.

6.4 Category 'X' Type Ratings

6.4.1 Category 'X' – Instruments. A Type Rating for any of the paragraphs 8.1, 8.2, 8.3 or 8.4 of Airworthiness Notice No. 10 will be granted subject to a satisfactory oral examination on those items in the modular syllabus applicable to the Category and to the Type Ratings.

6.4.2 Category 'X' – Electrical

(a) A Type Rating for any of the paragraphs 9.1, 9.2 or 9.3 of Airworthiness Notice No. 10 will normally be granted subject to a satisfactory oral examination on those items in the modular syllabus applicable to the Category and to the Type Ratings.

(b) A Type Rating in paragraph 9.4 of Airworthiness Notice No. 10 will normally be granted subject to evidence of satisfactory completion either of a CAA Recognised Course (See Chapter L5) covering the Type Rating or of a type training course to ATA 104 level 3 covering the Type Rating and carried out by a suitably approved JAR-147 Approved Maintenance Training Organisation approved by a JAA full member Authority. In either case the course should have been completed within the 3 years immediately preceding the date of application.

6.4.3 Category 'X' – Automatic Pilots – Aeroplanes or Rotorcraft. A Type Rating for any of the paragraphs 13.1, 13.2, 13.3, 13.4 and 13.5 of Airworthiness Notice No. 10 will normally be granted subject to a satisfactory oral examination on those items in the modular syllabus applicable to the Category and to the Type Ratings.

6.4.4 Category 'X' – Combined Category Instruments/Automatic Pilots. 'X' Combined Category LWTR is a prerequisite for the grant of any of the Combined Category Type Ratings listed in paragraph 10 of Airworthiness Notice No. 10. Such a Type Rating will normally be granted subject to evidence of satisfactory completion either of a CAA Recognised Course (See Chapter L5) covering the Type Rating or of a type training course to ATA 104 level 3 covering the Type Rating and carried out by a suitably approved JAR-147 Approved Maintenance Training Organisation approved by a JAA full member Authority. In either case the course should have been completed within the 3 years immediately preceding the date of application.

6.4.5 Category 'X' – Compass Compensation and Adjustment. A Type Rating for paragraph 15 of Airworthiness Notice No. 10 will normally be granted to holders of any Type Rated Licence in Categories 'A', 'C', 'X' or 'R' subject to the provision of evidence of compass swings, which have included compensation of compasses, on four aircraft within the preceding 12 months.

6.5 Category 'R' Type Ratings A Type Rating for paragraph 12.2 or 12.3 of Airworthiness Notice No. 10, will normally be granted subject to assessment by the CAA of the Record of Experience required in paragraph 6.1.

CHAPTER L3 EXAMINATIONS

- 1 **GENERAL** This Chapter provides information on the examinations appropriate to the grant or extension of Licences. The information in relation to LWTRs in particular may not apply to candidates who have completed successfully an Approved Ab initio Course. Such candidates should consult Chapter L6.
- 2 **LICENCE WITHOUT TYPE RATING**
 - 2.1 An applicant for an LWTR will be examined on those modules of the syllabus in Appendix 1 which are applicable to the Category/Sub-Division, less those modules previously satisfied by an existing LWTR held on a valid Licence.
 - 2.2 The examination for the grant of a Licence will normally be in two parts: (i) a written examination, comprising a multi-choice question paper and an essay question paper, and (ii) an oral examination. All papers of the written examination must be taken at one sitting. The oral examination can only be taken after the written examination has been passed and normally must be taken within 3 months of the written examination.
 - 2.3 The examination format for licence extension to include an LWTR is the same as that described in paragraph 2.2 but where an oral examination is part of the examination process the candidate normally will not be required to take an essay paper. However in the case of Categories 'B' or 'D' an essay paper is taken instead of a multi-choice paper.
 - 2.4 Category 'X' – Compass Compensation and Adjustment does not normally require an oral examination.
 - 2.5 The Authority may grant exemption from parts of the written examination to holders of particular qualifications: details are given in the Guidance Notes to the Form AD300.
 - 2.6 Technical manuals or other similar documentation are not used for reference purposes during the examination. Calculators or similar devices are not permitted to be used during examinations.
- 3 **TYPE RATINGS**
 - 3.1 The assessment procedure for Type Ratings is set out in paragraphs 5 and 6 of Chapter L2. Where an oral examination is required it will cover those items of the modular syllabus appropriate to the Type Rating.
 - 3.2 Concurrent applications for an LWTR and an associated Type Rating where both require an oral examination will result in one oral examination covering both aspects following a satisfactory written examination covering the LWTR aspects only.
- 4 **THE EXAMINATIONS**
 - 4.1 **General.** Examinations are either written or oral or both and information on their format is given below. Candidates should expect to be examined on the complete syllabus appropriate to the rating regardless of whether or not they have experience on particular systems.

- 4.2 Candidates should be prepared to show proof of identity, such as a passport or an identity pass, when attending for examination.
- 4.3 **Written Examination.** The time allowed for each examination paper is shown on the answer sheet which the candidate must sign. Each question in the written examination is worth equal marks; the pass mark is 75% in each module and 70% in the essay paper. Copies of past papers are not published but sample questions are shown in Appendix 5.
- 4.3.1 **Multi-Choice Paper.** Examination question booklets, which include instructions, are provided to candidates together with an answer sheet (see Appendix 6). Each question comprises an introductory statement and three alternative answers designated (A), (B) and (C) printed below the statement. Only one of these answers is totally correct, the remaining two answers are incorrect or incomplete in some definite aspect.
- 4.3.2 **Essay Paper.** This paper tests the candidate's ability to read, write and express himself in technical English and comprises a number of questions each with an allocated space in which the candidate is required to write the response. Some questions will cover basic principles and practical features appropriate to systems and/or components but in the main they will relate to maintenance and inspection aspects, condition assessment, functional checking, trouble-shooting procedures and maintenance certification.
- 4.4 **Oral Examination.** The oral examination is the final stage in the examining process for the grant or extension of an LWTR and, where appropriate (see paragraph 3.1), for extension to include Type Ratings. The examinations are conducted by Surveyors at CAA Regional Offices at times mutually agreed.
- 4.4.1 An LWTR oral examination covers both theoretical and practical aspects, with emphasis on typical maintenance practices and troubleshooting, of a sample from the syllabus modules appropriate to the Category of Licence, and within the levels indicated in Appendix 1.
- 4.4.2 An oral examination for a Type Rating is based on those items of the syllabus applicable to the Category and Type Rating (see Appendix 1), emphasis being placed on practical aspects. Areas of work itemised by the candidate in the Type Rating Record of Experience will be included in the examination.

5 FAILURE AND PARTIAL PASSES

- 5.1 **LWTR.** A candidate who wishes to reapply after any failure of an examination must complete and submit a Form AD 300, showing a further 2 months experience applicable to the LWTR and obtained since the date of the failure.
- 5.1.1 Following a written examination failure a candidate will be required to retake at the next attempt at the examination all multi-choice and/or essay papers appropriate to the LWTR, less any passed and credited under paragraph 5.1.2 or any for which the candidate continues to hold valid exemption.
- 5.1.2 A candidate who passes any multi-choice paper or essay paper of a written examination but who fails to achieve a pass overall may hold the pass(es) in credit for 12 months from the date of the examination. Any subsequent passes in other parts of the examination achieved during this period will also be held in credit provided that a pass in all papers applicable to the LWTR (including module 1 if applicable) is achieved within 12 months of the first pass. A candidate who does not achieve a pass in all elements of the written examination

relevant to the LWTR within the 12 months since the first pass was achieved will be required to resit all parts of the written examination at the next attempt. If a candidate has separate applications for different LWTRs in progress at a time, the examinations for the respective LWTRs will be treated separately and passes may not be transferred between them.

- 5.1.3 A candidate is allowed two successive attempts at an oral examination for an LWTR provided that the second attempt takes place within one year of the first attempt. A candidate who fails the second attempt at the oral examination may be required to take or retake the appropriate written examination, notwithstanding that the candidate may have been granted exemption from all or part of the written examination originally.
- 5.1.4 Where a candidate has applied for both Category 'R' Radio Communication/Navigation and Category 'R' Radio Radar and fails the examination for only the former, the pass in Radio Radar will be held for 12 months from the examination. If the candidate does not achieve a pass in Radio Communication/Navigation within this time the pass in Radio Radar will lapse.
- 5.2 **Type Rating.** A candidate who has failed a Type Rating oral examination and wishes to be re-examined, should complete a further copy of Form AD 300, and submit it together with a Form AD 301 Type Rating Record of Experience listing items of experience since the previous application.
- 5.3 **Failure Guidance** Candidates may request guidance following failure of an oral examination. However the Authority is unable to offer any beneficial guidance on failure of written examinations beyond the marks shown on the failure notification. Requests must be made in writing to the CAA Engineer Licensing Department and guidance will be supplied only in writing.

CHAPTER L4 LICENCE RENEWAL

- 1 **GENERAL** A Licence may be renewed as described below provided that the holder provides evidence of having been engaged on the maintenance of operating aircraft for periods totalling at least 6 months during the 12 months before application for renewal. Where a Licence holder is unable to show such experience but has been involved actively for the same minimum period in matters concerned with aircraft maintenance (e.g. as a quality engineer or quality manager, an aeronautical engineering instructor or as a flight engineer) consideration will be given to renewing the Licence.

- 2 **RENEWAL**

- 2.1 It is the responsibility of the Licence holder to ensure that his or her Licence remains valid. However, approximately two months before the expiry date of a Licence, a renewal form (AD 302) will be sent to the holder at the last address registered with the Engineer Licensing Department of the CAA. For this reason, and to be sure of receiving copies of amendments to Airworthiness Notices, it is important for Licence holders to notify changes of address promptly. On completion, the form should be returned with the appropriate fee to the address shown on it. Applications for renewal will not be accepted more than 60 days before expiry of the Licence.
- 2.2 A Licence cannot be back-dated and in order to ensure continuity of Licence coverage an acceptable application for renewal must be received by the CAA in good time before expiry of the Licence. Any lack of continuity in the validity of the Licence will be recorded on the renewed Licence. Any certifications issued after a Licence has lapsed could affect the validity of the Certificate of Airworthiness of the aircraft for which those certifications were issued.
 - 2.2.1 If certification has been made under the authority of a Licence which has lapsed, the Licence will not be renewed until a statement has been made that all such certifications have been recertified by the holder of a valid Licence. This statement must be made by the owner of the aircraft or by the maintenance organisation(s) responsible for the maintenance of the aircraft since the invalid certification was made.
 - 2.2.2 If certification has been made under the authority of a Company Authorisation based upon the certifier holding a valid Licence which had lapsed at the time the certification was made, the Licence will not be renewed until a statement has been made that all such certifications have been recertified by the holder of a valid Company Authorisation. This statement must be made by the Quality Manager of the approved maintenance organisation(s) responsible for the maintenance of the aircraft since the invalid certification was made.
- 2.3 The CAA can only renew a Licence upon being satisfied with the renewal submission and upon the receipt of the statutory fee. The charge payable will be shown on the application form. Licences are renewed for a period of five years.

- 3 **EXPIRED LICENCES**

- 3.1 A Licence which has lapsed for less than 2 years will be considered for renewal without examination of the holder provided that the other requirements of this Chapter are met.

- 3.2 A Licence which has lapsed for more than 2 years will not be renewed without examination of the holder. The amount of recent experience required will depend on the length of time since the licence lapsed and the nature of employment. Application for the re-issue of the Licence should be made in accordance with the procedures in Chapter L2. Examination details appropriate to the circumstances will be notified by the CAA. The extent of the examination will generally be dependent on the nature of the holder's employment since the Licence was last renewed and on the degree to which such employment can be considered by the CAA as comparable to those privileges for which the Licence was valid.

CHAPTER L5 RECOGNISED TYPE TRAINING

1 GENERAL

- 1.1 For the extension of a licence to include Type Ratings in paragraphs 5.6, 6.4, 6.5, 6.6, 7.3, 7.4, 9.4 and 10 of Airworthiness Notice No.10, the applicant shall have completed satisfactorily a type course recognised by the CAA. This Chapter sets out the requirements for the recognition of such courses.
- 1.2 An organisation applying for recognition of a type training course must be a United Kingdom Operator, United Kingdom Maintenance Organisation or a CAA Approved Maintenance Company. Recognition must also be requested for Manufacturers' Courses or other contracted out courses, ensuring that such training meets the Maintenance Organisation's needs for its employees. It may be necessary in these circumstances to supply additional training on those areas of the Section L syllabus that are not covered.
- 1.3 An applicant for a type rating referred to in paragraph 1.1 will normally be employed by the company requesting course recognition. However an application may be made by an engineer not employed directly by an organisation described in paragraph 1.2 provided that the applicant has completed successfully a CAA recognised course applicable to the type rating applied for and satisfies the experience requirements set out in Chapter L2.

2 REQUIREMENTS

- 2.1 Where the training is conducted internally the organisation shall nominate a manager of training and ensure that an adequate number of suitably qualified instructors are available. Training personnel must be provided with appropriate information to keep them up to date. Appropriate administrative support must be provided. Suitable facilities including classrooms, training aids and demonstration equipment shall be made available. Each course will cover at least the appropriate Type requirements shown in Appendix 1. Assessment of the standard attained at the end of each distinct phase of the course must be made and a final examination must also be conducted.
- 2.2 Where the training is contracted out, the organisation seeking recognition will be responsible for ensuring that standards equivalent to those in paragraph 2.1 are met.

3 APPLICATION FOR GRANT OF RECOGNITION

- 3.1 An organisation requiring recognition must submit an application on form AD 681R, copies of which are obtainable from the Engineer Licensing Department of the CAA. Following receipt of the application and other supporting documentation, the CAA will decide the level of investigation and assessment of training facilities and programmes, in accordance with the requirements of paragraph 2. No fee is payable for the grant of Recognition of Courses.

4 CONTINUANCE OF RECOGNITION

- 4.1 The training organisation shall be maintained at an acceptable standard and material changes in staff, syllabuses or facilities shall be notified to the CAA. Recognition shall become invalid if any of the information supplied on the AD 681R is no longer correct. To ensure that these requirements are being met the CAA shall have access to the training organisation and its records at any reasonable time.
- 4.2 CAA Recognition of training courses will normally be valid for a period of 3 years. No renewal reminder will be sent. To renew the recognition, the training organisation must submit a fresh AD681R. If none is received, the CAA recognition of the course concerned will lapse automatically.

5 JAR-147 APPROVED MAINTENANCE TRAINING ORGANISATIONS

A type course carried out to ATA 104 level 3 (Category B1 or B2 equivalent in JAR-66) by a JAR-147 Approved Maintenance Training Organisation which is appropriately approved by a JAA full member Authority for that aircraft type may be accepted in lieu of a CAA Recognised Course. Although such a course may cover the full JAR-66.45 Category B1 or B2 type training requirements, the privileges of the type rating for a Licence granted under Section L may be restricted to those of the LWTRs held.

CHAPTER L6 APPROVED AB INITIO TRAINING

- 1 INTRODUCTION** This Chapter details the requirements to be satisfied by Training Organisations seeking Approval of ab-initio courses giving basic aircraft engineering training and preparing students for CAA examinations for the grant of Categories 'A', 'C', 'X' or 'R' LWTRs. It also gives information on the application procedures and requirements for students completing such courses where they differ from those specified elsewhere in this document.

2 APPROVAL OF TRAINING COURSES

2.1 Training courses may be approved within:-

- (a) Mechanical Categories ('A', 'C' and may include 'X' Electrical) and/or
- (b) Avionic Category 'X' (excluding Compass Compensation and Adjustment) and Category 'R'.

The Approval granted will be related to one or more LWTR Categories only. No approval will be granted in relation to any Type Rating.

- 2.2** Applications for Approval of a training course covering periods of training of not less than 24 months for any acceptable group either of mechanical category LWTRs or of avionic category LWTRs will be considered. Applications for variations from the basic courses will be assessed by the CAA which may require adjustment of course duration. The inclusion of additional LWTRs will require consideration of extra theoretical and practical training.

- 2.3** Application shall be made on Forms AD 458 and 681, copies of which are obtainable from the Engineer Licensing Department of the CAA. The information to be provided relates to the requirements set out in this Chapter. On completion, the forms and other relevant training documentation, including the proposed company exposition, should be sent for assessment to the Engineer Licensing Department with the appropriate fee.

3 REQUIREMENTS FOR APPROVAL

3.1 Nominated personnel. The applicant for approval shall nominate the following:

- (a) a responsible person and deputy whose functions will include co-ordination of all appropriate departments to ensure compliance with the Authority's requirements and that the training is carried out in a satisfactory manner. If the nominated person lacks an aircraft maintenance background or experience, the applicant must ensure that such person is supported by a member of the instructional staff appointed to advise on all technical aspects of training.
- (b) departmental heads as appropriate to the training conducted.
- (c) a sufficient number of instructional staff, whose experience and qualifications shall be acceptable to the CAA, to carry out the training adequately. Account shall be taken of the instructor/student ratio. It will normally be required that personnel experienced in civil aircraft maintenance procedures are employed to supervise the practical training. The organisation shall establish a programme to provide periodic update training for instructors which may include attendance at seminars, type training or observation of maintenance.
- (d) examiners and signatories of course certificates.

3.2 **Company exposition.** The applicant shall provide an exposition of the organisation which shall include the following information:

- (a) the structure of the organisation, the terms of reference of senior and nominated personnel and the associated lines of responsibility.
- (b) a list of instructional staff.
- (c) addresses of locations at which training is carried out and a general description of the facilities available at each site.
- (d) a list of the courses approved by the CAA.
- (e) the procedures for notification of changes to the organisation.
- (f) the amendment procedure for the exposition and associated manuals.
- (g) the procedures, including details of the management and control systems, which the organisation has instituted to ensure compliance with the requirements for the Approval(s) held.

The exposition may be supplemented by a separate procedures manual which gives detailed guidance on the various procedures.

3.3 **Facilities and equipment**

3.3.1 The accommodation provided for classrooms, workshops and/or demonstration areas and administrative offices shall be acceptable to the CAA.

3.3.2 The number of classrooms and workshops (and/or demonstration areas) shall be satisfactory when considered in relation to the intended maximum number of students. Heating, lighting and noise insulation shall be to acceptable standards. Suitable arrangements shall be made for cleaning and maintenance. Classroom furniture, wall boards and equipment shall be to an acceptable standard.

3.3.3 Appropriate teaching, demonstration and projection facilities shall be available and shall be maintained to a satisfactory standard. Storage facilities shall be provided for equipment not in use.

3.3.4 Workshops shall be provided with basic equipment and hand tools appropriate to the training being given. Instructional equipment, airframes, engines and components sufficient to support the practical training specified in the approved course syllabus shall be provided. Such equipment shall be representative of the technology in current use and appropriate to the licence category for which training is being given.

3.3.5 Unless agreed otherwise with the CAA, a library shall be provided for the use of staff and students. Sufficient technical material to support the training given shall be provided. This should include relevant CAA publications, typical type related maintenance documentation and other general publications and documents. A nominated person shall be responsible for keeping the material up to date and for ensuring that the facility is maintained to a satisfactory standard.

3.4 **Training**

3.4.1 An acceptable course entry standard, which shall include competence in written and spoken English, shall be specified.

3.4.2 Detailed course syllabuses shall be submitted to the CAA for approval. Syllabuses shall be compatible with the relevant examination requirements of Appendix 1.

3.4.3 Detailed lesson plans shall be produced showing all practical and theoretical training periods, their durations and the subjects covered.

3.4.4 Lecture notes, diagrams and other training material supplied shall be prepared in accordance with an agreed procedure and shall be accurate at the time they are given to the students. Where no provision is made for subsequent amendment, written warning must be given to this effect. Care should be taken to ensure that such material is clear and legible.

3.4.5 An adequate period of the course must be spent in experience of the maintenance of representative operational aircraft/engines/systems as appropriate to the course. For a course covering one or two LWTR sub divisions this must be a minimum of six months (26 weeks) duration. Where the course covers more than two sub divisions this period will be extended by two months for each additional sub division. It is essential that the student gains a representative mix of experience, to a reasonable depth and complexity, reflecting the sub divisions being taken. This experience must be managed and monitored by the training organisation in accordance with an agreed procedure and records must be maintained by the organisation. Students are expected to maintain a logbook, to be countersigned appropriately, showing the experience gained. With the agreement of the CAA, this experience may be obtained at a suitable maintenance organisation, subject to a written agreement between the two organisations and acceptable arrangements for liaison and supervision of the students being in place.

3.4.6 Daily attendance records shall be maintained and held available for CAA inspection.

3.4.7 The process of monitoring students' progress shall be defined and the required standards shall be specified by the training organisation. Such monitoring shall include periodic reviews and the identification of any action required to correct any shortfall in a student's performance. A record of all reviews shall be kept.

3.5 Examinations

3.5.1 The training organisation shall establish an examination and assessment system to check the progress of each student and to demonstrate that the student has achieved a satisfactory level of knowledge and skill. This system shall be managed and monitored in accordance with procedures agreed with the CAA. An assessment shall be held at the conclusion of each section or phase of training.

3.5.2 A final assessment, representative of all subjects undertaken, will be carried out. As a minimum this will be a written examination, of multiple choice questions and essay type papers, but may be supplemented by an oral examination. The examinations shall be set at a level equivalent to the CAA examinations. This final assessment shall determine whether the student has achieved a satisfactory understanding of the subjects within the LWTRs sufficient to enable an application for those LWTRs to be made to the CAA.

3.5.3 Examination papers shall be prepared by nominated individuals within the organisation. Papers may be prepared from a question databank for each examination sitting or a sufficient stock of papers may be held. Examination papers shall cover the complete syllabus or section of the syllabus concerned. Examples of examination papers shall be submitted to the CAA for assessment. Each paper shall be identified with a reference number, issue or revision number and serial number. Records of papers shall be maintained. The papers used in any particular examination shall be decided by a nominated examiner or supervisory staff other than the instructor of the subject. Completed examination papers shall be made available to the CAA on request.

- 3.5.4 A system for the management of the development, review and amendment of questions shall be established and records maintained. A regular programme of analysis of examination questions shall be arranged under the direct supervision of a senior member of staff. The questions shall be reviewed against students' answers and to ensure that they reflect adequately new systems and advances in technology. Records of such reviews shall be kept.
- 3.5.5 Examination databanks shall be kept secure and protected from unauthorised access by adequate computer security means. Examination papers and databank printouts shall be kept in locked cabinets under the control of supervisory staff.
- 3.6 **Records.** Unless agreed otherwise with the CAA, examination papers shall be retained for a minimum of five years. Examination records shall not be destroyed without the written agreement of the CAA. Student records and other records required to be kept under the Approval shall be retained for such time as agreed with the CAA.

4 REQUIREMENTS FOR MAINTENANCE OF THE APPROVAL

- 4.1 An Approval granted under this Chapter shall be valid for a year but may be renewed subject to the following conditions:
- (a) the organisation continues to satisfy the requirements for the grant of Approval.
 - (b) any changes to the nominated personnel are notified in writing to and have been accepted by the CAA.
 - (c) the exposition and procedures required under this Chapter are reviewed periodically by the organisation and any necessary amendments promulgated.
 - (d) payment of the appropriate charge.
- 4.2 The Approved Organisation shall adhere to the agreed procedures set out in its exposition. Any variation to these procedures shall have the prior agreement of the CAA.
- 4.3 The CAA will carry out periodic audits of the structure and procedures of the organisation. Any deficiencies noted during an audit will be notified to the management of the organisation. Deficiencies are classified as either Level 1 or Level 2 dependent upon their significance as follows:
- (a) Level 1 – an item of a significant nature which is considered to lower the standard of training or which compromises the conditions or requirements of the Approval. This would warrant suspension of the Approval in whole or in part until corrective action has been taken. The organisation would be expected to take steps immediately to rectify any such item.
 - (b) Level 2 – an item of a less significant nature but which still requires correction to restore compliance with the requirements of the Approval. A Level 2 deficiency would require the organisation to offer a proposal for corrective action within a timescale agreed with the CAA.
- 4.4 The organisation shall inform the CAA in writing of intended action and proposed timescales to rectify any deficiency noted under paragraph 4.3. Confirmation that such action has been completed shall also be given to the CAA. The adequacy of any changes or procedures will be reviewed at the following audit.

5 APPLICATION FOR LICENCE WITHOUT TYPE RATING

- 5.1 Subject to paragraph 6, a candidate who has completed successfully a course approved under this Chapter is not required to comply with the normal experience requirements set out in Chapter L2 for those LWTRs in which he or she has been recommended as described below.
- 5.2 Subject to a satisfactory standard by the student throughout the Approved Course and specifically in the final examinations, an application may be made for those LWTRs in which a satisfactory standard has been reached. The application must be made on a form AD300 within 3 months of completion of the course and must include a recommendation by the training organisation. If the application is acceptable to the CAA, the candidate will be exempt from the written examination associated with the grant of those LWTRs.
- 5.3 Licence applicants who have completed an Approved Course are subject to the normal age requirement of 20 years for the acceptance of a licence application. Nevertheless students who are under 20 years of age at the completion of the training may take the Approved Course final examinations provided they satisfy all other course requirements and are not less than 18 years of age. Subject to a satisfactory standard being achieved, an application may be made, as described in paragraph 5.2, at 20 years of age. The application for grant of the Licence must be made and all examinations completed within 3 months immediately following the 20th birthday of the applicant. He or she must also have been engaged in employment providing relevant aircraft engineering experience for an acceptable period between completion of the training and the date of application for grant of the Licence. The date of completion of the Approved Course should be quoted in the application.
- 5.4 Applications to extend a Licence via the Ab initio scheme will not be accepted except for a resit allowed in paragraph 6.1 which follows a partial pass resulting in the issue of a Licence.
- 5.5 A Licence issued as a result of an Approved ab initio course will have the following condition included: "The holder of this licence is required to show a minimum of 12 months experience, from the date of issue, of maintenance of operating aircraft before they may be granted any authorisation privileges under JAR-145 or BCAR Chapter A8-13 or A8-18." This endorsement applies a requirement to the grant of authorisation to certify similar to that contained in Chapter L2 paragraph 6.2 for an application for a type rating. If, at the time of application for a licence, the applicant can show evidence of this 12 full months experience, in addition to that gained as part of the Ab initio course, the Authority may grant the licence without the endorsement. The licence holder may apply for removal of the endorsement on a form AD300 which must show evidence of the additional experience required. A charge for the variation of a licence will be payable in the latter case.

6 FAILURE OF CAA LWTR EXAMINATION

- 6.1 A candidate, on completion of an Approved Course for an LWTR, who fails the first attempt at the CAA oral examination, may be accepted for re-examination following a further period of at least 2 months training managed by the ab-initio training organisation. This training shall consist of a combination of theoretical instruction and practical experience relevant to the areas in which the candidate failed to achieve a satisfactory standard in the oral examination. Details of the additional training undertaken shall be shown on the application form. The

application for re-examination must be made on form AD300 and must be supported by the Training Organisation. If these procedures are not followed the candidate must meet the experience requirements in paragraph 7.1 or 7.2 as appropriate and the normal examination requirements set out in Chapter L3.

- 6.2 If the second attempt at the CAA oral examination also results in failure, no further applications for that candidate via the ab initio scheme will be accepted. If reapplication for the grant of a Licence is made, the candidate must show a minimum of a further 12 months experience in the relevant discipline, including at least 6 months experience relating to the LWTR sub division(s) being applied for. The candidate will be subject to the normal written and oral examination requirements set out in Chapter L3.

7 APPLICATIONS FROM FORMER AB INITIO STUDENTS

- 7.1 An ab-initio candidate who has completed the full course of ab-initio training but has not been recommended by the training organisation for CAA oral examination will be required to satisfy the normal requirements. However, some credit will be granted in recognition of the candidate's having attended a structured course of ab-initio training. The candidate will be required to obtain an additional eighteen months relevant practical experience before applying for the grant of a Licence Without Type Rating.
- 7.2 A candidate who has gained a licence through the ab-initio scheme and who wishes to extend the licence subsequently will be required to show 12 months recent experience of the maintenance of operating aircraft, 6 months of which must be applicable to the WTR applied for.

CHAPTER L7 AUTHORISATION TO EXAMINE

- 1 INTRODUCTION This Chapter describes the requirements which an organisation must meet before being granted an Authorisation to conduct written examinations on behalf of the CAA. Authorisation to Examine will be granted only to organisations within the UK.

2 AUTHORISATION TO EXAMINE

- 2.1 Authorisation to Examine may be granted to an organisation to conduct written examinations which will be recognised in lieu of the CAA's own written examinations. The Authorisation granted will be for one or more LWTR Categories. No Authorisation will be granted in relation to any Type rating.
- 2.2 Organisations providing examinations under the Authorisation to Examine scheme shall first be able to carry out an assessment of a potential candidate's experience and knowledge, equivalent to that conducted by the CAA under Chapter L2, before acceptance into this scheme.
- 2.3 The written examinations conducted by the organisation must establish that the requirements of Air Navigation Order Article 13(1) are met by each candidate in respect of the relevant LWTR categories and that he or she is able to read, write and carry out a technical discussion in English (see Chapter L2). These examinations carried out on behalf of the CAA must establish an assessment of knowledge standards equivalent to the CAA's own examinations. The examination processes conducted by the organisation and the standards achieved will be monitored closely by the CAA.
- 2.4 Some organisations authorised to conduct examinations may also be capable of providing additional training to applicants if considered necessary before examination. Such training is not a requirement of the scheme and is a matter for the applicant and the training organisation concerned.
- 2.5 An organisation which wishes to apply for Authorisation to Conduct Examinations in respect of Licence Without Type Rating (LWTR) Categories should apply on Forms AD681 and AD458 to the Engineer Licensing Department of the CAA and should include a copy of its Exposition, or an amendment to an existing ab-initio Approval Exposition, and the appropriate fee.
- 2.6 The CAA will conduct a review of the organisation and its procedures. The investigation and subsequent monitoring will concentrate on the procedures to ensure that the examinations are to a satisfactory standard. The organisation must satisfy the CAA that it has in place the applicable procedures required by this Chapter. Authorisation will not be granted until satisfactory compliance has been demonstrated.

3 REQUIREMENTS FOR AUTHORISATION

- 3.1 **Nominated Personnel.** The applicant for Authorisation shall nominate the following:
- (a) a responsible person and deputy whose functions will include co-ordination of all appropriate departments to ensure compliance with the Authority's requirements and that the examinations are carried out in a satisfactory manner.

In a case where the nominated person lacks an aircraft maintenance background or experience, the applicant must ensure that such person is supported by a suitably experienced member of the examining staff appointed to advise on all technical aspects of examination.

- (b) a sufficient number of examination staff, whose experience and qualifications shall be acceptable to the CAA, to carry out satisfactorily the preparation and conduct of the examinations. The term examiner in the context of this Chapter describes the person who will be setting and/or assessing each particular examination. This person should ideally have an aircraft maintenance technical background (or equivalent up-to-date knowledge through instructing) and, although he/she may be an instructor within the organisation, will not have been involved in any top up training provided to the applicant. The training and examination processes are to be kept separate.
- (c) signatories of Certificates of Examination.
- (d) persons who may make the recommendation to the Authority in support of a candidate's application for a Licence.

3.2 Company Exposition

3.2.1 The applicant shall provide an exposition of the organisation which shall include the following information:

- (a) the structure of the organisation, the terms of reference of senior and nominated personnel and the associated lines of responsibility.
- (b) a list of examining staff, who will be responsible for setting and/or assessing each particular examination.
- (c) addresses of locations at which examinations are to be carried out and a general description of the facilities available at each site.
- (d) a list of the LWTR sub divisions for which Authorisation is held.
- (e) the procedures for notification of any changes to the organisation.
- (f) the amendment procedure for the exposition and associated manuals.
- (g) the procedures, including details of the management and control systems, which the organisation has instituted to ensure compliance with the requirements for the Authorisations held.

3.2.2 The exposition may be supplemented by a separate procedures manual which gives detailed guidance on the various procedures. Where the organisation is already approved by the CAA, an amendment to the existing exposition may be submitted. This should group assessment and examination procedures together under appropriate headings and provide cross references.

3.2.3 The exposition shall be subject to regular review to ensure that it is up-to-date and that the organisation is following the defined procedures. Exposition development guidance notes are available from the Engineer Licensing Department.

3.3 Facilities and equipment

3.3.1 The accommodation provided for examination and administrative areas shall be acceptable to the CAA.

3.3.2 Offices and common rooms must be of an acceptable size appropriate to the numbers of examiners. Secure facilities will be available for the storage of examination papers and records, whether in hard copy or electronic format.

3.3.3 A suitable room must be available for the conduct of examinations and this should be arranged to ensure the comfort of the candidates and the integrity of the examination. The room must be free from any outside environmental interference and there should be no internal distractions. No training or technical material shall be displayed in the room during examinations.

3.4 Procedures

3.4.1 **Quality.** The standards of assessment, examination and the management process should be monitored on a regular basis by a responsible person of senior management level, preferably one who is not involved with the examination process.

3.4.2 **Records.** Records should be maintained for each engineer showing training given, examinations, dates and assessments. Such records should not be destroyed without the prior agreement of the CAA and must be produced upon request.

3.4.3 **Staff training.** The organisation shall establish a programme to provide periodic update training for examiners in new airworthiness requirements and new technology to keep their skills and experience up-to-date so that examinations may be kept current. This may include attendance at seminars, type training or observation of maintenance.

4 ASSESSMENT PROCEDURE

4.1 The organisation will carry out an assessment of the examination candidate's experience to ensure that the normal minimum requirements of Chapter L2 are satisfied. This assessment should be made by the organisation before acceptance of each candidate for examination. A Form AD300 showing the applicant's experience must be completed in the normal manner for final acceptance by the CAA following successful examination. Should the experience be found by the CAA to be unacceptable the application will be rejected and any examinations taken by the applicant will be invalid. In the case of doubt over the acceptability of a candidate's experience the organisation should consult the CAA.

4.2 As well as considering whether a potential candidate's experience is broad enough to be acceptable to the CAA, the assessment should also determine the candidate's academic knowledge. Entry standards should be such that potential candidates will be judged to have a reasonable chance of successfully completing the process. The organisation must pay particular attention in the pre-acceptance assessment to the requirement that the candidate is able to read, write and carry out a technical discussion in English.

4.3 Following assessment, the organisation may have identified some areas where an additional element of training is necessary or would be beneficial. Whilst this top up training is not part of the Authorisation to Examine process it is recognised that some Authorised organisations may also be training organisations. In such cases the organisation may reach agreement with a candidate to provide any such training. It is emphasised that this training should be related to teaching the subject and not training to pass the examination.

4.4 On completion of the assessment process and any top up training, the candidate may take the written examinations applicable to the Licence Without Type Ratings sought.

5 EXAMINATION PROCEDURE

- 5.1 The written examination will test as far as possible the candidate's practical and theoretical knowledge and understanding of maintenance practices and procedures. The examinations will cover all the appropriate modules of the syllabus set out in Appendix 1. All multiple choice and essay papers for a LWTR Category shall be taken in one day.
- 5.2 An organisation may not grant any exemptions from the relevant examination requirements for academic qualifications or foreign licences held, nor may credit be given for partial passes achieved at another Authorised organisation or in the CAA's own examinations. Exemptions may be granted only for those modules of Appendix 1 previously satisfied by an existing LWTR held on a valid CAA Licence.
- 5.3 The examination shall consist of written examinations for each module, as appropriate, based upon multiple choice type papers which contain a sufficient number of questions to cover the breadth and depth of subjects in each module.
- 5.4 In addition a selection of essay type questions, with a practical maintenance bias and covering the range of modules applied for, shall be set. The essay paper has two main purposes: to assess technical knowledge and to test the ability to read and write technical English to an acceptable standard.
- 5.5 The method of marking must be defined in the Exposition and shall reflect a pass mark standard of 75% for both the multiple choice and essay elements of the examination. There will be a selection of papers available for each LWTR covered by the Authorisation.
- 5.6 Examination papers will be prepared by nominated individuals within the organisation. Papers may be prepared from a question databank for each examination sitting or previously prepared hard copy papers may be held. The papers used in any particular examination shall be chosen by a nominated examiner and in the case of re-examination a paper shall not be given to a particular candidate more than once. The examination paper control process should be formalised to include question development, paper raising, moderation, analysis and security. A system of serialising examination papers and indicating amendment or revision standard will be required. Completed examination papers shall be submitted to the CAA on request.
- 5.7 A system for the management of the development, review and amendment of questions shall be established and records maintained. There should be a regular review of candidates' answers to examination questions in order to consider the continued acceptability of the questions and to allow updating of the examination papers where necessary. A regular programme of analysis of the questions shall be established to ensure that the questions reflect adequately new systems and advances in technology. Records of such reviews shall be kept.
- 5.8 Examination databanks shall be kept secure and protected from unauthorised access by adequate computer security means. Examination papers and databank printouts shall be kept in locked cabinets under the control of nominated individuals.

6 RECOMMENDATION AND APPLICATION FOR LICENCE WITHOUT TYPE RATING

- 6.1 A Certificate of Examination shall be issued to each candidate showing the LWTRs or modules examined, the date of examination and the marks achieved in each module. The Certificate shall be signed by a nominated person specified and accepted in the exposition.

- 6.2 Where an organisation is Authorised to examine for a number of LWTR categories, candidates may be recommended only for those in which they have reached a satisfactory standard during the written examination.
- 6.3 Recommendations must not be made before the candidate's 20th birthday.
- 6.4 The examining organisation will submit a list of all candidates examined and their results, regardless of whether they have passed or failed, to the CAA no later than two weeks following each examination sitting.
- 6.5 A candidate who has successfully passed the appropriate LWTR examination modules may apply on Form AD300 to the CAA for a LWTR. The form should show the candidate's experience (countersigned by appropriate referees), details of all Authorised examining organisations where the candidate has been examined, with all the relevant dates and results (pass or fail). The AD300 must also be endorsed with a clear recommendation from the Authorised organisation for the LWTRs for which the candidate is being proposed for oral examination, giving details of the dates of the examinations and marks gained. The recommendation must be made against valid Certificates of Examination and copies of all relevant Certificates shall be included with the application. A candidate must submit the application within three months of the date of recommendation.
- 6.6 The application will be assessed by the CAA and if found satisfactory (see paragraph 4.1) the candidate will be asked to contact a CAA Regional Office to arrange a mutually convenient date for an oral examination.

7 EXAMINATION FAILURE

- 7.1 A candidates who does not reach the required standard in any part of a written examination taken under this scheme will be required to complete the minimum period of two months additional relevant experience as specified in Chapter L3 before re-examination.
- 7.2 Any partial pass obtained will be valid for 12 months as described in Chapter L3 paragraph 5.1.2, provided that the candidate is re-examined at the organisation at which he or she failed. If a candidate is re-examined by another Authorised organisation, or by the CAA, no credit for any previous attempt at the LWTR examination may be given and the full examination relevant to the LWTR must be taken. Such a candidate must declare all previous examination attempts when applying for a further examination.
- 7.3 Only three attempts at the written examination for a particular LWTR, whether at one or a combination of Authorised organisations, will be allowed under this procedure. Thereafter a candidate will be required to submit a licence application directly to the CAA as described in Chapter L2.
- 7.4 A candidate will be allowed two attempts at the oral examination for a particular LWTR, as described in Chapter L3 paragraph 5.1.3. A candidate who has failed both attempts and who wishes to be re-examined for that LWTR will be required to submit a licence application directly to the CAA in accordance with Chapter L2 and resit all the relevant CAA written examinations as specified in Chapter L3.

8 REQUIREMENTS FOR MAINTENANCE OF THE AUTHORISATION

- 8.1 An Authorisation granted under this Chapter shall be valid for a year but may be renewed subject to the following conditions:
- (a) the organisation continues to satisfy the requirements for the grant of the Authorisation.
 - (b) any changes to the nominated personnel are notified in writing to and have been accepted by the CAA.
 - (c) the exposition and procedures required under this Chapter are reviewed periodically by the organisation and any necessary amendments promulgated.
 - (d) payment of the appropriate charge.
- 8.2 The Authorised organisation shall adhere to the agreed procedures set out in its exposition. Any variation to these procedures shall have the prior agreement of the CAA.
- 8.3 The CAA will carry out periodic audits of the structure and procedures of the organisation. Any deficiencies found during an audit will be notified to the management of the organisation as outlined in paragraph 4.3 of Chapter L6.
- 8.4 The organisation shall inform the CAA in writing of intended action and proposed timescales to rectify any deficiencies noted under paragraph 8.3. Confirmation that each action has been completed shall also be given to the CAA. The adequacy of any changes or procedures will be reviewed at the following audit.

APPENDIX 1

EXAMINATION SYLLABUS

- 1 The syllabus relevant to the examinations for all Licence Categories is presented in this Appendix as a series of subjects or combinations of subjects referred to as Modules, the content of each of the Modules is detailed in this Appendix.

- 2 The written and oral examinations for each Category of Licence, (and its Sub-Divisions where appropriate) are based on a number of the Modules, and the Module/Category relationship is set out overleaf. It will be noted that the modular arrangements recognise that major areas of the syllabus are common to more than one Licence Category and/or its Sub-Divisions. Thus, when an existing Licence is to be extended to include another Category or Sub-Division, those Modules which have been satisfied by previous examinations may be excluded.

Each module is numbered and contains a series of syllabus subject headings. Each subject is then further expanded in more detail against 'level numbers' corresponding to Licence Without Type Rating (LWTR) and Type Rating (TR). This expansion of detail provides an indication of the degree/level of knowledge, experience, competence and skill in aeronautical engineering required by the CAA.

- 3 There are three level numbers and they are defined as follows:-

Level 1: General appreciation of principles and familiarisation of the subject.

Level 2: Comprehension of principles and salient features with a practical ability to assess operational condition.

Level 3: Detailed knowledge of all aspects of the subject.

- 3.1 In applying the above levels to the subjects which, in particular relate to aircraft, engines, systems and items of equipment, the following aspects should be taken into account:-

- (a) theoretical principles
- (b) constructional arrangements, functional and design features
- (c) maintenance practices
- (d) normal, deteriorated and failed conditions.

CATEGORY		SUBJECT MODULE NUMBERS -																			
MODULE		'A' - Aeroplanes		'C' - Engines		'A' & 'C' Rotorcraft		'A' & 'C' Alships		'B' - Aeroplanes or Rotorcraft	'D' - Engines	Electrical	Instruments	'X' - Aeroplanes		Automatic Pilots	Rotorcraft	Combined	Compass Compensation	Communication & Navigation	Radar
		1	2	Piston	Turbine	Piston	Turbine	Piston	Turbine					1	1						
Regulations		1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1
Basic: Aircraft & Engines		2	2	2	2	2	2	2	2		2										
	Aircraft	3	3			3	3	3	3												
	Common:	Aeroplanes - 1	4	4																	
		Aeroplanes - 2																			
Aeroplanes - 2 only		5									5										
Piston Engines			6			6		6			6										
VP Propellers			7	7		7	7	7	7												
Turbine Engines				8		8		8	8												
Rotorcraft						9	9														
Alships								10	10												
'B' Licence										11											
Engine Overhaul											12										
Human Performance		13	13	13	13	13	13	13	13		13	13	13	13	13	13	13	13	13	13	13
Common:	Categories 'X' & 'R'																				
	Electrical Equipment & Systems											20	20	20	20	20	20	20	20	20	20
Basic:	Instruments											21									
	Gyroscopes												22								
Servo-mechanisms												23		23	23	23	23	23	23	23	23
Aeroplanes														24	24	24	24	24	24	24	24
Common														25	25	25	25	25	25	25	25
Automatic Pilots:																					
Rotorcraft																					
Instruments/Automatic Pilots																					
Compass Compensation																					
Radio:	Communication & Navigation																				
Radar:	Radar																				

MODULE 1 – REGULATIONS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Maintenance Engineers' Licences	2	–	<p>Air Navigation Order requirements</p> <p>Responsibilities: by statutory law and by the need to fly aircraft in a satisfactory condition, i.e. common/civil/constitutional law</p> <p>Penalties – under statutory law and resulting from civil law suits</p> <p>Categories – applicability</p> <p>Area and extent of limitations and privileges within Categories</p> <p>Overlap of Category applicability</p> <p>Relevant Airworthiness Notices</p>
Certifications	1	2	<p>Air Navigation Order requirements; BCAR Sections A and B</p> <p>Certificates of: Release to Service; Maintenance Review; Fitness for Flight</p> <p>Duplicate inspections</p> <p>Contributory certifications and reliance on other documentation and persons</p> <p>Certification – acceptance investigation and judgement procedures</p>
Aircraft, Engine and VP Propeller Log Books	1	2	<p>Air Navigation Order requirements; BCAR Sections A and B</p> <p>CAA Approval: Light aircraft, large aircraft</p> <p>Worksheets; Technical Log</p> <p>Data to be entered in log books</p> <p>Condition reports – e.g. heavy landing checks, defect investigations, NDT and other inspections, mandatory and non-mandatory</p>

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Aircraft, Engine and VP Propeller Log Book (continued)	1	2	Maintenance checks and inspections Cross-reference to other files/records Preservation of documents; ANO
Technical Log	1	2	Air Navigation Order requirements; BCAR Sections A and B Technical Log – Air Operator's Certificate requirements
Aircraft Documentation and Requirements	1	2	Type Certification Weight schedule External, and internal markings and signs, e.g. nationality and registration no smoking and fasten seat belt, placards and requirements, doors and exits Certificate of Airworthiness Categories, purposes of flight Certificate of Registration Air Operator's Certificate Schedule 5 requirements for equipment Radio station licence and approval Change of ownership Aerial Application Certificate Glider/banner towing
Approvals	–	1	Design Organisations
	1	2	Inspection Organisations
			Maintenance Schedules
			AOC interface
			LAMS – star inspections, C of A recommendation Stores: systems, release of parts

SECTION L

MODULE 1
REGULATIONS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Defect Reporting	1	2	Air Navigation Order requirements Defects which are to be reported Reportable accidents
CAA Requirements	1	2	BCAR Sections A and B
	2	—	BCAR Section L
	1	2	Airworthiness Notices Mandatory Modifications and Inspections:— British American Foreign Aircraft, engines, equipment
Joint Aviation Authorities Requirements	2	2	JAR-145
	1	1	JAR-21
			JAR-25
			JAR-23
			JAR-29
			JAR-66
			JAR-147
			JAR-OPS

MODULE 2 – BASIC: AIRCRAFT/ENGINES

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Engineering Drawings and Technical Information	1	–	Drawing details – common practices: plan, elevations, isometric, sections, scale, dimensional and indicating presentation
	2	–	Use, validity control, interpretation
	1	2	Maintenance Manuals, Parts Catalogues, Overhaul Manuals
			Service bulletin and modification data Maintenance schedules: approved and otherwise
Mathematics/Science	1	–	Simple calculations: measurements, angles, graphs, metric/imperial, volume, density, specific gravity, pressure, forces, moments, centre of gravity
			Resolution of forces
			Pressure/volume/temperature of gases
			Hydraulics: basic principles, liquids in flow and static conditions
			The atmosphere – density/pressure/temperature/altitude/humidity
Hangar/Workshop Common Practices and Tools			Basic principles of motion, acceleration, centrifugal, centripetal forces, friction
	1	–	Lubrication methods and application
			Hand tools, simple machine tools
			Go/No Go gauges, fits and clearances
	1	–	Precision measuring instruments
	2	–	Torque loading
	1	–	Assessment of in service condition of soldered, brazed and welded joints

(continued over)

Syllabus Subject	Level		
	WTR	TR	
Hangar/Workshop Common Practices and Tools (continued)	1	-	Inhibiting and corrosion protection Painting and paint stripping Fire protection and safety in and around the workshop/hangar/aircraft Storage and handling
Common Parts	1	2	Control cables and fittings Fastening devices - threaded, riveted and swaged V-band clamps and couplings Locking: parts and methods Bearings Pipes: rigid and flexible Keys and key ways Worm drive and other types of band clips
Gases and Compounds	1	2	Air, nitrogen, carbon dioxide, oxygen, helium Acetylene Safety aspects Adhesives, oils, greases, sealing compounds
Metals	1	-	Light alloys, iron and steel
	1	2	Titanium
	1	-	Brass, bronze, copper, lead
	1	2	Recognition and general characteristics of metals used Application and use of metals The purpose of heat treatments Uses of different heat treated materials Anodic treatments Corrosion treatments during manufacture Identification of corrosion

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Metals (continued)	2	2	Corrosion treatments during repair Fatigue Other protective treatments/finishes
Non-destructive Condition-Testing	1	–	Typical uses and display of defects using: X ray/gamma ray, ultrasonic, eddy current, magnetic particle
	2	–	Penetrant leaching
	1	2	Visual probes Eyeglass equipment: usefulness, effectiveness of various magnifications
Basic Electrics	1	–	General principles and practices
			Simple circuits a.c. to d.c., d.c. to a.c., a.c. to a.c. conversion
			Insulation and conductivity
			Common items used in aircraft applications, e.g. resistors, potentio- meters, solenoids, transformers, semi- conductors, capacitors, relays
			Micro switches
			Proximity detectors
			Fuses, circuit breakers
			Motors/actuators
			Principles of frequency wild, constant frequency a.c. power
			Circuit wiring, connectors, crimping, clipping, cable sizes and types
Environmental Aspects	1	2	Bonding
			Static electricity; lightning; static charges; 'interference' effects on radio equipment
			Effects of snow, ice, lightning and turbulence

MODULE 3 — CATEGORY 'A' COMMON — AEROPLANES/ ROTORCRAFT/AIRSHIPS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Basic Aerofoil Theory	1	2	Lift/thrust/drag/weight Stalling of an aerofoil Induced and parasitic drag Boundary layer Aerofoil shapes Chord/span/aspect ratio
Sub-Structures	1	2	Folded metal, sheet metal, extrusions, tubing Effect of swaging, lightening holes Use of different metals Commonly used fasteners and joint methods Protective treatments and precautions Honeycomb Reinforced plastic/epoxy materials, applications Floors Seats — crew, passenger — 'crash' situation Aerials, pitot probes, drain masts, air intakes and similar structural fitments Instrument panels and consoles Radio and equipment racks and stowages
Materials — non Metal:—			
Reinforced Plastics/ Epoxy Composites	1	2	Glass, fibre and filament reinforcement Materials used Cold setting, hot setting systems Construction principles used, aircraft applications Failure characteristics Honeycomb, foam sandwich

Syllabus Subject	Level		
	WTR	TR	
Systems:—			
(1) Hydraulic	2	—	Simple systems, i.e. powered pump, reverse selection, pressure relief, pressure regulation LP and HP filters
	1	2	Types of pump Differing fluids — mineral/fire-resistant Control and indication methods
(2) Landing Gear and Brakes	1	2	Wheels, tyres, shock absorbers castering, steering methods
	2	—	Simple hydraulic brakes, i.e. master cylinder to wheel-brake unit
	1	2	Brake discs and calipers
	1	—	Landing and braking energy conversion
(3) Electrical	1	2	Simpler type systems Batteries, generators, relays, wiring Voltage control Current limiting Paralleling a.c. from inverters Crimping Soldered joints Control and indications
(4) Instruments (other than Engine)	1	2	Pitot/static systems and associated instruments Gyro instruments — vacuum/pressure/electrical Pressure and temperature indication Position indication Compasses
(5) Radio	1	—	VHF communication systems

SECTION L

**MODULE 3
CATEGORY 'A' COMMON —
AEROPLANES/ROTORCRAFT/AIRSHIPS**

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Safety Equipment	1	2	Fire extinguishers — hand
			Life jackets
			Life rafts
			Seat belts/harness — passenger/crew 3-point, 4-point, inertial, lapstraps
	—	3	Mandatory requirements for upper torso restraint
Ground Handling	1	1	Jacking, trestling, slinging, towing, tie down
			'Servicing' activities
			Storage
			Painting — protective finish/external markings
	1	2	Weighing and centre of gravity determination — weighing report
			BCARs
			Scale positions
			Basic Weight
			Unuseable fuel
			Oil and other consumable liquids — quantities
			Role variations
			Hold/seat row/removeable equipment
			Station identification
			C of G datum

MODULE 4 – CATEGORY 'A' – AEROPLANES 1 AND AEROPLANES 2

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Theory of Flight and Control	1	2	Stability and control Equilibrium Stalling of the aircraft Flaps and slats Aerodynamic balance Mass balance Aileron/elevator/rudder control Tabs – servo/anti-servo/balance/anti-balance/trim/spring Canard/foreplanes
Aircraft Structures	1	2	Main structures – fuselage/wing Stressed skin – diaphragms and longerons Tubular structures Skin, frames and stiffening Wing: spar and rib structures Integral fuel tanks Load paths Empennage Windows, doors and hatches
Materials – non Metal:			
(1) Wood	–	2	Types, application and uses Diseases – environmental effects Plywoods Glues – past and present Storage and condition control Damage – failure modes Painting/protective finishes

Syllabus Subject	Level		
	WTR	TR	
Materials – non Metal: (continued)			
(2) Fabrics	-	2	Natural and man-made materials – types, applications and uses
	-	1	Techniques used during covering
	-	2	Repairs
			Paint finishes and protective treatments
			Butrate and nitrate paints
			Ageing
			Tautening, heat shrinking
			Strength considerations
			Drainage and apertures
			Stitching, stringing, adhesives
			Testing
Systems:			
(1) Flight Controls	1	2	Aileron, elevator rudder
			Operating systems and surfaces – manually operated
			Trim operating systems and surfaces – manual and electric
			Flap systems – electrical, hydraulic and manual
	-	2	Flap systems – pneumatic

(continued over)

SECTION L

MODULE 4
CATEGORY 'A' —
AEROPLANES 1 AND AEROPLANES 2

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Systems: (continued)			
(1) Flight Controls (continued)	1	2	Simple asymmetric protection
			Slat systems — automatic, and manual
	—	2	Hydraulic
	1	2	Tab systems — trim, balance, servo, anti-servo, anti-balance, spring servo
			Stall sensing and warning — simple systems, e.g. vane or reed types
			Basic auto pilots — simple systems
			Inputs into main controls — function testing — attitude, heading and height sensing
(2) Ice and Rain Protection	1	2	Liquid, electric and boot systems
			Power source, control and indication
			Windscreen wipers
	—	2	Electrically-heated windscreens
(3) Heating and Ventilation	1	2	Combustion heaters, exhaust heat exchangers
			Ram air
			Ventilation fans
(4) Oxygen	1	2	Bottle storage, distribution, regulation
			Masks
	2	—	Safety features and requirements
(5) Pressurisation	1	2	Simple systems — bleed air, turbo-charger bleed
			Passenger environmental requirements for the control of:—
			oxygen, heating, ventilation, rate of change, humidity
			Mass flow control

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Systems: (continued)			
(5) Pressurisation (continued)	1	2	Temperature control Differential pressure — maximum, negative Control and indication Cabin structure, windows and doors for pressurised flight
(6) Vacuum/Pressure	1	2	Dry and wet pump systems Oil separation Gyro supply Relief valve Filtering Aerofoil anti-icing
(7) Pneumatic	—	2	Landing gear/flaps/brakes Operating systems Basic theory and common practices

MODULE 5 – CATEGORY 'A' – AEROPLANES 2 ONLY

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Theory of Flight and Control	1	2	Transonic effects, swept wings, wing fences, spoilers, high lift devices, vortex generators
			High speed stall
			Shock wave
			Speed of sound – mach numbers
			Wake turbulence
	–	2	Supersonics – sound waves
			Delta wing forms
			Kinetic heating
			C of G control
	1	2	Active controls – computerised flight management systems – general principles
Aircraft Structures	1	2	Fail-safe application
			Fatigue effects and control
			Wing: box/integral tank construction
			Pressure-loaded skin, bulkheads, windows, windcreens, doors
			Milling/chemical etch constructed structures
			Bonded type construction
			Fasteners – close tolerance
			Sealing compounds
			Maintenance programmes – structural surveys
			NDT programmes
			Large aircraft paint and protective finishing processes
			Cargo holds
			Venting and draining
			Sound proofing

Syllabus Subject	Level		
	WTR	TR	
Materials – non-Metal:			
Furnishings	1	1	Upholstery
			Toilet and galley partitioning
			Carpets and curtains
			Particle boards and plastic laminates
	1	2	Fire resistance/escape requirements
			Passenger seats
			Crew seats – cabin and flight crew
Systems:			
(1) Flight Control	1	2	Powered controls
			Spoiler, air/speed brake, lift dump
			Lift augmentation – LE droop, slats/flaps
			Flap operating systems – large transport aircraft
			Flap assymetric and alternate operation
			Stall sensing – stick shake
	–	2	Stick push/nudge
	–	1	Electronic control systems
	1	1	Fly by wire
	(2) Hydraulic	1	2
Accumulator/cut-out dependent systems			
Pressure/volume control			
Pressure-reducing valves			
Fire-resistant fluids – temperature, contamination, compatability			
Pressurised reservoirs			
Multiple system provision			
Alternate systems – HYRAT/ hydraulic motors			
Electrically-powered and air-driven systems			

(continued over)

Syllabus Subject	Level		
	WTR	TR	
Systems: (continued)			
(2) Hydraulic (continued)			Leak protection systems — system isolation, 'fused' systems, priority control Internal leakage — cause and effects — acceptability
(3) Landing Gear	1	2	Multiple axles and wheels Bogey beams Door sequencing Main and alternate brake provision Anti-skid system — electronic and mechanical — aquaplaning Landing gear unsafe protection Alternate lowering Weight on/weight off sensing Fire protection Powered steering — retraction — self centring — 2 Auto braking
(4) Pneumatic (ATA 36)	1	2	Bleed air pneumatic systems Systems supplied Bleed air valves Mass, flow, pressure and temperature control and indication Ducting Leak detection Alternate supply — APU and ground cart
(5) Ice and Rain Protection	1	2	Mainplane/tail hot air anti-ice systems Control and indication Leak/overheat-detection/protection

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Systems: (continued)			
(5) Ice and Rain Protection (continued)	1	2	Ice detection Rain repellant Windscreen wipers Laminated windscreen heating Waste water discharge Pitot/static sensors
(6) Environmental and Passenger Systems:—			
6.1 Air Conditioning	1	2	Cabin blower/bleed air supply Heat exchangers Cold air units/air cycle machines Vapour cycle systems Humidity control systems Mass, flow, pressure and temperature control and indication Leakage detection and protection Ventilation requirements Passenger service unit air supply Water extraction Recirculation
6.2 Pressurisation	1	2	Outflow control — electric, electronic and pneumatic Maximum differential and negative pressure control Cabin altitude and rate of change Emergency dump and manual control Ditching Cabin altitude warning Entrance/access/baggage door sealing and locking, indications and warnings

Syllabus Subject	Level		
	WTR	TR	
Systems:— (continued)			
Environmental and Passenger Systems: (continued)			
6.3 Oxygen	1	2	Storage, distribution and charging Drop-out system Chemical systems Therapeutic provision Masks — passenger/crew/smoke
	1	3	Bottle checks and precautions
6.4 Toilets, Waste and Water, Galley Services	1	1	Toilets: servicing provision
	1	2	Toilet flushing systems — pump over-heat protection Water — washing, hot/cold, potable Potable water — health protection Pressure control Water heating systems — safety provisions Waste collection and drainage Galleys — refrigerators, food and drink, ice — health protection Lifts, safety factors Catering trolleys
6.5 Baggage	1	2	Automatic systems — pallets and containers Restraint and securing
	1	1	Dangerous goods
6.6 Entertainment and Passenger Service	1	1	Films, video, television and audio Public address
(7) Electrical	1	1	3-phase a.c. power generation systems:— Control and protection Transformer rectifier units Cables and terminations

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Systems: (continued)			
(7) Electrical (continued)	1	1	Basic electronics — hardware — printed circuit boards Built-in testing provisions Static inverters
	—	1	Multiplex — basic principles
	1	1	Logic — basic principles
(8) Instruments	1	1	ADI, HSI presentation and ground functioning Altitude encoding and transponder systems — general Computer inputs Centralised air data units CRT displays Flight recorders — voice recorders INS
Equipment, Safety	1	2	Slides, rafts, dinghies Portable oxygen Loud hailers Smoke masks/hoods Survival equipment Notices/placards

MODULE 6 — CATEGORY 'C' — PISTON ENGINES IN AEROPLANES/ ROTORCRAFT/AIRSHIPS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>W/TR</i>	<i>TR</i>	
Principles, Terminology, Definitions and Laws	1	2	Normally aspirated and supercharged operation
			Four stroke cycle
			Ignition timing, mixture, fuel grade, detonation
			Power
			Overhaul periods/continuation in service beyond overhaul recommendation
			Ground running — principles and problems
			Effect of altitude, humidity, temperature, and icing
			Standard atmosphere, pressure altitude
			Fixed and variable pitch propeller effects (not rotorcraft)
			Vibration characteristics
Constructional Arrangement	1	2	Type certification
			General arrangement — internal
			General arrangement — external
			Crankcase breathing
			Propeller shaft sealing
			Materials
			Fixed pitch propeller provision (not rotorcraft)
			Power take-off provision (rotorcraft/airships)
			Cooling
			Cylinders, pistons and valve gear
			Hydraulic tappets
			Camshaft
			Casings, mountings and accessories drive

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Systems:			
(1) Carburation and Induction	1	2	Air intake — normal/alternate — filtering Manifolds Anti-icing provision Float type and injection systems Engine driven fuel pumps Priming systems Mixture/idle cut-off/throttle control
(2) Ignition	1	2	Magnetos Ignition harness Spark plugs — reach variations, operating temperatures — long life Switch control Timing (internal/external) Advancing and retarding mechanisms Screening Starting aids — impulse couplings and ignition boosting
(3) Starting	1	2	Starter motors — manual, Bendix, solenoid, pre-engaged — engagement methods Non-engagement indication and effects Starter relays Earth straps Cooling Effects on battery

SECTION L

**MODULE 6
CATEGORY 'C' —
PISTON ENGINES IN AEROPLANES/ROTORCRAFT/AIRSHIPS**

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Systems: (continued)			
(4) Fire Protection and Indication	1	2	Extinguishant, bottles, cartridges, 'life control' Detection systems and warnings Two shot provision
(5) Lubrication	1	2	Wet and dry sump systems System arrangement Pressure control Effects of hot and cold weather Filtering Straight, detergent, ash dispersant oils Engine condition assessment using oil system analysis Propeller feathering systems (not rotorcraft or airships) Oil coolers — temperature control valves Hoses, rigid pipes, internal passages, splash — oil jet Cooling functions of the oil system
(6) Supercharging/ Turbocharging	1	2	Directly driven and exhaust driven superchargers Manual and automatic control Lubrication and hydraulic power Controls and indication Automatic control systems
(7) Aircraft Fuel	1	2	Tanks, cells and integral systems Venting Fuel pumps — electrical Fuel grades and quality MOGAS

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Systems: (continued)			
(7) Aircraft Fuel (continued)	1	2	Water contamination — drains Filtering Controls and indications
(8) Engine Controls	1	2	Throttle Mixture Propeller (not rotorcraft) Alternate air Manual controls for turbocharger
(9) Engine Instruments	1	2	Manifold pressure Rotational speed Pressure and temperature Cylinder head temperature Exhaust gas temperature
(10) Propellers — fixed pitch (not Rotorcraft)	1	2	Materials Diameter — minimum/maximum Protective finishes Damage areas Cropping Balance control Attachment Spinners Alternative types — different manufacturer/pitch

**MODULE 7 — CATEGORY 'C' — VP PROPELLERS — PISTON ENGINES
IN AEROPLANES/AIRSHIPS, TURBINE ENGINES IN AEROPLANES/AIRSHIPS**

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Principles, Terminology, Definitions and Laws	1	—	Constant speeding Pitch variation Ground and flight functioning characteristics Power conversion Blade forces: aerodynamic and centrifugal Aerofoil aerodynamic principles Pitch coarse/fine, high/low, reverse Feathering Vibration characteristics Turbine engine installation propeller systems
Constructional Arrangement	1	2	Pitch change mechanism single/ double acting CSUs/governors Balance control Materials Diameter — minimum and maximum Pitch stops — fixed, centrifugal, manual and electrical Protective finishes — contour control
	1	3	Damage acceptance areas
	1	2	Attachment and assembly methods Oil transfer — governor/propeller/ sump Safety visibility
Automatic and Manual Pitch Control Systems	1	2	Pilot control and governor sensing Feathering
Ice Protection	1	2	Liquid and electrical systems

MODULE 7
CATEGORY 'C' —
VP PROPELLERS — PISTON ENGINES IN AEROPLANES/AIRSHIPS
TURBINE ENGINES IN AEROPLANES/AIRSHIPS

SECTION L

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Turbine Engine Application (not airships)	1	2	Auto-feathering
			Synchronising/synchrophasing
			Braking
			Automatic and manually controlled pitch limiting systems
			Beta control
			Permitted balancing

MODULE 8 — CATEGORY 'C' — TURBINE ENGINES IN AEROPLANES/ ROTORCRAFT/AIRSHIPS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Principles, Terminology Definitions and Laws	1	2	Gas flow path — temperature, velocity and pressure
			Compression
			Combustion
			Turbine power extraction
			Effects of atmospheric variations in temperature, density, pressure altitude on engine and on engine/aircraft combination
			Single shaft, two and three shaft engines
			Centrifugal and axial flow compressors
			Fan engines
			By-pass engines
			Water/water methanol injection
			Power turbines
			Surge/compressor stalling
			Propeller turbines
			Gas producers
			APU applications
			Thrust reversal
			Power assessment
Constructional Arrangement	1	2	Casings, shafts, bearings, accessories drive
			Air intakes and compressors
			Combustion section
			Turbines and exhaust
			Materials
			Modular construction
	1	3	Engine inspection capability and condition assessment provision

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Constructional Arrangement (continued)	1	3	Principles of 'condition monitored' and 'on condition' maintenance programmes
	—	2	Supersonic flight air intake geometry control systems
Propeller and Shaft Power Provisions	1	2	Gas producers
			Reduction gearing
			Power and auxiliary drive
			Rotational speed and power control, safety systems
	1	1	Principles of torque/power/rotational speed in power transmission by rotating shafts
Systems:			
(1) Thrust Reversing (not rotorcraft)	1	2	General arrangements
			Control/interlocks
			Safety features
			Operating systems — hydraulic/pneumatic mechanical
			Turbine and fan applications
(2) APU's	1	2	General arrangements
			Intake and exhausts systems — door operation
			Load control
			Electrical output control and management
			Speed control
			Fuel control
			Safety features
			Ground/flight/altitude-limiting factors
			Mounting

(continued over)

SECTION L

MODULE 8
CATEGORY 'C' —
TURBINE ENGINES IN AEROPLANES/ROTORCRAFT/AIRSHIPS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Systems: (continued)			
(2) APU's (continued)	1	2	Fire protection and indication Bay cooling Ground running
(3) Fuel Control	1	2	Principles — parameters Mechanical/electronic control Power speed — control and limiting Temperature and power factors Burners — primary and secondary provision
	—	2	Burners — shaft injection, torch ignition
	1	2	Governor speed sensing
(4) Fuel Systems	1	2	Tanks — cells and integral systems Refuelling/defuelling, crossfeed, jettison, venting, transfer Scavenging — jet pumps Boost pumps, backing pumps LP/HP valves and control Tank selection Internal/external pipes, hoses, connectors Fuel types Static electricity — effects and control Leak assessment and control Fuel quantity indication — 'Level Sticks' Water contamination — effects and control SG/Density/volume/weight

(continued over)

Syllabus Subject	Level		
	WTR	TR	
Systems: (continued)			
(4) Fuel Systems (continued)	1	2	Filtering and heating Fuel systems in pressurised cabin areas
(5) Water Injection (not rotorcraft)	1	2	Water/water methanol applications Sensing, control and safety provision Power effects Tankage Replenishing/dumping Pumps Effects on fuel control Pipes and pipe lines
(6) Lubrication	1	2	Tanks, storage, venting, contents indication Pressure/scavenge pumps Filters, screens and magnetic plugs/chip detectors Pressure/flow control Heat exchangers oil/fuel, oil/air Sealing — labyrinth seals, carbon seals, etc. Overboard drains — drains systems Lubrication of main bearings, accessories and gear trains Supply to propeller systems Contamination by hydraulic fluid/fuel Types of oil Internal/external pipes, hoses and passages — effects of heat Use of oil for ice protection — intake and fuel control

SECTION L

MODULE 8
CATEGORY 'C' —
TURBINE ENGINES IN AEROPLANES/ROTORCRAFT/AIRSHIPS

Syllabus Subject	Level		
	WTR	TR	
Systems: (continued)			
(7) Cooling, Sealing, and Bleed Air Services	1	2	Internal cooling, external cooling, sealing air Overboard dump — temperature monitoring Off-takes for other services — air conditioning, anti-icing, equipment drive, pressurising of hydraulic reservoirs, water systems, etc. Centrifugal filters
(8) Surge Protection and Airflow Control	1	2	Bleed valves — operating system Variable inlet guide vanes — scheduling, operating systems Surge sensing 'Surge margins'
	—	2	Supersonic flight air intake geometry control
(9) Ice Protection	1	2	Hot air systems — struts and intakes Electrical systems — engine and intakes Use of oil and air bleeds Pressure sensor heating Control and indication
(10) Fire Protection	1	2	Fire detection Overheat warning Fire extinguishing Bay and zone isolation Fire walls, bulkheads, cladding Fire wires, detector units Single/dual detection Extinguishants First and second shot capability

(continued over)

Syllabus Subject	Level		
	WTR	TR	
Systems: (continued)			
(10) Fire Protection (continued)	1	2	Warnings and indications — lights, aural warnings, fuse types, squib test 'Bottle gone' indicators Operating systems Over pressure Cartridges — life control Electric and electronic systems
(11) Ignition	1	2	High energy ignition systems
	—	2	Torch ignition Glow plug systems
	1	2	Igniter plugs and leads Operation inside and outside the starting cycle
(12) Starting	1	2	Starting cycle Initiation — HP valves, termination, bleed valves, starter valves, power lever, self sustaining speeds Starter motors — electrical, pneumatic, starter/generators — HP air, impingement air Clutch provision, overspeed sensing Manual operation starter cooling/ resting Ground power electrical/pneumatic provisions
	1	2	Power/throttle/thrust reverse HP/LP valve controls — manual and electric Condition control systems Propeller control (not rotorcraft)

(continued over)

SECTION L

MODULE 8
CATEGORY 'C' —
TURBINE ENGINES IN AEROPLANES/ROTORCRAFT/AIRSHIPS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Systems: (continued)			
(13) Controls (continued)	1	2	Auto control of throttle Control runs
	—	1	Electronic control systems
(14) Pods, Pylons, Cowlings and Mountings	1	2	General arrangements Services and controls — input/exit Materials Venting Zone demarcation Mountings Pylon and pod structural features Torque, vibration, expansion provisions Bay venting Cooling air intakes
(15) Electrical	1	2	a.c. generators — CSDs/IDGs Starter/generators Starter motor high current circuits CSDs — principles of operation, disconnect/reconnect, lubrication/hydraulic operation, filters, coolers
(16) Instruments	1	2	Rotational speed indication; a.c. generator and pulse probe systems Temperature and pressure systems Pressure ratio systems Turbine temperature systems Instrument system amplifiers Fuel flow indication Torque indication

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Systems: (continued)			
(16) Instruments (continued)	1	2	Fuel contents/oil contents — electrical and electronic Vibration indication
Ground Handling	1	2	Storage and inhibiting Spare engine carriage Ground running — noise control — power checking Functional checks of engine associated services

MODULE 9 – CATEGORY 'A'/'C' – ROTORCRAFT

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Theory of Flight and Control	1	2	Rotor disc: forces acting, lift, drag centrifugal force, weight, rotor useful force, phase lag; advance angle non-constant speed drive (Hookes Joint) effect
			Articulated/semi-rigid/rigid rotors
			Flapping/dragging/feathering
			Climbing/losing height/horizontal flight
			Main and anti-torque rotors – control inputs – cyclic and collective
			Effects of aircraft speed on rotors
			Directional control
			Translational lift/inflow/ground effect
			Vortex ring effect
			Retreating blade stall
			Reverse flow
			Auto-rotation; auto-rotative force/blade section
			Auto-rotation rev/min
Constructional Arrangements	1	2	Twin rotors
			Rotorcraft structures, load paths, vibration effects
			Landing gear configurations: skids/wheels/floats
			Fuselages, tail cones, pylons, engine mounts
			Gearbox and transmission mountings
Systems: (1) Flying Controls	1	2	Doors and windows
			Collective/cyclic/directional
			Hydraulic
			Rotor heads – main and tail rotor

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Flying Controls (continued)	1	2	<p>Articulated, rigid, semi-rigid, teetering</p> <p>Swash plate/spider control input methods</p> <p>Blades: construction and materials; balancing: static, dynamic, span wise, chord wise</p> <p>Tracking: flag and in-flight methods</p> <p>Tabs/trailing edge bending</p> <p>Vibration – effects and analysis</p> <p>BIM indicators</p> <p>Automatic Pilots/Autostabilisers – Control interface</p> <p>System components – component replacement and subsequent testing</p>
(2) Ice and Rain Protection	1	2	<p>Windscreen wipers</p> <p>Electrically-heated windscreens</p>
(3) Heating and Ventilation	1	2	<p>Exhaust heat exchangers</p> <p>Ram air</p> <p>Ventilation fans</p>
Transmission Systems	1	2	<p>Engines to rotors: shafts, clutches, free wheel units; reduction gearboxes; main transmission/ gearboxes, combining gearboxes</p> <p>Tail rotor drive: drive shafts, intermediate gearboxes, tail rotor gearboxes</p> <p>Lubrication systems: oils, coolers, cooling fans, filters, magnetic plugs, chip detectors, pumps, pressure control</p> <p>Universal drive provision</p> <p>Splined shafts, type of gears – tooth pattern</p> <p>Instrumentation</p> <p>Rotor brake systems</p>

SECTION L

MODULE 9
CATEGORY 'A'/'C' -
ROTORCRAFT

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Equipment	1	2	Hoists and winches
			External load carrying
			Flotation
			Survival systems
			Specialised role equipments, aerial spraying, cameras
Instruments	1	1	ADI, HSI
			Flight Recorders
	1	2	HUMs

MODULE 10 — CATEGORY 'A'/'C' — AIRSHIPS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Principles of Lift	1	—	Bodies immersed in fluids
			Gases: free to expand/constant volume/constant temperature/constant pressure
			Mixture of gases in a containing vessel
	2	—	Centre of gravity, centre of buoyancy, static heaviness, static lightness, static trim
			Ballonet ceiling, pressure height
			Superpressure, superheat
			Porosity
			Equilibrium
			Ballast-shot/water
Theory of Flight and Control	1	—	Aerodynamic lift, aerodynamic balance
			Stability and control
			Free ballooning
			Fins, rudders, elevators
			Tabs: balance/servo/trim/spring
			Powered flying controls
Envelope	2	—	Materials: fabrics, Kevlar
	1	—	Ultra-violet light effects
			Gas-tight membranes
			Ballonets, gases, load curtains, shear curtains, support cables, gas valves, air valves, entry ports, inspection domes, charge adaptors, load patches, handling lines, nose cone
			Charging, purging, porosity checks
			Lightning protection
			Air systems: ram air scoops, ballonet fans, dampers, transfer fans

Syllabus Subject	Level		
	WTR	TR	
Gondola	2	—	Main Structures Materials: Kevlar laminate, Fibrelam, sandwich panels, metal skin frames and stiffening
	1	—	Moulding/bonding techniques Support cables, support cable attachment, bulkheads, equipment attachment Furnishings Doors, windows and hatches Fire protection — skinning Lightning protection
Systems:			
(1) Flight Control	1	—	Fins, rudders, elevators Operating systems and surfaces — manually/power operated Trim operating systems — manual and electric
(2) Ice and Rain Protection	1	—	Windscreen wipers
(3) Heating and Ventilation	1	—	Exhaust heat exchangers Ventilation system
(4) Vacuum/Pressure	1	—	Supply and associated system
(5) Landing Gear	1	—	Geometric arrangement Structural arrangements Castering/pivoting/locking Shock absorbers Weight sensing/measurement

SECTION L

MODULE 10
CATEGORY 'A'/'C' —
AIRSHIPS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Ducted Propellers	1	—	Principles of operation Propeller forces: aerodynamic/ centrifugal Pitch variation/control Positive/negative vectoring Power conversion Control systems: electronic control, emergency forward coarse selection Balance Clutches Materials Protective finish: contour control, visibility Duct pivoting systems: drive and control, motors, limit control, gear- boxes, inter-connection, emergency manual
Ground Handling	1	—	Attaching to/releasing from/mast Ground power Fuelling Ballasting Helium: charging, purifying, leak, testing Pressure watch techniques Mooring — mobile/portable Engine running Hangaring Adverse weather

MODULE 11 – CATEGORY 'B' – AEROPLANES/ROTORCRAFT

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Regulations	1	2	Registration process
			Issue of Certificates of Airworthiness – special conditions, mandatory requirements for modifications/inspections, markings, equipment
			Flight Manual – provision of manuals and documents
			Prototypes, modified prototypes, series aircraft
			Acceptability of foreign type certification
			AANs for a type within particular C of A Categories
			Modification standard – recording
			Relevance of previous maintenance records
			Build standard
			Public transport – operator's responsibilities
			Loading
			Performance
			Categories of Flight
			Glider towing
			Parachuting
			Aerial application
			Exits and break-in markings
			Documents to be carried
			Records to be kept
			Production and preservation of records
			Offences in relation to documents and records

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Refurbish/'Overhaul' of Aircraft	1	2	<p>Preparation of the aircraft – cleaning, access dismantling, jacking and trestling, furnishing removal</p> <p>Preparation of inspection reports and establishment of work required</p> <p>Final inspection – preparation of final reports and records/log book entries</p> <p>Mandatory Modifications, Inspections, Service Bulletins, Airworthiness Directives applicable to the type rating sought</p>
Overhaul/Repair of Parts/Components	1	2	<p>Overhaul data – requirements, documentation, work sheets, inspection stages, testing</p> <p>Use and control of workshop inspection aids including non-destructive test equipment</p> <p>Factors and limitations affecting choice of equipment and methods used</p> <p>Overhaul and testing procedures for component parts of pneumatic, hydraulic, air conditions, oxygen, anti-icing, de-icing, fire extinguishing and rotorcraft transmission systems</p> <p>Assembly procedures and approved repair schemes applicable to major components</p> <p>Engine mounting structures</p> <p>Inspections necessary before, during and after repair, including checking of alignment and symmetry</p> <p>Repair, inspection and testing of tanks, heat exchangers, fuel and oil systems, and all types of control systems relevant to a Category 'B' Licence</p>
Facilities	1	2	<p>Preparation and layout of workshops</p> <p>Care, use and checking for accuracy of test equipment</p>

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Welding	1	2	Use and application
			Approved welders – limitations, periodic testing
			Support – pre-heating – pressure relief
			Cleaning and preparation
			Fluxes and filler/welding rods
			Gas and specialist welding principles
			Materials
			Strength of welded joints
			Inspection before, during and after welding
			Pre- and post-treatments
			Equipment
Brazing/Hard Soldering	1	2	Use and application
			Support, pre-heating, pressure relief
			Cleaning and preparation
			Fluxes – fillers/spelter
			Materials
			Equipment

MODULE 12 — CATEGORY 'D' — ENGINE OVERHAUL

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Category 'D' Licences: General	2	—	<p>Overhaul as a condition control process — its advantages and disadvantages</p> <p>Familiarity with the operating environment of piston engines in aircraft</p> <p>Sudden stoppage — over-revving, over-boosting, over-heating</p> <p>Bogus parts</p> <p>Fatigue</p> <p>Mandatory reporting</p> <p>Fuels and oils — Mogas</p>
Overhaul Process Control	2	—	<p>Facilities: shop layout — stores; work environment; equipment for cleaning, inspection, rework and testing</p> <p>Control of precision measuring instruments and equipment</p> <p>Work package control and processing</p> <p>Acceptability of third party work/ opinions/reports/recommendations e.g. manufacturers and their agents/ other agencies</p> <p>Use of experts and expert opinion</p> <p>Use of unskilled labour</p>
Constructional Arrangement and Piston Engine General Considerations	1	2	<p>Crankshaft, balance weights, main bearings</p> <p>Auxiliary drives, internal lubrication provisions</p> <p>Seals and sealing materials</p> <p>Oil coolers and thermostatic valves</p> <p>Oil pumps, filtering, pressure control</p> <p>Fuel pumps — engine driven</p> <p>Ignition and valve timing provision</p>

(continued over)

Syllabus Subject	Level		
	WTR	TR	
Constructional Arrangement and Piston Engine General Considerations (continued)	1	2	Drive pulleys
			Hardness testing, fits and clearances
			Dowels and blind holes
			Sequential torque assembly — retorquing requirements
			Tooth patterns and backlash checks
			Contact area checking
			End float clearance, checking and setting
Repairs and Rectification	1	1	Bonding and main earthing
			Machining
			Heat treatments
			Anodic treatments
			Plating
	2	2	Corrosion treatments
			Protective treatments and finishes
			Surface finishes
			Fits and clearances
			Thread forms
Overhaul Activity	1	2	Cylinder and piston assemblies
			Cooling baffles — hottest cylinder
			Main casings
			Rear covers
			Gear trains
			Camshaft and valve operating mechanisms
			Crankshaft, connecting rods — bearings
			Lubrication systems — passages, jets, pumps, pressure relief valves, coolers, thermostatic valves, filters and strainers

(continued over)

SECTION L

MODULE 12
CATEGORY 'D' —
ENGINE OVERHAUL

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Overhaul Activity (continued)	1	2	Sealing — slinger rings, and mechanical flow control Crank cases, rear covers, sumps Engine mounting provision Governor drive provision Induction and exhaust manifolds Reduction gears, assemblies and housings Superchargers/turbochargers Carburettor/injection systems Hoses and pipes Electrical wiring Ignition harness
Non-Destructive Testing	2	—	Eddy current/ultrasonic/X-ray/gamma ray/magnetic particle Techniques — status and approval Approved NDT organisations Interpretation of results Certification of inspection completion/acceptability of the condition found
Welding/Brazing	2	—	Preparation — fluxes, welding/brazing rods Expansion/contraction effects and control Hollow parts — internal protection Welding methods: gas/arc/resistance welding Brazing/hard soldering methods Approval of welders Inspection of welded/brazed joints

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Testing after Overhaul	2	—	Dynamometer testing Fan testing Endurance tests Final tests Testing in aircraft Run-in procedure Oil consumption run Turbocharger setting up after overhaul
Release, Preservation, Storage and Transportation	2	—	Log Books:— certification, reports, references, recording of parts, limits, concessions, modifications, alternate parts, mandatory modifications and inspections Service information leaflets, etc Lifer parts, salvage schemes/ oversize parts Inhibiting:— internal, external, injectors, carburettors, turbochargers

MODULE 13 – HUMAN PERFORMANCE

<i>Syllabus Subject</i>	<i>Level</i>	
	<i>WTR</i>	<i>TR</i>
General	2	The need to take human factors into account Incidents attributable to human factors/human error 'Murphy's' Law
Human Performance and Limitations	2	Vision Hearing Information processing Attention and perception Memory Claustrophobia and physical access
Social Psychology	1	Responsibility: individual and group Motivation and de-motivation Peer pressure 'Culture' issues Team working Management, supervision and leadership
Factors Affecting Performance	2	Fitness/health Stress: domestic and work related Time pressure and deadlines Workload: overload and underload Sleep and fatigue, shiftwork Alcohol, medication, drug abuse
Physical Environment	1	Noise and fumes Illumination Climate and temperature Motion and vibration Working environment
Tasks	1	Physical work Repetitive tasks Visual inspection Complex systems
Communication	2	Within and between teams Work logging and recording Keeping up to date, currency Dissemination of information
Human Error	2	Error models and theories Types of error in maintenance tasks Implications of errors (i.e. accidents) Avoiding and managing errors

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Hazards in the Workplace	2		Recognising and avoiding hazards Dealing with emergencies

MODULE 20 – COMMON – CATEGORIES 'X'/'R'

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Engineering Drawings	2	–	Use, validity control
	3	3	Wiring diagram manuals, inter-connection charts, schematic diagrams
Technical Information	1	2	Service bulletins, modification data, manuals, schedules
Mathematics	1	–	Simple calculations, measurements, angles, graphs, transposition of formulae, volume, density, pressure Powers of numbers, binary notation, simple equations, conversion of units, SI/Imperial
Tools	1	1	Hand tools, simple machine tools, precision measuring instruments
	2	3	Crimping tools, hand and hydraulic
Common Parts	1	1	Fasteners, locking devices, washers, pipes (rigid and flexible), bearings, adhesives, solvents, oils, greases
Common Practices	1	2	Torque loading
	1	–	Corrosion protection, metal contamination Storage and handling, fire protection, general safety Earthing of aircraft and bonding Aircraft handling, towing and mooring
	1	2	Ground services, a.c. and d.c.
	1	–	Soldering
	2	3	Crimping
	2	–	Electrostatic damage protection Cable looms, harnesses, terminations and disconnects

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Electrical Theory	2	–	General principles, basic laws, units, power in circuits, magnetism, simple d.c. and a.c. circuit calculations, insulators, conductors, semi-conductors, circuit elements and symbols
	2	2	Transformers – single phase, 3-phase, auto-transformers
	1	–	Transistor – biasing, simple circuit arrangements
	2	–	Amplifiers – signal amplifiers, feedback
			Synchros – CTs, differential, torque synchros and resolvers
	1	–	Switch gear, relays, circuit protection devices, magnetic indicators and annunciators
			Batteries – applications and handling
Digital Techniques			Electrical measuring instruments, circuit testing methods
	2	–	Logics – basic gate functions and truth tables
	1	–	Microprocessors – block diagram
			Digital computing techniques
			Parallel and serial operation
High Intensity Radiated Fields			Volatile/non-volatile data storage
	1	2	Multiplex systems
	1	1	Effect on sensitive systems, principles and methods used to minimise HIRF effects
Fly by Wire	1	1	General principles

MODULE 21 — BASIC: ELECTRICAL EQUIPMENT AND SYSTEMS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Batteries	1	—	Principles of primary and secondary cells
	2	—	Lead-acid types Ni-Cad types
	2	3	Methods of charging batteries in aircraft
	2	—	Capacity testing, storage
Direct Current Machines	2	—	Basic laws and principles
			Types and characteristics
			Control
Direct Current Generation	1	2	Voltage regulation
			Control
			Load sharing
			Paralleling
			System layouts Interlock circuits
Power Conversion Equipment	1	2	Static and rotary inverters
			Transformer rectifier units
Fire Protection	1	2	Detection systems
			Fire and overheat warning
			Smoke detectors — principles and applications
			Overheat sensors
			Extinguishing systems Warnings
Flight Controls	1	2	Motors and actuators — clutches and brakes
			Limit switches, micro switches and proximity detectors

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Flight Controls (continued)	1	2	Power control units Flap motors protection and control Trim motors
Fuel Systems	1	2	Boost pumps control and indication Jettison systems Refuel/defuel systems Fuel heaters Crossfeed, supply and shut-off valves -- normal and emergency
Hydraulic Systems	1	2	Pump control and isolation Pressure switches Overheat warnings Electrically-operated priority valves Fluid reservoir components Low level warnings
Landing Gear Systems	1	2	Actuation -- motors -- selection and control Indication -- proximity sensors -- micro switches Air/ground sensor systems Anti-skid systems -- operation, control and override Automatic braking systems -- inputs; control and override
Lighting Systems	1	2	External systems: landing, navigation, anti-collision and inspection, etc Internal systems: normal and emergency, fluorescent tubes, reading and passenger information systems, multiplex function

SECTION L

MODULE 21

BASIC: ELECTRICAL EQUIPMENT AND SYSTEMS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Pneumatics	1	2	Control — indication and protection
Engine and Propeller Control	1	2	Fuel control valves Temperature and speed limiting systems Propeller feathering controls Electronic engine control
Starting and Ignition	1	2	System types Control Principles of operation of high energy ignition units Aircraft and engine applications and related systems, e.g. stall warning
Alternating Current Machines	2	—	Basic laws and principles Types and characteristics Control
Alternating Current Power Generation	1	2	Constant and variable frequency Constant speed drive units Paralleling Load sharing Load shedding Generator control unit Voltage regulation Load controller Differential protection Fault and test panels Voltage, frequency and excitation control and protection

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Alternating Current Power Distribution Systems	1	2	Bus-bar layouts
			Split and parallel systems
			Transfer relay interlocks
			Emergency conditions
			APU and GPU interlocks
			Warnings
			Maintenance panels
Air Conditioning Systems	1	2	Control
			Indication
			Protection
Ice and Rain Protection Systems	1	2	Windscreen heating: control, indication and failure
			Engine/propeller and airframe anti-ice protection: thermal, electrical and pneumatic
			Warnings and indications
			Overheat indications and protection
			Ground operations
			Windscreen wiper, washer and rain-repellant systems
			Sensor protection — angle of airflow, pitot head, static plate and temperature probes
			Waste water heaters — thermal anti-icing protection
Auxiliary Power Units	1	2	Aerial heaters
			Starting, control, protection
			Power generation
			Fire protection

SECTION L

MODULE 21

BASIC: ELECTRICAL EQUIPMENT AND SYSTEMS

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Ground Power Supplies	—	2	Interlocks and protection of aircraft supplies Control
Centralised Warning and Indication Systems	1	2	Inputs Output warnings Priority philosophy
Galley/Toilet Services	1	—	Power supply and protection Water heating Equipment

MODULE 22 – BASIC: INSTRUMENTS CATEGORY 'X'

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Pitot-Static Systems and Instruments	1	–	Atmospheric physics, temperature lapse rate, Mach number computation
	2	–	Airspeed indicator, altimeter, vertical speed indicator, and machmeter
			Servo altimeter
	1	2	Pitot probes, static plates and heaters
	2	2	Pipelines and flexible hoses
	1	2	Drain traps, associated equipment
			Altitude and airspeed switches
Rate of Turn and Slip Indication	1	2	Rotor speed; display
Vacuum Systems	1	–	Sources
	1	2	Control and adjustment
			Indication
Pressure Measurement	1	–	Sensing elements; capsules, bellows, Bourdon tubes, transmitters
			Displays
Temperature Measurement	1	2	Variable resistance
			Thermocouples; compensation; limits and values; servo indicators; control system inputs
Rotational Speed Measurement	1	2	Direct drive indicators; tachogenerator and indicator systems; pulse probe systems
			Displays
Position Measurement	1	2	d.c. and a.c. systems

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Quantity Measurement	1	2	Direct reading
	2	2	Electrical and electronic systems
	1	2	Compensation Power supplies
Flow Measurement	1	2	Indicators Transmitters Power supplies
Compasses	1	2	Direct reading compass installation; safe distance Flux detectors and remote sensors remote system components Heading reference outputs
Air Data Computation	2	—	Sensors and inputs Signal processors: mechanical, electrical and electronic Signal outputs and displays
Reduced Vertical Separation Minima	1	2	Signal sources and interface with other systems
	1	2	Maintenance practices
Flight Path Computation	2	2	Signal sources, radio inputs
	1	2	Modes, computation Displays
Electronic Display Systems	1	1	CRT; LED; LCD displays
	1	2	EADI; EHSI; symbol generators Control panels Comparators and monitors Engine indicating and crew alerting systems Electronic centralised aircraft monitors
Flight Data Recorders	1	2	Requirements
	1	2	Sensors and inputs Cockpit Voice Recorder inputs Interface with aircraft systems

(continued over)

SECTION L

MODULE 22
BASIC: INSTRUMENTS CATEGORY 'X'

Syllabus Subject	Level		
	WTR	TR	
Flight Data Recorders (continued)	1	2	Signal processing
			Entry panels
			Computer principles
			Data recording methods
			Retrieval and verification
	1	1	Readout
	1	2	Failure monitors
Inertial Navigation Systems and Inertial Reference Systems	1	1	Basic principles
			Platform construction
			Computation
	1	2	Displays and interface with aircraft equipment
			Mode selector and CDU
			Failure/fault indicators
		Power supplies and cooling	
Ground Proximity Warning Systems	2	2	Modes
			Warnings
	1	2	Inputs and interface with other aircraft systems
	1	1	Computation
			Monitors
			Failure indications
Vibration Measurement	1	2	Types of pick-up
			Signal conditioning
			Displays
			Alarm levels and warnings

MODULE 23 — BASIC GYROSCOPES AND SERVOMECHANISMS CATEGORY 'X'

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Gyroscopes	1	—	Basic principles
	1	2	Types and methods of operation — vacuum electrical, or laser
	2	—	Handling care
	1	2	Attitude sensing:— Errors, correction Remote gyros, interconnections and transfers Limits Direction sensing:— Errors, compensation Remote gyros, interconnection and transfers Rate sensing:— Alignment Rotor speeds
Accelerometers	1	2	Basic principles
Servomechanisms	1	2	Rate and position sensing and control
			Integrators
			Response and damping
			Power requirements
			Clutches
			Override and lockout protection
			Null and loop error sensing
			Synchronisation systems
			Force rebalance systems

MODULE 24 – AUTOMATIC PILOTS – AEROPLANES CATEGORY 'X'

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Theory of Flight (Fixed Wing)	1	2	<p>Forces on the aircraft</p> <p>Stability – dihedral, sweepback, etc.</p> <p>Control axis</p> <p>Primary control surfaces – operation and effect on the aircraft</p> <p>Secondary controls</p> <p>Forces during turns</p> <p>Functions of trim tabs, balance tabs and servo tabs</p> <p>High speed buffet and stall conditions</p> <p>Auto-pilot control axis</p> <p>Auto-stabilisers – wing levellers</p> <p>Co-ordinated turns, aileron/rudder cross feed</p> <p>Versine generation and application</p> <p>Sideslip monitors – Slip and skid in a turn</p> <p>Turbulence penetration and the effect on autopilot control</p>
Yaw Dampers	1	2	<p>Dutch Roll phenomenon</p> <p>Yaw sensing</p> <p>Yaw signal processing</p> <p>Synchronisation</p> <p>Series and parallel systems</p> <p>Cockpit indication</p> <p>Aileron/rudder control interaction in turns</p> <p>Rudder PCU, LRUs</p> <p>Interlocks with autopilot systems</p>

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Pitch Trim Systems	1	2	Longitudinal axis stability High speed tuck Mach No. inputs
Mach Trim	1	2	Mach trim actuators computation Connections with aircraft controls Warnings
Alpha Trim	1	2	Angle of attack sensing Computation Interface with other aircraft systems: e.g. N1 computers – stall warning systems Flight directors
Auto-Stabilisers	1	2	Trim actuators – control and safety interlocks Speed change systems for trim actuators Interlocks Elevator/stabiliser interaction
C of G Trimmers	1	2	Computation Indication
Demand Signals	1	2	Control wheel steering systems Touch wheel steering systems

MODULE 25 – AUTOMATIC PILOTS – COMMON – CATEGORY 'X'

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Error Signals	1	2	Rate system – errors and control Displacement system – errors and control Heading and course error inputs Radio beam deviation inputs Attitude inputs CADC/autopilot interface – e.g. q or % adaptation Sideslip sensors and monitors
Signal Processing	1	2	Typical channel signal flow path Buffer amps Input signal modulation Summing points Signal sensors and switching functions Integrators Limiters Gain programmers Dual channel monitors Voter systems
Demand Signals	1	2	Mode selectors Control display units Turn controllers Control column transducers Command override systems Mode compatibility Mode annunciators Failure and disconnect lights and aural warnings

(continued over)

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Demand Signals (continued)	1	2	Interlocks - pre- and post-engage
			Pitch attitude trim
			Roll out/heading-hold, engage
			Synchronisation
			Trim monitors and indicators
			Altitude hold inputs
			Vertical speed control
			Mach/IAS hold
			Altitude acquire or change systems
Command Signal Outputs	1	2	Power control units - line replaceable units
			Solenoid valves
			Transfer valves
			Position sensors
			Servomotors - construction, interconnection with control runs
			Clutches - torque settings
			Brakes
			Tachogenerators - feedback and damping
			Position feedback - indication
			Torque limiting
			Hardover sensing - disconnection
			Jam detection
			Runaway conditions - disconnection
			Pilot override - disconnection

MODULE 26 – AUTOMATIC PILOTS – ROTORCRAFT – CATEGORY 'X'

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Theory of Flight (Rotorcraft)	1	2	Rotor disc: forces, lift, drag, centrifugal force, weight, phase lag Articulated/semi-rigid/rigid rotors flapping/dragging/feathering Vertical and translational flight Main and anti-torque rotors, control inputs cyclic, collective, rudder pedals Directional control Autorotation Forward speed effects
Command Outputs	1	2	Actuators Indicators
Trim Systems	1	2	Manual/Automatic Indication
Stability Augmentation Systems	1	2	Actuators Indicators Computation

MODULE 27 – COMBINED CATEGORY INSTRUMENTS/AUTOMATIC PILOTS – CATEGORY 'X'

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Automatic Throttle Systems	1	2	Control inputs
			Related engine controls
			Sensors
			Engine coupling units: clutches and servo-motors
			Override and safety considerations
			Modes of operation
			Electronic engine control: micro-processor inputs and control
Automatic Landing Systems	1	2	Principles, requirements and approach categories
			Types of system operation: dual or triple channel
			System operation on approach
			Monitors and failure conditions
			Roll-out control
			BITE
	1	3	Category downgrade and reinstatement procedures
Digital Flight Systems	1	2	Flight management systems

MODULE 30 – COMPASS COMPENSATION

<i>Syllabus Subject</i>	<i>Level</i>	
	<i>WTR</i>	<i>TR</i>
Compass Compensation	2	–
		Base survey techniques
		Compass swinging areas
		Aircraft magnetism
		Terrestrial magnetism – variation
		Methods and procedures for swinging compasses
	1	–
		Flux valve operation
	3	–
		Deviation: calculations and effects on a compass
		Compensation and adjustment procedures
	1	–
		Various compass types

MODULE 31 – RADIO COMMUNICATION AND NAVIGATION – CATEGORY 'R'

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Radio Theory	1	–	Propagation of radio waves Polarisation Radiation patterns Transmitters and receivers RF Amps, IF Amps Oscillators, frequency synthesisers Frequency multipliers Mixers, detectors, BFO, AGC Noise limiters, muting circuits, audio amplifiers Modulators, RF power amplifiers matching units Filters and tuned circuits
Interference	2	–	Principles and methods used to minimise the effects of conducted and radiated interference Methods used to minimise the effects of lightning strikes and static on aerials
Aerials and Feeders	2	–	Diplexers, baluns and matching stubs Fixed and variable matching arrangements Locations and types of aerials – communication and navigation Bandwidth and effective height of an aerial
Communication	2	–	Calculation of standing wave ratio Control and monitoring circuits
Audio Systems	2	–	Intercommunication Audio mixing and distribution systems Public address and entertainment systems Headsets and microphones

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Cockpit Voice Recorder	2	–	Signal sources Control circuitry; hot microphone Requirements
VHF/HF Communications	2	–	Airborne installations
VOR/ILS	1	–	Ground station signals
	2	–	Airborne installations
			Control
			Monitors
			Indicators
			Loading
			AFCS and instrument interface
Marker	1	–	Ground installations
	2	–	Airborne systems
Automatic Direction Finding	2	–	Receiver
			Loop and sense aerials and feeders
			Bearing errors and correction devices
			Loop swings
Satellite Communication and Navigation (GPS) Systems	1	–	Airborne installations
			Receiver, computer
	2	–	Displays
			Interface with other systems
Flight Compartment Electronic Display Systems	1	–	EADI; EHSI; symbol generators
			Control panels
			Comparators and monitors
Microwave Landing Systems (TRSB)	1	–	Receiver, computer
			Interface with other systems
RNAV	1	–	Computer
			Interface with other systems
			Indications

MODULE 32 – RADAR SYSTEMS – CATEGORY 'R'

<i>Syllabus Subject</i>	<i>Level</i>		
	<i>WTR</i>	<i>TR</i>	
Pulse Techniques	1	—	Radar transmitter/receiver Pulse modulation Peak power, average power Duty cycle, pulse shape, pulse width Pulse rise time and repetition frequency Range accuracy and resolution Receiver bandwidth Noise
Primary Radar	2	—	Weather radar:— Control and monitoring circuits Indicators; displays Scanners; waveguides
	1	—	Doppler:— Aerials Indicators Interface with other equipment
	2	—	Radio altimeters:— Pulse and FM.CW systems
Secondary Radar	2	—	DME:— Indicators Control and monitor circuits Interface with other aircraft systems ATC Transponders:— Instrument system interface Control and monitor circuits
	1	—	TCAS:— Indicators Control and monitor circuits Interface with other aircraft systems

APPENDIX 2

SUGGESTED STUDY MATERIAL

- 1 A study of the following official publications relevant to the subject of Regulations and Airworthiness Requirements is essential in respect of examinations associated with the various categories of licence. The publications may be purchased from Her Majesty's Stationery Office and Westward Digital Limited at the addresses below.

The Air Navigation Order	} HMSO 49 High Holborn London Telephone 0171-873 0011
Air Navigation (General) Regulations	

NOTE: The CAA also publishes a loose-leaf edition of the above Statutory Instruments. It is obtainable under reference 'CAP 393: Air Navigation – the Order and the Regulations' from the address below.

British Civil Airworthiness Requirements:

(CAP 553) Section A – Certification
and Approval Procedures
(CAP 455) Airworthiness Notices
(CAP 468) Section L – Licensing – Aircraft
Maintenance Engineers

Joint Aviation Requirements

(JAR-145) Approved Maintenance
Organisations
(CAP 562) Civil Aircraft Airworthiness
Information and Procedures
(CAP 396) Registration, certification
and maintenance of aircraft

Westward Digital Limited
37 Windsor Street
Cheltenham
Glos. GL52 2DG
Telephone Cheltenham (01242) 283100

- 2 The following publications provide useful information for study in connection with the Licence, and may be obtained direct from the publisher, or through bookshops. Books may also be available in libraries.

Open Tech Study Plans Learning Packages	} Aviation Training Association 125 London Road High Wycombe Bucks HP11 1BT Telephone High Wycombe (01494) 445262

Aircraft and Systems

Understanding Aircraft Structures	J Cutler	Blackwell Scientific Publications
The Aeroplane Structure Mechanics of Flight	A C Kermode A C Kermode	} Longman Group Publications
Light Aircraft Inspection Light Aircraft Maintenance	J E Heywood J E Heywood	
Into Thin Air	E W Still	T & A D Poyser Blackwell Scientific Publications
Aircraft Maintenance and Repair Maintenance of Aeroplane Vehicles	Bent & McKinley Northrop Institute of Technology	Normalair-Garrett McGraw-Hill

Aircraft and Systems (continued)

A & P Mechanics General Handbook	EA-AC65-9A	} Aviation Maintenance Foundation Inc (USA)
A & P Mechanics Airframe Handbook	EA-AC65-15A	
Aviation Maintenance Handbook and Standard Hardware Digest	EA-AHS-1	
Transport Category Aircraft Systems	EA-363	} Aviation Maintenance Foundation Inc (USA)
Aircraft Weight and Balance	EA-BAL	
Aircraft Corrosion Control	EA-CC-1	
Advanced Mathematics for the Aircraft Technician	EA-MAT	
Aircraft Air Conditioning Systems	EA-AAC-1	
Aircraft Fabric Covering	EA-ADF	
Aircraft Hydraulic Systems	EA-AH-1	
Aircraft Oxygen Systems	EA-AOS	
Aircraft Painting and Finishing	EA-AP-2	
Aircraft Tires and Tubes	EA-ATT	
Aircraft Wheels, Brakes and Anti-Skid Systems	EA-AWB	
Aircraft Bonded Structure	EA-NMR	
Aircraft Sheet Metal Construction and Repair	EA-SMF	
The Anatomy of the Aeroplane	Darrol Stinton	Blackwell Scientific Publications
The Helicopter – Its History and How It Flies	J Fay	David and Charles
Helicopter Flight Theory for Pilots and Mechanics	J R Montgomery	Sikorsky
Dynamics of Helicopter Flight	Saunders	John Wiley & Sons
Fundamentals of Helicopter Maintenance	EA-HF-1	Aviation Maintenance Foundation Inc (USA)

Powerplants

The Jet Engine	Rolls-Royce	} McGraw-Hill
Aircraft Powerplants	Bent & McKinley	
Powerplants for Aerospace Vehicles	Northrop Institute of Technology	
The Aircraft Gas Turbine Engine	Pratt & Whitney	} T & A D Poyser
Light Aircraft Inspection	J E Heywood	
A & P Mechanics Handbook	EA-AC65-12A	
Aircraft Propellers and Controls	EA-APC	} Aviation Maintenance Foundation Inc (USA)
Aircraft Reciprocating Engines	EA-ARE	
Aircraft Fuel and Metering Systems	EA-FMS	
Aircraft Ignition and Electrical Power Systems	EA-IGS	
Aircraft Gas Turbine Powerplants	EA-TEP-1	} McGraw-Hill
Jet Aircraft Power Systems	Cassamassa & Bert	
Aircraft Gas Turbine Engine Technology	Irwin E Tregar	

Avionics

Aircraft Flight Instruments and Integrated Systems	E Pallett	} Longman Group Publications
Aircraft Electrical Systems	E Pallett	
Aircraft Radio Systems	J Powell	} Blackwell Scientific Publications
Automatic Flight Control	E Pallett	
Electrical Technology	E Hughes	Longmans
Electronics II	D C Green	Longman Group Publications
Electronics III		
Microprocessors/Microcomputers: An Introduction	Givens/Roesser	} McGraw-Hill
Elements of Electronics	Hickey/Villines	
Handbook for Electronic Engineering Technicians	Kaufman/Siedman	
Aircraft Electricity and Electronics	Eisman/Bent/McKinley	
Electronic Computers Made Simple	Jacobweitz	W H Allen
Aircraft Batteries	EA-AB-1	} Aviation Maintenance Foundation Inc (USA)
Basic Electricity for A & P Mechanics	EA-BE-1	
Basic Electronics and Radio Installation	EA-BEM	
Aviation Electronics	EA-AEG-1	
D C Circuits	EA-DCC	
Manual of Avionics	Brian Kendal	PSP Professional Books
Digital Avionic Systems	GRS Spitzer	Prentice Hall
Modern Aviation Electronics	A Helfrich	IAP Inc Training Manual
Avionic Fundamentals		

APPENDIX 3

EXAMPLE OF A COMPLETED FORM AD 300

CIVIL AVIATION AUTHORITY

Please complete this form in BLACK INK and using BLOCK CAPITALS

CAA Ref: _____ /

APPLICATION FOR THE GRANT OR EXTENSION
OF AN AIRCRAFT MAINTENANCE ENGINEER'S LICENCEPlease read the enclosed guidance notes before
completing this form.

1 PERSONAL DETAILS

Surname COPTHORNE Title MR Date of Birth 13/03/71
 Other names DAVID CAMERON Nationality BRITISH
 Permanent address 11 LONDON ROAD Tel No. 01212 612345
CHRISTCHURCH DORSET UK Post Code RH6 2DE
 Address for use with this application AS ABOVE
 UK Post Code RH6 0YR
 Name of Employer CHARTER AIRWAYS Date of joining 06/10/91
 Employed at GATWICK AIRPORT Work Tel No. 01293 8232831
 UK AMEL No. 24800 Expiry date 31/03/93 UK Aeronautical Maintenance Certificate No _____

2 PREVIOUS APPLICATION

Please give details of your last application for the grant or extension of a United Kingdom Aircraft Maintenance Engineer's Licence or AMC.

Approximate date	Licence Rating	Was application accepted?	Result of examination
APRIL 1995	AEROPLANES 2	YES	FAIL

3 RATING APPLIED FOR

Please fill in below the details of the rating for which you are applying.
 Ensure you have studied the current issue of BCAR Section L and Airworthiness Notice No. 10. These are obtainable from Printing and Publication Services, Greville House, 37 Grafton Road, Cheltenham, Glos GL50 2BN

Licence	Category	Sub-division/type rating being applied for
Without Type Rating	A	AEROPLANES TWO
Type Rating	A	BOEING 737

4 EXAMINATION VENUE & DATE

I wish to take my written examination at GATWICK 30/02/98
 (Any oral examination will take place at the CAA Regional Office in the UK which covers your place of employment)
 If you have any preference for a particular sitting or range of dates please note these also. We will try to accommodate your wishes where possible.

FOR CAA USE ONLY

LWTR

Module 1 Yes / No

Regs essay Yes / No

Satisfactory/Unsatisfactory

Exemptions

Tech essay Yes / No

Signature

Reasons for Exemptions

TR

Papers

Satisfactory/Unsatisfactory

Time

Signature

AD300
120896

SAMPLE ONE TYPICAL INITIAL APPLICATION STYLE

5 State in date order full particulars of experience (including service in HM Forces, if applicable) together with any practical experience gained as a student at any aeronautical school or college. Please indicate whether experience was obtained by full-time or part-time involvement; if part-time state approximate hours per week. Service Personnel should supply documentary evidence of recent experience (originals will be returned).

IMPORTANT: The application will not be accepted unless (i) the information required is given in sufficient detail to show clearly satisfaction with any experience requirement in the current issue of British Civil Airworthiness Requirements Section L (Licensing) for the category of licence for which application is made, (ii) the conditions of Column (4) are complied with, and (iii) a satisfactory Type Rating Record of Experience (on Form AD 301) is submitted if applicable.

NOTES: 1 If the application is for the extension within a Category, particulars of relevant experience are required only since the date of the last application for the Category, together with Type Rating Record of Experience on the type to which the application relates.

2 The Type Rating Record of experience should be compiled in accordance with Appendix 4 of British Civil Airworthiness Requirements Section L.

3 The signature in column (4) constitutes confirmation of the adjacent entry in Columns (1), (2) and (3). This certification shall normally be made by an engineer who has regular professional contact with the applicant. The signatory may be an experienced person other than an appropriately licensed engineer with the prior agreement of the Engineer Licensing Department of the CAA.

Types of Aircraft, Engine or Equipment, showing the particulars relevant to the application being made (1)	PRECISE NATURE of work, and name of person in charge of Department or in similar authoritative position. State name of employer and place of employment (2)	DATES From To (3)	Signature of Referee and name in capitals. To be signed by person quoted in Column (2). (See Notes above) (4)
BOEING 767/737 AIRBUS A320 FOKKER 70	AIRFRAME/ENGINE APPRENTICE BIG AIRCRAFT AIRLINES - STANSTED TRAINING MANAGER - A WISEONE	SEPTEMBER 1990 - AUGUST 1994.	<i>A Wiseone</i> Big Aircraft Airlines Training Dept A WISEONE 17/7/97
BOEING 767 - 310 767 - 200 AIRBUS A320 G.E. 80C2	BASE MAINTENANCE AIRFRAME AND ENGINE SYSTEMS BIG AIRCRAFT AIRLINES - STANSTED SUPERVISOR - J JONES	SEPTEMBER 1994 - JULY 1996.	<i>J JONES</i> J JONES/BAA LAE 53343 20/7/97
BOEING 767 - 300 AIRBUS A320 G.E. 80C2	LINE MAINTENANCE AND RETIFICATION ON AIRFRAME AND ENGINE SYSTEMS CHARTER AIRLINES CHIEF ENGINEER - J MAJOR	AUGUST 1996 - TO PRESENT.	<i>J Major</i> J MAJOR Chief Engineer Charter Airlines 21/7/97

Continue on separate sheets, if necessary

AD300
120896

SAMPLE TWO TYPICAL APPLICATION TO EXTEND A LICENCE

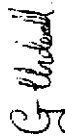
5 State in date order full particulars of experience (including service in HM Forces, if applicable) together with any practical experience gained as a student at any aeronautical school or college. Please indicate whether experience was obtained by full-time or part-time involvement; if part-time state approximate hours per week. Service Personnel should supply documentary evidence of recent experience (originals will be returned).

IMPORTANT: The application will not be accepted unless (i) the information required is given in sufficient detail to show clearly satisfaction with any experience requirement in the current issue of British Civil Airworthiness Requirements Section L (Licensing) for the category of licence for which application is made, (ii) the conditions of Column (4) are complied with, and (iii) a satisfactory Type Rating Record of Experience (on Form AD 301) is submitted if applicable.

NOTES: 1 If the application is for the extension within a Category, particulars of relevant experience are required only since the date of the last application for the Category, together with Type Rating Record of Experience on the type to which the application relates.

2 The Type Rating Record of experience should be compiled in accordance with Appendix 4 of British Civil Airworthiness Requirements Section L.

3 The signature in column (4) constitutes confirmation of the adjacent entry in Columns (1), (2) and (3). This certification shall normally be made by an engineer who has regular professional contact with the applicant. The signatory may be an experienced person other than an appropriately licensed engineer with the prior agreement of the Engineer Licensing Department of the CAA.

(1) Types of Aircraft, Engine or Equipment, showing the particulars relevant to the application being made	(2) PRECISE NATURE of work, and name of person in charge of Department or in similar authoritative position. State name of employer and place of employment	(3) DATES From To	(4) Signature of Referee and name in capitals. To be signed by person quoted in Column (2). (See Notes above)
BOEING 737 - 200/300 G - CAAC G - CAAB	SCHEDULED, NON SCHEDULED MAINTENANCE MODIFICATIONS ON COMPANIES AIRCRAFT. GENERAL AVIATION LTD SMALL AIRFIELD G. UNDERALL - GENERAL MANAGER.	OCTOBER 1996 - JULY 1997	 G. UNDERALL - General Manager 2/8/97

Continue on separate sheets, if necessary

6 QUALIFICATIONS WHICH MAY ALLOW EXEMPTIONS

List certificates (including licences not issued by this Authority) which may enable the CAA to grant exemptions from part of your examinations. (Copies must be attached with each application)

7 PROOF OF IDENTITY

Please attach a copy of your birth certificate, Passport or Government-issued document showing your name and nationality. This must be certified as a true copy by the referee who signs Part 9 of this form.
(These need only to be sent with your first application or at such time as your name or nationality is changed officially)

State document used including any reference number PASSPORT NO. A12346

8 SIGNATURE

I hereby declare that the information given on this form is true in every respect.

Signature of applicant D C Cophorne Date 13/07/97

9 REFEREE

This section is to be completed in all cases by the Referee who confirms the current period of experience at part 5, column (4).

I hereby declare to the best of my knowledge the information given by the applicant is true. The attached documents are true copies of the originals (Each document should have the following statement 'I CERTIFY THIS TO BE A TRUE COPY' followed by your signature. You must ensure that you see the original before making this statement.) You should ensure that the applicant cannot add statements to part 5 after you have signed the document.

Signature of referee [Signature] Date 26/07/97

10 TYPE RATING

This section is required to be completed only when an application is made for a Type Rating.

(i) I hereby certify that I am not aware of any reason why D.C. COPHTHORNE
should not be granted a Type Rating in respect of Category A

(ii) This applicant being in the employment of GENERAL AVIATION LTD has received
Type Training required by BCAR Section L appropriate to his responsibilities as a Licensed Engineer.

Signed G Underall Name G UNDERALL
(BLOCK CAPITALS)

Position or Status GENERAL MANAGER

Licence No. L518943 Date 15/08/97

This certification shall normally be made by an engineer who has regular professional contact with the applicant and who has held a UK Licence in the discipline for which application is made for a minimum of 24 months. The licence must be valid. The signatory may be an experienced person other than an appropriately licensed engineer with the prior agreement of the Engineer Licensing Department of the CAA.

IMPORTANT NOTES:

- (1) It is an offence to make with intent to deceive any false representation for the purpose of procuring the grant, issue, renewal or variation of any licence.
- (2) Requests to amend this application after its receipt by the CAA will not be accepted. This application is valid for 6 months only.

When completed, this form (and relevant Type Rating Records of Experience if applicable) should be sent to the Civil Aviation Authority, Engineer Licensing, Aviation House, Gatwick Airport South, West Sussex RH6 0YR.

AD300
120896

GUIDANCE NOTES

NOTE: Please read the relevant parts of BCAR Section L before completing the form.

1 EXAMINATION VENUES

1.1 AMEL written examinations are held usually twice per month at the following locations:

East Midlands Airport	Gatwick Airport	Luton Airport
Stansted Airport	Manchester Airport	Weston-super-Mare
Irvine		

If you are taking a written examination, an examination date approximately six weeks after acceptance of the application form will be offered; if you have a preference for a particular range of dates or if you are unavailable for any period please note this on the application form: we will try to accommodate your preferences but cannot guarantee that this will always be possible as some of the exam centres have limited seating capacity.

- 1.2 Oral examinations are normally conducted at the CAA Area Office appropriate to the applicant's place of work or permanent home address.
- 1.3 Examinations will only be conducted in the United Kingdom.

2 COMPLETING THE APPLICATION FORM

- (a) You will need to complete a separate AD 300 for each LWTR category (ie Airframe, Engine, each X Category and Radio) for which you are applying; however, where BCAR Section L requires multiple categories to be taken together (eg Aeroplanes 1 and an engine category or A&C Rotorcraft) one AD 300 will be acceptable.
- (b) If you are applying for a type rating an AD 300 and sufficient AD 301s covering the work you have done on the type must be submitted for each type for which you are applying (see BCAR Section L Appendix 1).
- (c) When completing Part 5 column 2 of the AD 300 you must show the precise nature of the work you have done and its relevance to the maintenance of operating aircraft; descriptions of individual tasks are not required for a LWTR application.
- (d) Although you do not have to describe your complete aviation background you must show at least the minimum experience required by BCAR Section L according to the nature of your application.
- (e) If satisfactory completion of a recognised course is required, evidence of this (including written acceptance of its acceptability by your employer, if not already recognised) must be submitted with the application.

3 EXEMPTIONS

You may be granted exemption from parts of the **written** examination if you hold certain qualifications or licences; if you think you qualify for these exemptions you must submit supporting documentation **each** time you make an application. These exemptions are listed overleaf:

<i>If you</i>	<i>You may be exempt</i>
Hold a valid UK AMEL	Multi-choice questions from modules which form part of a category already held on your licence.
Hold a valid ICAO Type II Licence or FAA A&P Certificate (but not a temporary certificate)	Multi-choice questions from modules (except module 1) where the rating on the licence corresponds to the category for which you are applying. Note: Where a candidate's results are such that all of the examination must be retaken or following a partial pass a candidate again fails, these exemptions may be withdrawn for further applications for that category.
Hold a valid foreign AME licence, the examinations for which were conducted by a UK CAA Surveyor, or which was issued under the direct supervision of UK CAA personnel Note: You will need to provide written confirmation from the relevant foreign authority	All written examinations (except Regulations) provided that: (a) the examination was conducted to the current issue of BCAR Section L and (b) any type rating which you are applying to be transferred must be for a type currently on the UK register and not a type for which completion of course is required by BCAR Section L3.
Hold an Aeronautical Maintenance Certificate	Multi-choice questions from modules which are held on your AMC.
Are or were in the UK Armed Services	Multi-choice questions from modules (except module 1) dependant upon your rank and trade in the services and the category for which you are applying (see the relevant DCI). The exemptions will be granted for up to 5 years from leaving the Services.
Hold an appropriate City & Guilds Technician Certificate or a BTEC granted by certain colleges accepted by the CAA for this purpose	Multi-choice questions from modules (except module 1) where the certificate is relevant to the category for which you are applying. The exemption will be granted for up to 5 years from the date of issue of the certificate.

APPENDIX 4

TYPE RATING RECORD OF EXPERIENCE — FORM AD 301

- 1 **GENERAL** As stated in Chapter L2, a satisfactory Record of Experience must be submitted as part of an application for a Type Rating. Details of this form, methods of completion, and confirming signatories required are given in this Appendix.
- 2 **ITEMS TO BE RECORDED**
 - 2.1 The Record of Experience items should be grouped under suitable headings appropriate to the Licence Category (see Tables 1 and 2 of this Appendix) in order that distribution and depth of coverage can be assessed. The experience shown must have been gained within the three years prior to the application.
 - 2.2 The amount of detail should be related to the construction and complexity of the type/group of aircraft, engine or equipment concerned. Account should also be taken of maintenance procedures, defect rectification and the duties and responsibilities which devolve on the holder of the Type Rated Licence.
 - 2.3 It is not sufficient to make such simple statements as, for example, 'No. 1 inverter replaced', 'Hydraulic pump replaced' or, '50-hour check carried out'. The replacement of items requires subsequently that specific functional checks be carried out, and therefore evidence of such checks must also be given in the Type Rating Record of Experience. In the case of time-cycled checks, reference should also be made to the extent of work involved relevant to the systems and/or equipment covered by the checks. Checking/inspection items are of limited worth, but the work items which follow from such checks/inspections provide the greater experience.
 - 2.4 If an oral examination is to be conducted for the Type Rating, the Record of Experience will be used as a basis for questions on the practical aspects of items included in it.
 - 2.5 An example of a completed Type Rating Record of Experience is given in Table 3 of this Appendix.
- 3 **CONFIRMING SIGNATORIES** Items and dates entered in the Record of Experience should be countersigned by a person of supervisory status to whom the applicant is responsible in relation to the work experience recorded and who should confirm that the experience is reflected accurately in the document. See also Chapter L2, concerning the certification required on Section 10 of Form AD 300.
- 4 **ASSESSMENT BY THE CAA** It should be assumed that the person assessing the Record of Experience is not acquainted either with the applicant or the company by whom he or she is employed. For this reason, emphasis is placed on the way in which work is recorded against specific registered types of aircraft, on overall practical experience and on countersigned certifications.

TABLE 1 (App 4)
CLASSIFICATION OF ITEMS OF WORK FOR COMPLETION OF TYPE RATING
RECORD OF EXPERIENCE
(Categories 'A' and 'C')

Sub-headings under which representative selection of items of work carried out or participated in	Licence Categories			ATA Chapter
	'A' – Aeroplanes	'C' – Engines	'A' & 'C' Rotorcraft	
Airframe Structure, including doors and windows	X		X	51
Flight Control Systems	X		X	27
Flaps and Lift Control Systems	X			27
Hydraulic Systems	X		X	29
Pneumatic Systems	X		X	36
Landing Gear Systems	X		X	32
Air Conditioning Systems	X		X	21
Pressurisation Systems	X			21
Ice and Rain Protection Systems	X		X	30
Oxygen Systems	X		X	35
Life-saving and Safety Equipment	X		X	25
Fire Detection and Extinguishing Systems	X	X	X	26
Electrical Systems	X*	X*	X*	24
Instrument Systems	X*	X*	X*	31
Automatic Pilot Systems	X*		X*	22
Airframe Fuel Systems		X	X	28
Main Engines and Power Plant		X	X	71
Engine Fuel Systems		X	X	73
Oil Systems		X	X	79
Ignition Systems		X	X	74
Propeller Systems		X		61
Air Intake Systems		X		72
Thrust Reverser and Exhaust Systems		X		78
Rotor Systems			X	65
Transmission Systems			X	65
Replacements of Systems Components	X	X	X	ALL
Replacements of Main Engines		X	X	71
Replacements of APUs		X		49
Ground Handling	X		X	9/10
Ground Running and Adjustments		X	X	76
Minor Repairs	X		X	51
Defect Diagnosis and Rectification	X	X	X	ALL
Current Mandatory Modifications and Inspections	X	X	X	ALL

*In accordance with the responsibilities and privileges defined in Airworthiness Notice No. 3.

TABLE 2 (Appendix 4)
CLASSIFICATION OF ITEMS OF WORK FOR COMPLETION OF TYPE RATING
RECORD OF EXPERIENCE
(Categories 'X' and 'R')

Sub-headings under which representative selection of items of work carried out or participated in	Licence Categories		ATA Chapter
	'X' - Electrical	'X' - Compass Compensation and Adjustment	
Main a.c. Power Generation Systems	X		24
Main d.c. Power Generation Systems	X		24
Power Distribution Systems	X		24
Batteries	X		24
Secondary Power Generation Systems	X		24
External Power Supply Systems	X		24
Auxiliary Power Units	X		49
Warning and Alerting Systems	X		All
Circuit Installation and Testing	X		All
Engine Starting Systems	X		74/80
Engine and Propeller Control Systems	X		61/76
Rotor Control Systems	X		22
Fuel Systems	X		28/73
Oil Systems	X		79
Fire Detection and Extinguishing Systems	X		26
Ice and Rain Protection Systems	X		30
Air Conditioning Systems	X		21
Pressurisation Systems	X		21
Flight Control Systems	X		27
Hydraulic and/or Pneumatic Systems	X		29/36
Landing Gear Systems	X		32
Lighting Systems	X		24
Passenger Service Systems	X		25
Multiplex Systems	X		31/All
Indicating Systems -	X		31/All
Replacement of systems Components	X		All
BITE checks	X		All
Defect diagnosis and Rectification	X		All
Current Mandatory Modifications and Inspections	X		All
Warning and Alerting Systems	X	X	All
Circuit Installation and Testing	X	X	All
Direct and Remote-reading Compass swings		X	34

TABLE 2 (Appendix 4)
continued

Sub-headings under which representative selection of items of work carried out or participated in	Licence Categories		ATA Chapter
	'X' – Instruments	'X' – Combined Category Instruments/Automatic Pilots	
Indicating Systems:			
Pressure	X	X	77
Temperature	X	X	77/79
Engine Speed	X	X	77
Quantity	X	X	28/29/79
Flow	X	X	73
Position	X	X	All
Vibration	X	X	77
Pitot-static Instrument Systems	X	X	34
Gyroscopic Flight Instrument Systems	X	X	34
Compasses Direct-reading and/or Remote-Reading	X	X	34
Flight Director Systems	X	X	34
Air Data Computer Systems	X	X	34
Inertial Navigation Systems	X	X	34
Ground Proximity Warning Systems	X	X	34
CRT Display System	X	X	31
Flight Director Systems	X	X	31
Replacement of System Components	X	X	All
BITE Checks	X	X	All
Defect Diagnosis and Rectification	X	X	All
Current Mandatory Modifications and Inspections	X	X	All
Yaw Damper Systems		X	22
Pitch Trim Systems		X	22
Mach Trim Systems		X	22
Automatic Pilot Systems		X	22
Auto Throttle Systems	X	X	22
Autoland Systems		X	22
Flight Management Systems		X	34

TABLE 2 (Appendix 4)
continued

Sub-headings under which representative selection of items of work carried out or participated in'	'X' Automatic Pilots Aeroplanes	'X' Automatic Pilots Rotorcraft	R Radio Communication/ Navigation	'R' Radio Radar	ATA Chapter
Yaw Damper Systems	X				22
Mach Trim Systems	X				22
Pitch Trim Systems	X	X			22
Automatic Pilot Systems	X	X			22
Yaw systems		X			22
Stability Augmentation Systems		X			22
Trim Systems		X			22
Warning And Alerting Systems	X	X	X	X	All
Circuit Installation and Testing	X	X	X	X	All
Replacement of System Components	X	X	X	X	All
Defect Diagnosis and Rectification	X	X	X	X	All
Current Mandatory Modifications and Inspections	X	X	X	X	All
BITE Checks	X	X	X	X	All
HF Communication Systems			X		23
VHF Communication Systems			X		23
Intercommunication			X		23
Service Interphone/Public Address Systems			X		23
Passenger Entertainment Systems			X		23
Multiplex Systems			X		31
Cockpit Voice Recorder			X		31
VHF Navigation Systems			X		34
Marker Systems			X		34
ADF Systems			X		34
Sat Comm			X		34
GPS			X		34
Weather Radar Systems				X	34
Radio Altimeter Systems				X	34
DME Systems				X	34
Transponder Systems				X	34
TCAS				X	34
Microwave Landing Systems				X	34

TABLE 3 (Appendix 4)
EXAMPLE OF A COMPLETED FORM AD 301

CIVIL AVIATION AUTHORITY

TYPE RATING RECORD OF EXPERIENCE

for Category ...A..... RatingHS 748.....

Please read these notes before completion:

- (1) Information and guidance on completion of this AD 301 can be found in BCAR Section L Appendix 4
(2) The Person in charge should certify each item when satisfied that the applicant has taken part in or carried out a task.

I hereby declare that the information given on this form is true in every respect.

Applicant's full name.....D COTHORNE.....Signature.....*D C Cophorne*.....Date.....13/08/97.....

Aircraft type & registration	Details of work performed	Specific date of work performed	Signature, name and status of person in charge and date
HS 748	<u>STRUCTURES, DOORS, WINDOWS</u>		
G - CCAA	Area of corrosion found in lower fuselage skin at station H25, in area of stringer 25R. Repair carries out as detailed in repair manual page 28. Size 180mm x 230mm.	06/10/96	
G - CAAC	Main passenger door seal found damaged. New seal fitted, door checked for correct fit and closure, pressure test carried out.	02/12/96	
G - CCAA	Captains DV window delaminated. New DV window fitted, all connections made, heating checked correct opening closing and sealing checked.	05/05/97	
G - CAAC	Loose rivets found in right wing aileron shroud, rib 21 position, all loose rivets replaced.	02/07/97	
G - CAAC	CURRENT MANDATORY MODIFICATIONS AD 76-15-02 - Periodic check carried out. Fuel Tank Pressure check.	06/08/97	

G Underall
G UNDERALL
General Manager
Licence 56789
13/08/97

Applicant's full name.....D COPTHORNE.....Signature *DC Copt*.....Date..13/08/97..

Aircraft type & registration	Details of work performed	Specific date of work performed	Signature, name and status of person in charge and date(s)
HS 748	<u>FLIGHT CONTROL SYSTEM</u>		
G - CCAA	During a 300 hour inspection. Right aileron trailing edge distorted due to ground equipment contact. Trailing edge de-rivctted, straightened and re-rivctted.	02/07/97	
G - CCAA	Right aileron main enter lower cable frayed, new cable fitted and tensioned, rigging and movement checks carried out.	03/07/97	
G - CCAA	Rudder right cable pressure seal at rear pressure bulkhead leaking. New cable and pressure seal assembly fitted and tensioned rigging and movement checks carried out. cabin pressure test carried out.	05/07/97	
G - AACC	Right elevator trim/balance tab operating rod rear bearing loose. new rod end fitted rigging and movement checks carried out.	02/12/96	<i>G Underall</i> G UNDERALL General Manager Licence 56789 13/08/97
	<u>HYDRAULIC SYSTEM</u>		
G - CAAC	Right engine driven pump leaking at gland. new pump fitted, system bled and fluid level topped up, function tested on engine run.	12/05/97	
G - CAAC	Main system hydraulic feed line from reservoir chafed in hydraulic bay, new pipe fitted, system topped up and function tested.	23/06/97	

If necessary add continuation sheets and number in sequence

Page no

APPENDIX 5**SPECIMEN EXAMINATION QUESTIONS****1 ESSAY QUESTIONS****Regulations**

Describe the responsibilities of either a company approved under JAR-145 or BCAR A8-15 (M3).

Category A

Describe the inspections and procedures you would adopt to rectify the following reported fault. 'The trailing edge flaps fail to extend to the selected position.'

Category B

Describe the procedure associated with the supervision, and the eventual certification, of the repair of a severely damaged aileron hinge attachment.

Category C

Describe the inspections and procedures you would adopt to rectify the following reported fault. 'High vibration indicated on number one engine.'

Category D

Describe the inspections and their purposes, necessary before dismantling an engine for overhaul.

Category X - Electrical

Detail the checks on an anti-ice system following electrical engine inlet heater mat failure.

Category X - Instruments

Following a report that the engine speed indication system was intermittent, describe how you would carry out defect diagnosis on the system.

Category X - Autopilots

Following reports that the aircraft was flying off the radio beam, describe the checks to prove the defect.

Category X - Radio

The ADF is reported as unreliable. Detail checks and inspections required to ascertain serviceability of the system.

2 MULTIPLE CHOICE QUESTIONS**Category 'A'**

A hydraulic regulator (cut out):-

- (A) will control the maximum pressure automatically.
- (B) will reduce the working pressure as selected.
- (C) will regulate the amount of fluid in the reservoir.

Category 'A'

A balance tab is an auxiliary surface fitted to a main control surface:-

- (A) operating automatically to assist the pilot in moving the controls.
- (B) operating automatically to provide 'feel' to the controls.
- (C) operated independently by the pilot to remove excessive loads from the controls.

Category 'A'

The turbine in an air cycle machine/cold air unit:-

- (A) increases the air pressure above that of the cabin.
- (B) drives the compressor which provides pressurisation.
- (C) drives the compressor in the unit and creates a temperature drop in the pressurising air.

Category 'A'

In an air supply system using a positive displacement type cabin supercharger, if the supply is not required it will:-

- (A) be prevented from leaving the supercharger outlet.
- (B) be returned to the supercharger inlet.
- (C) be spilled to atmosphere.

Category 'A'

Balance marks on an aircraft tyre and tube are normally:-

- (A) a coloured line on tyre and tube.
- (B) two parallel coloured lines 1 inch apart on the tyre, and two coloured dots on the tube.
- (C) a coloured line on the tube and a coloured dot on the tyre.

Category 'C'

The Beta range (propeller turbine engines) is:-

- (A) where the throttle lever controls the blade angle of the propeller above the 'FLIGHT IDLE' position.
- (B) where the throttle lever controls the blade angle of the propeller between 'GROUND IDLE' and 'MAX REVERSE' position.
- (C) where the throttle lever controls the blade angle of the propeller below the 'FLIGHT IDLE' position.

Category 'C'

When inhibiting gas turbine engine fuel systems:-

- (A) the fuel must be drained from the engine fuel system before attaching the inhibiting rig.
- (B) the inhibiting oil is drawn through the engine fuel system by suction from the inhibiting rig.
- (C) the fuel should be forced out of the engine fuel system by inhibiting oil pressure.

Category 'C'

Piston engine inlet valve opening before exhaust valve closing is intended to permit:-

- (A) an increase of pressure in the cylinder on completion of the induction stroke.
- (B) the incoming mixture to mix with a certain proportion of exhaust gases.
- (C) a greater amount of mixture to enter the cylinder.

Category 'C'

Gas turbine engine variable inlet guide vanes:-

- (A) ensure satisfactory starting is achieved at any ambient temperature.
- (B) minimise stalling at the front stages of the compressor, with variation of engine conditions.
- (C) prevent excessive exhaust gas temperatures during rapid accelerations of the compressor rotational speed.

Category 'A/C'

The advancing blade of a helicopter rotor:—

- (A) is the blade moving with the relative airflow.
- (B) is the blade moving to the highest point during one revolution of the rotor.
- (C) is the blade moving forward into the relative airflow.

Category 'A/C'

With increase in altitude, stalling of the main rotor retreating blade will occur:—

- (A) at a lower helicopter forward speed than that at a lower altitude.
- (B) only at a higher helicopter forward speed than that at a lower altitude.
- (C) only at a lower helicopter forward speed with a decrease in all-up weight.

Category 'X'

An auto-transformer incorporates:—

- (A) a tapped winding with a part that is common to primary and secondary circuits.
- (B) three separate windings with three separate connections.
- (C) two windings wound 180° apart and centre tapped.

Category 'X'

The secondaries of a linear variable differential transformer are connected in:—

- (A) series opposition.
- (B) parallel.
- (C) series additive.

Category 'X'

In an Integrated Flight Control System, signals from radio navigation systems can provide control in:—

- (A) the lateral aircraft axis only.
- (B) the vertical aircraft axis only.
- (C) both lateral and vertical axes.

Category 'X'

During descent, the pressure around the capsule in a rate of climb indicator will be:—

- (A) the same as the pressure in the capsule.
- (B) lower than the pressure in the capsule.
- (C) higher than the pressure in the capsule.

Category 'X'

A high inertia mass, restrained by springs, is usually the basic component in:—

- (A) a heading sensor.
- (B) a liquid flow rate sensor.
- (C) an acceleration sensor.

Category 'X'

In an Inertial Navigation System, 'Transport Rate' errors are due to:—

- (A) aircraft movement in any direction over the earth's surface.
- (B) aircraft movement across parallels of longitude.
- (C) aircraft movement across parallels of latitude.

Category 'X'

When function testing the autopilot on the ground, the first check would be:-

- (A) that rigging pins are fitted.
- (B) that the control surfaces and systems are free and clear of obstruction.
- (C) that the aircraft is on jacks and the undercarriage is retracted.

Category 'R'

A radar transmission pulse of very short duration:-

- (A) allows reception of returns from very short range.
- (B) does not allow reception of returns from very short range.
- (C) does not provide good range resolution.

APPENDIX 6

EXAMPLE OF MULTI-CHOICE ANSWER PAPER

CIVIL AVIATION AUTHORITY		AIRCRAFT MAINTENANCE ENGINEER'S EXAMINATION							
<p>PLEASE READ INSTRUCTIONS TO CANDIDATES IN QUESTION PAPER.</p> <p>To answer questions fill in the appropriate box like this:</p> <p>Use the pencil provided.</p> <p>Erase errors completely.</p> <p>Use back of this page for working out.</p>		<p>EXAM NUMBER</p> <p>1001</p>	<p>CANDIDATE NUMBER</p> <p>987654321</p>						
		<p>VENUE</p> <p>GATWICK</p>	<p>SUBJECT</p> <p>AEROPLANES 2</p>						
		<p>NAME</p> <p>D. COPTHOUSE</p>	<p>TIME ALLOWED FOR THIS PAPER</p> <p>1 hour 50 minutes</p>						
		<p>CANDIDATE'S SIGNATURE</p>	<p>DATE</p>						
		<p>TIME TAKEN</p>	<p>EXAMINER'S SIGNATURE</p>						
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