Safety Regulation Group

Civil Aviation Authority

CAP 659

Amateur Built Aircraft

A Guide to Approval, Construction and Operation of Amateur Built Aircraft

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Foreword

The second edition of CAP 659 is a complete revision of the original publication. The CAP has been brought up to date to reflect the latest practices in the regulation of amateur built aircraft as well as to reflect the recent changes to aviation safety regulation brought about by the formation of the European Aviation Safety Agency (EASA) by the European Union (EU). The content of the CAP has been substantially expanded from the previous edition and rewritten in plain language, including the use of more precise wording, descriptive headings, tables, figures, and active voice.

In updating the CAP we have recognised that the construction of an aircraft with the eventual aim of flying it follows two distinct but interrelated parallel paths: physical construction and satisfying legislative requirements. With the latter aim in mind the CAP is intended to answer most, if not all, of the "How do I - - ?" variety of questions, as well as advising how to avoid many of the regulatory pitfalls and blind alleys that can seriously frustrate if not terminate an amateur built aircraft project. Also, we have taken note of the USA's impact on the amateur built aircraft movement.

The USA is the largest exporter of kit aircraft for amateur building and the origin of most of the plans used by amateur builders. We have taken the opportunity to harmonise, where possible, our advice and practices with those of the Federal Aviation Administration (FAA). To this end this second edition follows the format and where appropriate the content of FAA Advisory Circulars (ACs) 20-27F – Certification and Operation of Amateur Built Aircraft and 20-139 - Commercial Assistance During Construction of Amateur Built Aircraft.

1 Introduction

Paragraphs 1.1 to 1.4 below set out the legal framework that relates to the issue of a Permit to Fly for amateur built aircraft.

1.1 Under Article 8 of the Air Navigation Order an aircraft may not fly unless, subject to certain exceptions, there is in force a valid Certificate of Airworthiness (C of A) issued under the law of the country of registration or the State of the operator in respect of it or, has rendered valid a Permit to Fly or equivalent document issued by the authorities of the state of registration of a foreign country which apply standards substantially equivalent to those applied by us. One of those exceptions is that an aircraft may fly within the borders of the UK (without a valid Certificate of Airworthiness) if we the CAA have issued it with a Permit to Fly.

1.2 An amateur built aircraft cannot qualify for the issue of a Certificate of Airworthiness since, by definition, it would not in its entirety have been designed and constructed by an appropriately qualified organisation as required by:

ICAO Annex 8; and
British Civil Airworthiness Requirements; and
EU Regulations Nos. 1592/2002 (establishing EASA) and 1702/2003 (the EASA Implementation Regulations); and
EASA Certification Specifications (CSs).

The level of airworthiness achieved by both the design and during the building process is variable and because of these circumstances we do not consider it appropriate that we should issue a C of A to such an aircraft. We will, however, consider as an alternative the issue of a Permit to Fly under the requirements of BCAR Chapters A3-7 or B3-7, when we are satisfied that the criteria of BCAR Chapters A3-7 or B3-7 have been met.

1.3 The Permit to Fly is issued under Article 11 of the Air Navigation Order. We must be satisfied that the aircraft is fit to fly and may not issue a permit if we are satisfied it is eligible for and ought to fly under a C of A.

1.4 This CAP provides guidance to amateur constructors on how to comply with BCAR Chapter A3-7 and associated regulations for an amateur built aircraft (i.e. an aircraft constructed other than in accordance with the processes applicable to civil type certificated design) in order for it to qualify for a Permit to Fly.

1.5 Words purporting the masculine gender include the feminine.

1.6 Where the terms ‘we’ or ‘our’ have been used, this is in place of ‘the CAA’.

1.7 **Purpose of This CAP**

1.7.1 This CAP follows on from CAP 733 - Permit To Fly Aircraft by giving you information and guidance on how to:

a) get the design of your amateur built aircraft approved;

b) fabricate and assemble your amateur built aircraft;

c) register, identify and mark your aircraft;

d) get your aircraft inspected and the Permit to Fly issued;

e) flight test your aircraft;

f) operate your aircraft; and

g) pursue approval of an amateur built aircraft purchased outside the United Kingdom.

1.7.2 This CAP 659 is not mandatory and does not constitute a regulation. It describes an acceptable means, but not the only means, of complying with the approval requirements applicable to amateur built aircraft detailed in CAP 553, BCAR Section A, Sub-section A3-7 - Issue and Renewal of Permits to Fly. However, if you use the means described in this CAP 659 you should follow the advice given as closely as possible unless an alternative process has been agreed between you and the CAA.

1.7.3 Lists of relevant publications related to this CAP are given in Appendix 7.

1.8 Who This CAP Affects

1.8.1 This CAP applies to anyone who seeks a Permit to Fly for an amateur built aircraft.

1.8.2 This CAP is equally applicable to anyone who is restoring an aircraft (which is not eligible for a Certificate of Airworthiness) and seeks a Permit to Fly for it, be it an existing amateur constructed aircraft, or an historic aircraft whether factory built or otherwise and irrespective of whether it was originally built in the UK or has been imported. Further guidance on the approval of rebuilt and restored aircraft can be found in CAP 455 - Airworthiness Notices, Notice Nos:

AN 11 The Rebuilding and Restoration of Aircraft; and

AN 97 Return to Service of Aircraft items Recovered from Aircraft Involved in Accidents/Incidents.

1.8.3 If you are intending to restore an ex-military aircraft in excess of 2730 kg MTWA then you are advised to contact the Certification and Approvals Department of our Design and Production Standards Division to discuss if the project should be overseen by organisations approved in accordance with CAP 553, BCAR A, Sub-section A8-20 - Approval of Organisations Responsible for the Restoration, Airworthiness Control and Maintenance of Aeroplanes of Military Origin above 2730 kg MTWA and all Rotorcraft of Military Origin.

1.8.4 This CAP essentially deals with the amateur building of Aeroplanes, Microlights, Gyroplanes and Helicopters. Where the amateur building of Balloons, Sailplanes, Hang Gliders and Paragliders is concerned you are advised to contact the BBAC, the BGA or BHPA as appropriate for guidance.

1.9 Relationship Between the CAA and BMAA and PFA

1.9.1 The CAA approves all amateur built aircraft. The route to achieving approval is either by us conducting a direct investigation of the aircraft or, for certain simpler types of aircraft, via the BMAA or PFA conducting the investigation on our behalf. At the end of the BMAA or PFA investigation we issue the approval on the basis of their recommendation.

1.9.2 Whereas this CAP applies to anyone who seeks a Permit to Fly for an amateur built aircraft it only describes the processes that should be followed where the CAA is directly involved in the investigation and approval of the aircraft. Where appropriate, and for completeness, cross-reference is made to BMAA and PFA processes, but no attempt is made to define them. Amateur builders who wish to know what those processes involve are advised to contact the BMAA or PFA direct. Nevertheless, those processes will be very similar to those described in this CAP in all major respects.

1.10 Impact of EASA

EASA became operational on the 28th September 2003, and over a 42 month transition period will be assuming many of the functions currently undertaken by the NAAs of the EU Member Nations. Where known, the impact of EASA on the amateur construction of aircraft is stated in this CAP. Nevertheless, EU Regulation No. 1592/2002, which is the legislation enabling the formation of EASA, has certain alleviating provisions built into it for amateur constructed aircraft. The alleviation is to be found in Annex II to the regulation. It states that the EU Member State on whose register an amateur constructed aircraft appears will administer the aircraft under their local rules.

2 Abbreviations and Definitions

2.1 Abbreviations

AAN	Airworthiness Approval Note
AC	Advisory Circular
AMSD	Aircraft Maintenance Standards Department (of the CAA)
ANO	Air Navigation Order
BBAC	British Balloon and Airship Club
BCAR	British Civil Airworthiness Requirements
BGA	British Gliding Association
BHPA	British Hang Gliding and Paragliding Association
BMAA	British Microlight Aircraft Association
CAA	Civil Aviation Authority
CAAIP	Civil Aircraft Airworthiness and Inspection Procedures
CAP	Civil Aviation Publication
C of A	Certificate of Airworthiness
CS	Certification Specification
DOA	Design Organisation Approval
DPSD	Design and Production Standards Division (of the CAA)
EASA	European Aviation Safety Agency
ETSO	European Technical Standards Order
EU	European Union
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
HADS	Homebuilt Aircraft Data Sheet
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirements
JTSO	Joint Technical Standards Order
MPD	Mandatory Permit Directive
MTWA	Maximum Total Weight Authorised
NAA	National Airworthiness Authority
NDT	Non Destructive Testing
PFA	Popular Flying Association
PFRC	Permit Flight Release Certificate
PMR	Permit Maintenance Release
POA	Production Organisation Approval

RO	Regional Office
TC	Type Certificate
TSO	Technical Standards Order
UK	United Kingdom of Great Britain and Northern Ireland
USA	United States of America

2.2 Definitions

Aircraft Builder/Constructor
In the context of this CAP, the person who has made application to the CAA for a Permit to Fly for the amateur built aircraft and is the person actually undertaking the construction of the aircraft.

Aircraft Evaluation
The evaluation performed for the purpose of determining if a specific amateur built aircraft meets the 51% rule, and is thus eligible to be considered as being amateur built.

Amateur Built/Constructed Aircraft
An aircraft that complies with EU Regulation 1592/2002 Annex II paragraph (c), see paragraph 3.1.1 of this CAP.

Amateur Builder/Constructor
A person undertaking the construction of an amateur constructed aircraft and who is not being compensated for his efforts by a third party.

Applicant
A person who has made application in writing directly, or via the BMAA or PFA, to the CAA for the issue of certificate, permit or license.

Builder Centre
A place where amateur builders can obtain instruction, help and support during construction of their aircraft.

Builder's Log
A document that records the construction activity, and is progressively updated as work continues. It can contain the work sheets, kit manufacturer's construction activity checklist, photographic records etc.

Commercial Assistance
Assistance in the building of an amateur built aircraft in exchange for compensation. This does not include one builder helping another.

Compensation
Payment by the amateur-builder (applicant) in cash, services, or other tender, to any person who provides assistance on a commercial basis in the building of an aircraft.

Checklist
The Fabrication/Assembly Operation Checklist, (See Appendix 4 and Annex to Appendix 4 of this CAP) used by the CAA as an aid in determining if a manufacturer's aircraft kit is compliant with EU Regulation No. 1592/2002 Annex II paragraph (c). It is also used for determining if a completed aircraft is eligible for approval as an amateur built aircraft.

51% Rule
The 51% rule as related to a Permit to Fly issued for the purpose of operating an amateur built aircraft means that when the aircraft is completed, the majority of the fabrication and assembly tasks have been performed by the amateur builder(s) who submitted the application for the Permit to Fly.

Kit Built Aircraft
An aircraft that is constructed from a manufactured kit that may include some major sub-assemblies and/or pre-assembled components.

Kit Evaluation
An evaluation by the CAA, or other Foreign National Airworthiness Authority acceptable to the CAA, to determine if an aircraft built from, and according to, the kit instructions will meet EU Regulation No.1592/2002 Annex II paragraph (c), i.e. comply with the 51% rule and is thus eligible to be considered as being amateur built.

Letter of Eligibility
A letter provided by the CAA, or other Foreign National Airworthiness Authority acceptable to the CAA, to an aircraft kit manufacturer advising that the aircraft kit requested to be evaluated meets EU Regulation No. 1592/2002 Annex II paragraph (c) or the major portion requirement of USA FAR section 21.191 (g).

Major Portion
USA FAA equivalent of the 51% rule.

Person
In the context of this CAP, an individual, or a body of individuals corporate or unincorporated.

Plans Built Aircraft
An aircraft where the airframe is constructed exclusively from plans/blueprints without the aid of purchased major sub-assemblies or pre-assembled kit components. This also includes aircraft of a builder's original design.

Type Certificate
A document issued by an Airworthiness Authority that attests to the fact that an aircraft's design conforms to an internationally recognised code of airworthiness requirements, which in turn meets minimum ICAO standards.

Unacceptable Commercial Assistance
Any commercial assistance that reduces the work performed by the amateur builder to less than 51% of the aircraft construction.

3 Definition of an Amateur Built Aircraft and who is Eligible to Construct One

3.1 Definition of Amateur Built Aircraft

3.1.1 EU Regulation No. 1592/2002 Annex II paragraph (c) defines an amateur built aircraft as an **'aircraft of which at least 51% is built by an amateur, or a non-profit association of amateurs, for their own purposes and without any commercial objective'.**

'At least 51% is built by an amateur' is colloquially known as 'the 51% rule' and for reasons of brevity this colloquialism is used throughout this CAP.

'Own purposes' is generally understood to mean for the education and recreation of the constructors, and not commercial gain.

3.2 What Type of Aircraft may I Construct ?

3.2.1 You may construct any type of aircraft providing it falls within the following criteria:

"day VFR use only, with not more than 4 seats including that of the pilot for aeroplanes and not more than 2 seats including that of the pilot for helicopters and gyroplanes. If the aircraft has 3 or 4 seats including that of the pilot then an engine

and propeller that are type certified or approved by an alternative equivalent means will have to be used with it."

Outside of this broad criteria the aircraft will not be eligible for amateur constructed status and the award of a Permit to Fly. Instead, it must qualify for an ICAO Standard Certificate of Airworthiness. To achieve the C of A, a Type Certificate must first be in place for the aircraft. Type Certificates and Certificates of Airworthiness can only be issued if the design, certification, manufacture and maintenance of the aircraft has been undertaken by organisations approved for the purpose by EASA in accordance with Part 21 (which is the Annex to EU Regulation No. 1702/2003).

3.3 Who is Eligible to Construct an Amateur Built Aircraft?

Anybody is free to construct an amateur built aircraft. But in order for the constructor to maintain amateur status and for the aircraft to subsequently qualify for approval as amateur built, the following criteria will have to be met:

3.3.1 We will need to be satisfied that both the building and operation of the aircraft will be solely for the education and recreation of the amateur builder. This means that he would not be permitted to commission someone else to build his aircraft or even, subject to the provisions of the 51% rule, significant parts of it, with the exception of the engine(s), propellers, and helicopter or gyroplane transmissions, rotor heads or rotor blades. Stage inspections made at suitable intervals along with a final inspection of the aircraft and its records will verify that these conditions are being met.

3.3.2 Projects that are jointly owned by a number of individuals will be considered to be acceptable, provided that each individual makes a contribution to the building of the aircraft relative to the proportion of their financial investment in the actual aircraft.

NOTE: Once the aircraft is complete and before it first flies, in order to remain within ANO (2005), Article 162 (as amended) definitions of private flight, the number of owners of the aircraft must be reduced to 20 or less, each holding at least a 5% equity stake in the aircraft. In order to achieve this situation some of the original group may have to be bought out by the remaining group members.

3.3.3 If any member departs the group for whatever reason then he may not sell his interest for more than the percentage proportion he is entitled to of the certified market value of the aircraft at that time. For this purpose a member's 'entitled to percentage portion' consists of his percentage contribution to the groups financial investment at cost of parts and materials only, used in construction of the aircraft. Or, if he invested in a completed aircraft, his investment as a percentage of the valuation of the aircraft at the time the investment was made.

A certified market value is the price put on the aircraft by an independent valuer who would be making a valuation of the aircraft for tax or insurance purposes. If any one group member sells his share for profit then we will deem the aircraft has been constructed for profit and it will loose its eligibility for amateur built status.

3.3.4 Projects undertaken by schools, colleges, universities, bona-fide apprentice schemes, Government sponsored training schemes, registered charities or bona-fide youth groups whether or not the participants have a financial investment in the actual aircraft will be considered to be acceptable.

3.3.5 Any project which, at any stage during the construction is in our, or the BMAA's or the PFA's opinion considered to be for commercial or personal gain; i.e. intended for profitable sale when complete, cannot be defined as an amateur built aircraft, other than those projects described in paragraph 3.3.7.

3.3.6 For projects involving specialist skills in critical areas, (e.g. welded components or fibre reinforced parts which are not supplied assembled as part of the kit), specialist

help will be permitted provided that the CAA, the PFA or the BMAA as appropriate, are satisfied that the 51% rule has not been breached. (See appendices 3 and 4)

3.3.7 We will consider applications from Persons (see definitions) under commercial arrangements without the need for a CAA approved organisation only for the following projects that will be constructed in the UK:

a) Individual full size replicas of vintage or veteran types that are not eligible for a Certificate of Airworthiness (and which meet the criteria of paragraphs (a) to (d) of Annex II to EU Regulation No. 1592/2002) built from the original manufacturers drawings. Some modifications will be permitted such as fitting radio or navigational equipment, use of alternative materials where the original material is no longer available, safety improvements or an alternative engine where the original type of unit cannot be obtained. Aircraft which are series to the first aircraft built (i.e. any attempt to produce repeat examples of the type under the same commercial arrangements) will not qualify for consideration under these amateur building rules. However, in certain circumstances (e.g. meeting the needs of motion picture or TV productions), series production may be possible by other routes.

b) Individual projects which have a specialist function, e.g., those which will be designed and built specifically for racing, record attempts, aerobatic competitions or for the making of motion pictures or television programmes. Repeat examples will not normally be eligible, nor will aircraft of types that are eligible for a Certificate of Airworthiness. However, in certain circumstances (e.g. meeting the needs of motion picture or TV productions), series production, of types ineligible for a C of A, may be possible by other routes.

c) Aircraft built by a kit manufacturer or kit agent/Importer, which will be used primarily for proving and demonstrating the flight characteristics of an aircraft, and intended to be sold in kit form. Providing that as "intended to be sold" the kit meets the 51% rule.

d) Aircraft built by a kit importer, which will be used primarily for proving and demonstrating the flight characteristics of an aircraft, and intended to be sold in kit form. Providing that as "intended to be sold" the kit meets the 51% rule. If the kit importer wishes to sell the completed aircraft as ex-demonstrator, then in order to avoid the "building for profit" restrictions they should realistically be restricted to constructing and selling on one such aircraft about every 18 months to 2 years.

NOTE: For imported aircraft or components refer to paragraph 21.

4 Approving and Operating an Amateur Built Aircraft

4.1 The CAA undertakes the approval of amateur constructed aircraft. In many circumstances, the BMAA or the PFA are approved by the CAA to undertake many of the approval activities on the CAA's behalf. All the organisations charge for their services. If the BMAA or PFA route is open to you then it can be used as a cost-effective option when compared to dealing directly with the CAA. Irrespective of the route chosen it is the CAA who ultimately issues the Permit to Fly.

4.2 Figure 1 shows the steps necessary to obtain a Permit to Fly. A detailed explanation of each step follows this flowchart.

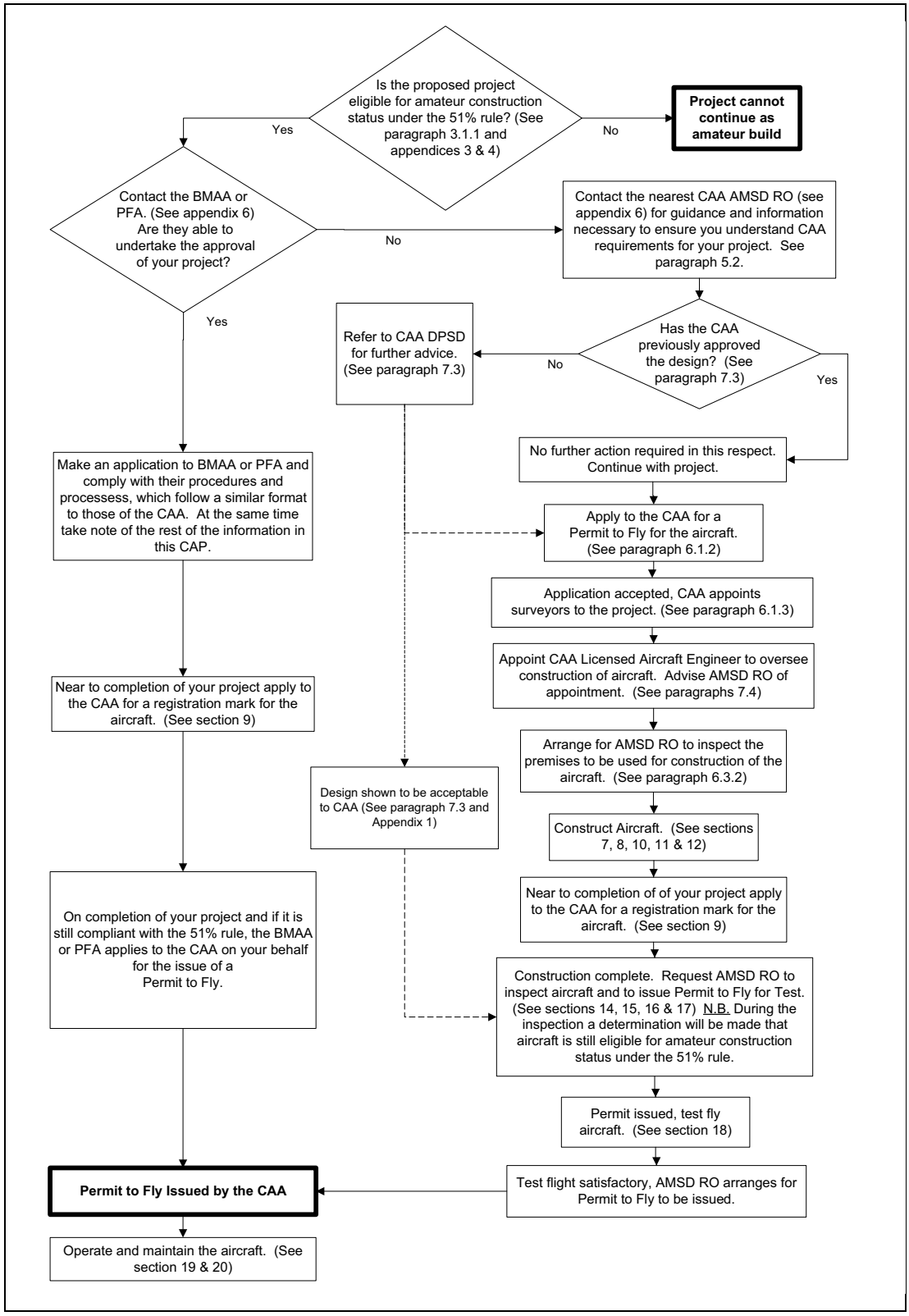

Figure 1 Approving and Operating an Amateur Built Aircraft

5 What To Do and Know Before Building an Amateur Built Aircraft

5.1 There are essentially 3 routes for amateurs building aircraft:

a) design and build your own from scratch; or

b) build from plans to someone else's design; or

c) assemble from a kit.

Once you have decided on the type of aircraft that you wish to build we recommend that before you commit yourself to building it, you contact the BMAA or PFA (as appropriate) to discuss your intended project and determine if either of those organisations can oversee its build and approve it for you.

5.2 If the BMAA or PFA cannot help you then you are advised to contact the nearest CAA AMSD RO.

a) Discuss with them the type of aircraft, its complexity and its materials. Provide a three-view sketch, drawing or photograph of the proposed aircraft project and the date you think you will finish. The AMSD RO should give you any guidance and information necessary to ensure you thoroughly understand the CAA regulations that apply to your project and what their involvement will be in the project.

b) If you are using an existing design then the AMSD RO should advise you if the CAA has approved examples of this type before. If they are not able to give you this information they should refer you to our Design and Production Standards Division at Gatwick for further information.

c) Upon request, you will be given all the forms you need to get your aircraft registered and approved.

6 Commencing Your Project

Health Warning!

Do not start construction of your aircraft until: the CAA, BMAA or PFA, as appropriate, has accepted registration of your project with them; a licensed engineer or BMAA or PFA inspector has been appointed; your premises have been inspected; and your record keeping system has been set up. If you do start work before these initial steps have been taken then you may find it impossible to find organisations and/or individuals who are prepared to oversee your project. You will in effect be asking them to take responsibility for something they have had no involvement with and possibly cannot be backtracked. Given this state of affairs no one will be prepared to recommend and issue a Permit to Fly for your aircraft.

6.1 Starting the Process

6.1.1 The first thing you will need to do is register your project with the organisation that will be overseeing your project. The BMAA and PFA have their own processes for this activity and they will advise you accordingly.

NOTE: Do not confuse 'registering your project with the organisation that will be overseeing your project' with 'having your aircraft placed on the UK Register'. They are two entirely different processes producing very different results, and you will have to do both.

6.1.2 If you are following the CAA route then you will first need to have a constructor's serial number allocated to your, as of yet, un-built aircraft. You can have your aircraft placed on the UK Register at this stage (see paragraph 9) but it is not necessary. Once you have a constructor's serial number allocated you will then need to make application to us for your Permit to Fly using Form CA3. You are advised to do this at an early stage. Your local AMSD RO will be able to supply you with a copy of the form and help you with any questions you may have about completing it.

6.1.3 Once we have accepted your application your project is registered with us. The next action on our part is to allocate two Surveyors to your project, one from your local AMSD RO (the RO Surveyor) and one from the Certification and Approvals Department of DPSD at Gatwick (the Design Surveyor).

6.2 How to Describe your Aircraft and Allocate a Constructor's Serial Number

6.2.1 The first thing to understand is that no matter where you source the aircraft from or what the original designer has named it, you are the Constructor. So for the official record your name is the one stated as the Constructor. If you are building the aircraft from a kit then the kit may have been allocated a serial number by the kit supplier, if so then use it. If a kit serial number has not been supplied or you are building from plans then you will have to allocate your own. Which will normally be "01" or perhaps your initials plus 01. For example:

Type:	Cayley Flyer
Constructor:	Joseph Courtney
Serial:	JC01

If you choose the BMAA or PFA route for approval of your aircraft then contact them for advice on constructors serial numbers, as they have their own systems and generally allocate the serial number on your behalf.

6.3 What you can expect from the Surveyors

6.3.1 They should give you any guidance and information necessary to ensure you thoroughly understand the CAA regulations that apply to your project, and what their involvement will be with the project.

6.3.2 The AMSD RO Surveyor will:

a) review and, if found to be acceptable, agree to the premises in which you intend to construct the aircraft;

b) agree to your nominated CAA Licensed Engineer (see paragraph 7.4);

c) inspect the aircraft at certain pre-determined stages of its construction to ensure that:

i) acceptable standards of workmanship are being achieved;

ii) good aeronautical engineering practices are being observed;

iii) the quality of the product is adequate; and

iv) conformity with the approved design standard is being achieved.

d) satisfy him/herself on the adequacy of the documentation being used to record the construction of the aircraft;

e) monitor the use of the Builders Log;

f) assess that the completed aircraft still qualifies for amateur build status as per the 51% rule;

g) be involved in the administration of the flight test programme;

h) approve the maintenance regime for the completed aircraft; and

i) issue the Permits to Fly.

6.3.3 The DPSD Certification and Approvals Department Design Surveyor will:

a) be responsible for overseeing the approval of the design of your aircraft (see Appendix 1). He will do this by working with the designer of the aircraft. Additionally this may be in conjunction with a design organisation that has been approved by us as being acceptable to present to us compliance findings with the airworthiness requirements. (see paragraph 7.3.2 and Appendix 1);

NOTE: As the applicant, it is **your responsibility** to ensure that all information is provided in order to allow us to approve the design by the time the aircraft is complete and ready for flight. **You are the Project Manager**.

The amount of work required to approve the first aircraft is often considerably more than for subsequent examples of the type. All the same we do treat each home built aircraft as a unique project, since we need to check that the subsequent aircraft have been built to the same design standard as the first one. There are often design differences (modifications) or differences in the circumstances of the build that have to be investigated and approved;

b) co-ordinate as necessary with other Specialist Surveyors within the CAA who are involved with the design investigation;

c) when advised by the RO Surveyor that construction is complete, raise an AAN that defines the build standard of the aircraft, approves the design and recommends that a Permit to Fly for Test is issued;

d) ensure that one of our Test Pilots is assigned to oversee the flight test programme. See paragraph 18; and

e) re-issue the AAN recommending that a normal Permit to Fly be issued once our Test Pilot is satisfied that the aircraft has satisfactorily completed its flight test programme and our RO Surveyor is finally satisfied with the construction, maintenance and documentation of the aircraft.

7 Designing and Constructing an Amateur Built Aircraft

7.1 Obtaining Help

7.1.1 Contacting the BMAA or PFA for Help

You can get help from the BMAA or PFA (see Appendix 6 for contact information). Both associations promote aviation safety and construction of amateur built aircraft and provide technical advice and help to their members. However, because of the nature of the CAA approvals that they hold their employees (the "CAA Signatories") may be restricted, due to conflict of interest, in the technical help they are able to give you with designing an aircraft. Nevertheless they provide contact details for technically qualified people who can work with you on a consultancy basis to develop your design and create the necessary design submission.

7.1.2 Asking Others for Help

During design and/or construction, you may ask persons with aviation design or engineering experience, other builders, mechanics with aircraft, airframe, and powerplant experience, and other persons with relevant expertise to advise you on the design and/or construction of your aircraft. You may also approach educational institutions for such help, even going so far as to form a student project as a form of assistance (see paragraph 3.3.4); but see paragraph 7.1.3 below and Appendix 3 if payment for services is expected or requested.

7.1.3 Contracting for Commercial Help

You may contract commercially for several tasks, such as design and certification/approval services, welding, machining, installation of avionics, upholstery, and painting. See Appendix 3 - Commercial Assistance During Construction of an Amateur Built Aircraft for detailed information about the types of commercial help you can use and how it impacts on the 51% rule eligibility criteria.

NOTE: Contracting design and certification/approval services does not impact at all the 51% rule eligibility criteria.

7.2 Purchasing Prefabricated or Assembled Components and Materials

7.2.1 We do not expect you to personally fabricate every part of the aircraft. You may use commercially produced components and materials when constructing your amateur built aircraft. However, we will not give credit for fabrication of these components. Use the guidelines in the Table 1 on the following page, especially for parts constituting the primary structure, such as wing spars, critical attachment fittings, and fuselage structural members.

Table 1

Type of Component/Material	Guidelines for Use
Any choice of engines, propellers, wheels, or other components	We recommend you use EASA/CAA approved components (for example, components produced by a company that has an EASA PART 21 Sub Part G POA, a ETSO or equivalent procedures used in the USA).
Any choice of materials	We recommend you use material of established quality (for example, materials produced under a specification recognised as being acceptable for aviation use).
Major components (for example, wings, fuselage, and empennage) from type-certificated, experimental, or other amateur built aircraft	You should know whether the components are in a condition for safe operation. This description refers to the condition of that component relative to structural strength, wear, or deterioration. You are cautioned against using parts from accident damaged aircraft unless they have been assessed as being airworthy by an expert source and you have obtained the guidance and agreement of the CAA, BMAA, or PFA as appropriate. See also CAP 455, Airworthiness Notice 19 and CAP 562, CAAIP, leaflets 11-27 and 11-28.

7.2.2 You should not use materials whose identity or quality you do not know.

7.2.3 You may use the Fabrication/Assembly Operation Checklist (see Appendix 4) as an aid to determine if using certain components would affect the requirement to fabricate and assemble the major portion of your aircraft.

7.3 Meeting General Design and Construction Requirements

7.3.1 Amateur builders are free to develop their own designs or build from existing designs. We require all designs to be approved by us (see Appendix 1). The designs will normally be required to meet the standards set out in established airworthiness codes (see Appendix 1 for a listing of appropriate airworthiness codes). For existing designs, we may, in exceptional circumstances, accept verified extensive good service experience as meeting the intent of a design investigation. The service experience must be formally verified by the NAA of the country in which the aircraft was originally designed or, an acceptable alternative organisation vouched for by that NAA.

7.3.2 We do not directly undertake the investigation of designs. Instead we approve organisations to investigate designs on our behalf. When satisfied that a design meets the relevant airworthiness regulations the organisation makes a recommendation to us for an approval to be granted. (See Appendix 1 for further information on the type of approved organisation needed per project type). The BMAA and PFA are approved by us to investigate the designs of certain classes of aircraft intended for amateur construction; and recommend to us when the designs should be approved.

Health Warning!

We recommend that before you commit yourself to construction of the aircraft you discuss with the Design Surveyor (or BMAA or PFA as appropriate) the approval status of the design of the aircraft and any modifications you wish to make to it. If the design and or modifications are not approved by us, the Surveyor (or BMAA or PFA) will advise you how to get them approved. Ensure you get this advice in writing. The approval of modifications is discussed in Chapter 4 of CAP 733 – Permit to Fly Aircraft. Inevitably you will have to use the services of someone who is deemed acceptable to the CAA to investigate the designs of the aircraft and modifications and make recommendations to the CAA for approval. (See Appendix 1). If you are following the CAA route and the modifications are only of a minor nature (i.e. have no impact upon the airworthiness, performance or handling of the aircraft) your Licensed Engineer can get them approved directly through the RO Surveyor.

However, please note that due to the less strict airworthiness requirements in most other countries, many amateur built aircraft designs emanating from abroad may not be able to be approved in the UK with out first undergoing comprehensive investigation. Which may also require some redesign of the aircraft or, as an alternative imposition of operational limitations in order to show compliance with our standards. Please don't forget that just because a designer claims his product has been designed to meet a specific airworthiness code does not mean to say that an airworthiness authority or its agents have issued a certificate to say that it does. The only evidence we will accept of a design meeting an airworthiness code is the issuance of a certificate saying so by an airworthiness authority.

7.3.3 We recommend that if feasible you use EASA/CAA or FAA approved components and materials, especially when you are building parts constituting the primary structure. You should be able to prove the identity and quality of any materials you use.

7.3.4 The manufacture of composite aircraft needs special care. The component and the material from which it is being made from are manufactured simultaneously. Therefore it is extremely difficult to know with any degree of certainty the properties of the finished material. However, if good process controls are used then approximate properties of the material can be guaranteed with a good measure of confidence. (Appendix 2 details a comprehensive list of process controls).

7.4 Appointing a Licensed Engineer

If you are not using the BMAA or the PFA to administer and oversee the construction and approval of your aircraft then you will need to appoint a CAA Licensed Engineer to assist you in this matter. The engineer should be type rated in categories appropriate to the aircraft you are building and he should be acceptable to the RO Surveyor supervising your project. You will probably have to pay him for his services.

7.5 What to Expect from your Licensed Engineer

7.5.1 Your Licensed Engineer will advise you on:

a) Matters relating to your workshop, tool kit and similar facilities.

b) What constitutes acceptable parts and materials for your aircraft.

c) What constitutes acceptable manufacturing processes and techniques.

d) What constitutes acceptable standards of workmanship.

e) The documentation you will need to keep to record the construction of your aircraft, and how to manage that documentation.

f) The amount of supervision you can expect from him.

g) The stages of construction which he personally needs to supervise and inspect.

h) The stages that the RO Surveyor needs to personally inspect. He will agree this programme with the Surveyor.

7.5.2 They will also:

a) arrange for all necessary duplicate inspections to be performed on engine controls and flying controls; and

b) sign off the stages of the construction and sign and issue the PFRC/PMR. Once the PFRC/PMR has been issued the CAA will be in a position to issue the Permit to Fly.

7.5.3 Remember when signing off your work the Licensed Engineer is taking legal responsibility for the quality of the work and that it conforms to the approved design. So if you have any disagreement with him on what constitutes an acceptable standard his word is liable to be the final one.

7.6 Building an Aircraft Using a Plan

7.6.1 Modifying a Design Plan

If you are working from an existing design plan and want to make modifications, the proposed changes should be discussed with the designer or equally knowledgeable person. It will need to be checked whether the design of the modification complies with the appropriated requirements, and whether the modification could have an adverse effect on the safety of the aircraft. Irrespective of whom you discuss the

modification with, the CAA, BMAA or PFA as appropriate, must approve it before the modified aircraft can be granted a Permit to Fly.

Whichever route you are following it is worth in the first instance discussing any possible plans or changes; with the RO Surveyor, BMAA or PFA as appropriate. Before committing yourself to any modification of an approved design you must apply for modification approval from your supervising organisation. All modifications you make to the aircraft must be recorded in your builder's log.

NOTE: Unless you are an expert in aircraft design or have access to similar expert resources we strongly urge you not to make modifications to your aircraft. What might seem like a good idea in isolation can upset the balance of the rest of the design, leading to serious consequences for the safety of the finished aircraft.

7.6.2 Buying a Partially Built Aircraft Built from a Plan

If you buy a partially built aircraft, built from a plan, you should get all the fabrication and assembly records, such as receipts for materials, the builder's log, and aircraft, engine, and propeller logbooks from the previous owner. Lack of such information may render it impossible to determine if such parts are airworthy. You should add the construction efforts of the previous amateur builders to your builder's log to show the construction history of the aircraft. This information will help us to determine if your aircraft is eligible for amateur built approval.

7.7 Building an Aircraft Using a Kit

7.7.1 Kits Eligible for Approval

You should always verify the aircraft will be eligible for UK CAA approval as an amateur built aircraft. Advertisements may be somewhat vague and in some cases misleading about whether a kit will produce an aircraft eligible for UK CAA amateur built approval. Use the information in Table 2 below as guidance.

Table 2

Scenario	Eligible	Not Eligible
You are able to show you built the major portion of the aircraft.	X	
The kit you are using or intend to use is one we, another acceptable foreign airworthiness authority the BMAA, or the PFA has evaluated and has been placed on either the CAA's or the relevant authority/organisation's list of amateur built aircraft kits which have been accepted as meeting the 51% rule. **NOTE:** We do not approve kits, kit manufacturers, or kit distributors. However, we will evaluate kits at the request of the kit manufacturer or distributor, primarily to determine if an aircraft built from a particular kit would meet the 51% rule. You can contact the CAA's DPSD or view the CAA's Web Site for the listing of eligible kits. Kits other than those on the list may produce an aircraft we would approve as amateur built.	X	

Table 2

Scenario	Eligible	Not Eligible
You used a construction kit containing raw materials and some prefabricated components. **NOTE:** The raw materials may include lengths of wood, tubing, extrusions, or similar items that may have been cut to an approximate length. We will also accept some prefabricated parts such as heat-treated ribs, bulkheads, or complex parts made from sheet metal, fibreglass, or polystyrene, and pre-cut/predrilled material, provided you fabricate and assemble the major portion of the aircraft as required by EU Regulation No. 1592/2002 Annex II paragraph (c).	X	
You assembled your aircraft from a kit composed of completely finished, prefabricated components, parts, or pre-cut or predrilled materials, and using these materials means you did not fabricate and assemble the major portion of the aircraft.		X
You hired someone to build the aircraft for you, and hiring this person means you did not fabricate and assemble 51% of the aircraft.		X

7.7.2 Modifying a Kit

If you are working from a construction kit and you want to make modifications you should discuss the changes with the Kit designer or an equally knowledgeable person. It will need to be checked whether the design of the modification complies with the appropriated requirements and whether the modification could have an adverse effect on the safety of the aircraft. Whichever route you are following then in the first instance it is well worth discussing any possible changes to the kit with the RO Surveyor, BMAA or PFA as appropriate. Irrespective of whom you discuss the modification with the CAA, BMAA or PFA, as appropriate, must approve it before the modified aircraft can be granted a Permit to Fly.

Whichever route you are following then in the instance it is well worth discussing any possible kits, or changes to them, with the RO Surveyor, BMAA or PFA as appropriate. Before committing yourself to any modification of an approved design you must apply for modification approval from your supervising organisation. All modifications you make to the aircraft must be recorded in your builder's log.

NOTE: Unless you are an expert in aircraft design or have access to similar expert resources we strongly urge you not to make modifications to your aircraft. What might seem like a good idea in isolation can upset the balance of the rest of the design leading to serious consequences for the safety of the finished aircraft.

7.7.3 Buying an Aircraft Built from a Partially Completed Kit

If you buy an aircraft built from a partially completed kit, you should get all fabrication and assembly records, such as receipts for materials, the builder's log, and aircraft, engine, and propeller logbooks, from the previous owner. Lack of such information may render it impossible to determine if such parts are airworthy. You should add the construction efforts of the previous amateur builder's to your builder's log to show the construction history of the kit. This information will help us to determine if your aircraft is eligible for amateur built approval.

7.8 Taking Note of CAA Airworthiness Information

When sourcing parts for your aircraft and during its construction/restoration phase you are advised to pay attention to the content of the requirements of:

CAP 455 Airworthiness Notices, Notices:

19 The Problem of Bogus Parts

50 Deterioration of Wooden Aircraft Structures

54 Instruments with Unusual Presentation

73 Corrosion of Aircraft Structures

CAP 562 Civil Aircraft Airworthiness Information and Procedures, Leaflets:

11-2 Carbon Monoxide Contamination in Aircraft

11-19 Aircraft Plywood - Thin Plywood Sheets

11-22 Appendix 31-1 Altimeters in Aircraft

11-22 Appendix 31-2 Vertical Speed Indicators on Imported Aircraft

11-24 Use of Aircraft Standard Parts in Aircraft and Aircraft Restoration Projects

11-27 Disposition of Scrap Aircraft Parts and Materials

11-28 Return to Service of Aircraft Items Recovered from Aircraft Invovlved in Accidents/Incidents

and CAP 747 Mandatory Requirements for Airworthiness, Generic Requirements:

8 Cotton, Linen and Synthetic Fabric-Covered Aircraft

10 Painting of Aircraft

13 Flame Resistant Furnishing Materials

7.9 Taking Note of CAA CAP 562 – Civil Aircraft Airworthiness Information and Procedures (CAAIP)

CAP 562 – CAAIP contains lots of practical information on practices and procedures relevant to the construction inspection, repair and design of aircraft. You are advised to make frequent reference to this publication.

7.10 Approval of Modifications

We must approve **all** modifications made to amateur constructed aircraft. However, if your aircraft is under the supervision of the BMAA or PFA then they can be approved by them as appropriate. The approval process for modifications approved by us is discussed in Chapter 4 of CAP 733 – Permit to Fly Aircraft.

Nevertheless, as a cost effective option instead of pursuing individual approval of each modification you may make arrangements with the Design Surveyor to have him approve the minor modifications and possibly the major modifications as a job lot. If agreed he will record their approval via the AAN recommending the Permit to Fly for Test. Depending on their nature, major modifications may still require to be individually approved, the Design Surveyor will be able to provide you with appropriate advice on a case by case basis.

8 Documentation and Recording the Build of your Aircraft

8.1 What Needs to be Recorded, Why and How?

8.1.1 You will need to record all of the activities undertaken during the construction of your aircraft. The record must be treated as a permanent record and form part of the documentary history of the aircraft. It may be that if a problem arises at a later date you will need to be able to trace back to source, parts and activities undertaken during build. Also you may be called upon to prove your aircraft was indeed amateur built, particularly if you are hoping to sell it abroad.

8.1.2 Therefore you will need to organise your records and their storage in an adequate and proper manner. The bottom line with respect to aircraft and record keeping is that if there are no, or inadequate records, then for certification/approval, airworthiness and operational purposes, the aircraft is deemed not to exist.

8.1.3 Also when the aircraft is finished and before it makes its first flight a set of log books will have to be raised for it.

8.1.4 Your Licensed Engineer will help you with setting up a record keeping system and raising the log books. Also the RO Surveyor allocated to your project will be able to provide you with useful advice and guidance.

8.2 What Sort of Records Are Needed?

8.2.1 You will need to raise work sheets recording the manufacture of the parts of the aircraft and its assembly. It may be that if you are assembling a kit built aircraft, a set of work sheets is provided, which not only acts as a check list of actions to take but can also be used as a permanent record of the construction. The worksheets will need to be signed-off at pre-determined stages by your licensed engineer. His signature confirms that the specified work has been completed, the parts etc conform to the drawings, and their quality is satisfactory.

8.2.2 You will need to keep all certificates, release notes (and descriptive receipts if appropriate) for all the materials, components, bought in parts, and sub contract activities used in the construction of your aircraft.

8.2.3 You will need the Certificates from the CAA that record our approval for the design of your aircraft and any modifications you have made to it.

8.2.4 If you are building an aircraft made from wood or composite materials, you will need to simultaneously make test pieces from the same materials being used for that specific part of the construction, the purpose of which is to prove the quality and strength of, say, a glued joint or a laminated surface. When you make the test pieces you are advised to make at least 2 at a time, one to be used at the time to prove the just manufactured item, and the other to be kept with the permanent aircraft records. Keeping the second test piece may assist at a later date with investigating in service problems that may occur with the aircraft. Make sure that all such pieces are properly identified. For more information on the records that need to be kept for a composite aircraft build see Appendix 2.

8.2.5 A long held custom and practice is for amateur builders to keep a photographic record of the construction of their aircraft as a means of supplementing the works sheets noted at 8.2.1 above and also to prove that they actually did build it themselves. Unfortunately all too often the photographs are of poor quality and do little if anything to meaningfully supplement the build records. They are nothing more than snapshots taken at a distance of a proud builder at the back of his workshop holding bits of the aircraft.

If the photographs are to be of any value then they need to properly depict the achieved quality of the construction work. Therefore in addition to generic shots they more importantly need to display close up details of the parts and assemblies. The photographs need to be properly captioned and of a sufficient size (A5 minimum) to adequately display the detail and quality of manufacture of the part or assembly being recorded.

The same comments generally apply to video diaries.

8.3 Log Books

8.3.1 Article 22 of the ANO 2005 (as amended) requires separate log books to be raised and kept up to date for the aircraft, its engines, and if fitted, variable pitch (VP) propellers. For aircraft not exceeding 2730 kg they must be a type approved by the CAA. Log books published by the CAA for aircraft not exceeding 2730 kg can be obtained from the CAA's Publishers (See appendix 6 for contact details) or most shops selling pilot's supplies.

The Log Books available are: CAP 398 Aircraft Log Book
CAP 399 Engine Log Book
CAP 400 Variable Pitch Propeller Log Book.

The BMAA and PFA also supply logbooks specifically tailored to the needs of Permit to Fly aircraft owners.

8.4 Log Cards

8.4.1 In addition to the log books detailed in paragraph 8.3.1, log cards will need to be raised for items that have finite fatigue lives. Helicopter rotor blades and drive shafts generally fall into this category. CAP 543 - Time Lifed Components, is a good method of retaining data for such items.

8.5 BMAA and PFA Controlled Projects

8.5.1 The comments and advice above apply equally, and without exception, to aircraft construction projects being controlled by the BMAA or PFA. Of course their own inspectors will be signing off the worksheets and advice on record keeping should be sought from the Inspector and the relevant organisation. Both organisations, in addition to the systems described above, have their own additional methods and processes for recording the construction process. Also the PFA and Pooley's Flight Equipment Ltd - on behalf of the BMAA - publish their own customised versions of CAA approved log books.

9 Registering your Amateur Built Aircraft

All aircraft are required to display registration marks before they are allowed to fly in United Kingdom airspace. The appropriate legislative requirements are detailed in the ANO 2005 (as amended) Articles 3, 4 and 5.

9.1 When to Register

9.1.1 Your aircraft must be registered with us before we can issue you with your Permit to Fly for Test. We recommend you apply for registration at least 60 to 120 days before you finish constructing your aircraft. This should allow you time to get your registration information before the finalised documentation is prepared authorising the flight test phase of your project.

The information in this paragraph is equally applicable if your aircraft is a second hand imported home built aircraft.

9.2 How to Submit your Application

9.2.1 The application to register your aircraft is made on Form CA1. When you have completed the form send it with the appropriate fee to the CAA's Aircraft Registration Section (See appendix 6 for full contact details).

Full details on how to register your aircraft, printable copies of Form CA1 and details of current fees are to be found on the CAA's Web Site: **www.caa.co.uk**. When there, click through the following links: Safety – Aircraft Register – Registration Information – Register an Aircraft – New Home Built Aircraft, or other link as appropriate.

9.3 How to Request a Specific Registration Mark

9.3.1 You may request a personalised registration mark for your aircraft. Information on how to do this can be found on the CAA's Web Site. **www.caa.co.uk** When there click through the following links: Safety – Aircraft Register – Registration Information – Registration Marks - Availability of UK Marks.

10 Identifying and Marking your Amateur Built Aircraft

10.1 When to Mark

10.1.1 You must mark your aircraft before the RO Surveyor has made his final inspection in readiness to issue your Permit to Fly for Test.

10.2 Required Registration Marks

10.2.1 Article 5 (2) of the ANO 2005 (as amended) states that the marks borne by an aircraft registered in the United Kingdom must comply with Part B of Schedule 2 of the ANO 2005 (as amended).

There are two elements to marking the registration on your aircraft.

a) Attachment to the aircraft of a fire-proof metal plate bearing the nationality and registration mark of the aircraft.

b) Displaying registration marks on the external surfaces of the aircraft.

10.2.1.1 Fire-Proof Metal Plate

The fire-proof plate must be engraved with the nationality and registration marks of the aircraft and it must be affixed in a prominent position on the fuselage, or, in the case of a Microlight aeroplane, the fuselage or the wing. We recommend the plate is made either of stainless steel, side dimensions of 50mm by 30mm with a thickness of at least 1 mm.

10.2.1.2 External Display of Registration Marks

Full details of how to mark your aircraft externally so that it is in compliance with the ANO 2005 (as amended) Schedule 2, Part B are to be found in CAP 523 – The Display of Nationality and Registration Marks on Aircraft: Guidance for Owners. It can be downloaded for free from the publications section of the CAA's website.

10.2.1.3 Display of Registration as Radio Call Sign

For aircraft equipped with communications radios either permanently installed or portable the aircraft registration also acts as the radio station call sign. Therefore a placard detailing the full registration must be affixed to the instrument panel and in full view of the pilot.

10.3 **Occupant Warning**

You must display the following placard in a readily visible location in the cabin or cockpit:

Occupant Warning

This aircraft has not been certificated to an international requirement. It is amateur built. It does not fully comply with the minimum international safety standards for the carriage of people.

It must be in full view of the occupants. Two or more may be needed for a tandem seated aircraft, or aircraft with 2 or 3 passenger seats.

10.4 **Other Placards and Markings**

The aircraft must be furnished with all other internal and external placards and markings required for the safe operation of the aircraft. Usually these placards are detailed in the limitations section of the flight manual. Relevant information may also be found in the drawings and assembly instructions.

Health Warning!

Where external markings are concerned do not be tempted to fall into the trap of believing external paint scheme and finish is everything and external markings only detract from it. They may well do so, but their proper and conspicuous display is a legal requirement. If the display of markings does not agree with your paint scheme then change the scheme.

Where internal markings are concerned placards should be restricted to items that provide information essential to the safe conduct of the flight or comply with legislative requirements. They should not include items relating to routine piloting actions e.g. checklists; as this detracts from the utility of the mandatory placards.

11 Flight Manual

11.1 These days all newly registered aircraft are required to have a flight manual. This is sometimes referred to as the Pilot's Operating Handbook or the Owners Manual, but properly, it is called the Flight Manual. The purpose of the flight manual is to detail airworthiness limitations and operational procedures for your aircraft that when followed correctly ensure that you are operating your aircraft in a safe manner and within its limitations. Section G of the airworthiness requirements appropriate to your aircraft (e.g. CS VLR), details the minimum information normally included in the flight manual.

11.2 If you are building your aircraft from a kit then in all probability a flight manual has been supplied with the kit. For a plans built aircraft some rudimentary information should have been supplied with the plans, which can form the basis of the flight manual and you will be expected to add to this. If you are building to your own design then you will have to provide all the information yourself.

11.3 At this stage of your build process, you will have produced a provisional flight manual, and certainly, you will need it before you start the flight test programme. At the conclusion of the programme, you will have sufficient information to finalise the content of the manual.

11.4 When finalising the manual you will need to agree its content with the CAA's Test Pilot. In the first instance you will need to do make your submission of the draft Flight Manual to the Design Surveyor.

11.5 Once you have produced your finalised flight manual and its content has been agreed by the CAA's Test Pilot you will be advised by the Design Surveyor of that fact.

11.6 The Design Surveyor can not finalise any outstanding design approvals and neither can the RO Surveyor issue the full Permit to Fly until your flight manual has been accepted by us.

NOTE: The CAA do not formally approve flight manuals for amateur built aircraft as would be done for aircraft with Certificates of Airworthiness.

12 Maintenance Schedule

12.1 From the moment your aircraft takes to the air it will be accumulating flying hours and thus will be subject to wear and tear. The wear and tear needs to be kept under control if the aircraft is to continue to be safe for flight. Notwithstanding the need for unscheduled repairs and rectification due to random faults and failures the continued safety of the aircraft is generally assured by means of routine scheduled maintenance.

12.2 If you are building your aircraft from a kit then in all probability some sort of maintenance guidelines have been supplied with the kit. For a plans built aircraft, or if you are building to your own design, then you will have to provide all the information yourself.

12.3 Irrespective of what type of aircraft you are building we strongly recommend that you maintain it in accordance with any maintenance instructions provided by the aircraft designer or kit manufacturer. If the designer's or manufacturer's advice is insufficient then we recommend that you maintain the aircraft in accordance with CAP 411 - Light Aircraft Maintenance Schedule Aeroplanes (CAA/LAMS/A/1999 Issue 2) or CAP 412 - Light Aircraft Maintenance Schedule (Helicopters) (CAA/LAMS/H/1999 Issue 2) as appropriate.

Before a Permit to Fly for Test can be issued to your aircraft you and your licensed engineer will have to first agree with the AMSD RO Surveyor a maintenance regime for the aircraft.

12.4 CAP 520 - Light Aircraft Maintenance and Chapter 5 of CAP 733 – Permit to Fly Aircraft contains further information on this subject.

13 Aircraft Radio Licence and Approval of Radio Installation

13.1 If you intend to use radio equipment for the purpose of communicating with ground stations or other aircraft then your aircraft must have an Aircraft Radio Licence. An Aircraft Radio Licence is required irrespective of whether the radio in use is a fixed installation or hand held. The licence is issued by the Office of Communication (Ofcom), but the actual application to and issue of is made to and by the CAA's Directorate of Airspace Policy. Full details on Aircraft Radio Licences along with fee

structure and application forms can be found at **www.caa.co.uk/dap/radio_licensing/default.asp**

Also it is a requirement of the ANO 2005 (as amended) that all radio equipment fitted to aircraft is CAA approved. Therefore you will need to ensure that the individual items of equipment as well as the installation are approved by the CAA. Information on how to make these checks is to be found in the FAQs at **www.caa.co.uk/dap/radio_licensing/default.asp**

13.2 The radio licence document serves a dual purpose. It is the actual licence and also an approval document specifying the types of transmitters that are approved to be installed in the aircraft e.g., ATC Transponder, DME, VHF Comm. The information needed to produce the installation approval part of the document is automatically gathered from the Form CA3 submitted by you when applying for your Permit to Fly as well as the formal report the RO Surveyor makes at the conclusion of his physical survey of your aircraft before issue of the Permit to Fly.

14 The Permit to Fly

14.1 Standard CAA policy is to initially issue a Permit to Fly for Test to the aircraft. This is so that the aircraft can be flight tested by a person acceptable to the CAA for the purpose, using an agreed flight test schedule, and to allow any necessary adjustments or alterations to be made to bring the aircraft to a satisfactory condition. If the aircraft performs satisfactorily by the end of the flight test program a full Permit to Fly can then be issued. A full Permit to Fly is valid for one year. It can then be renewed subject to annual maintenance having first been carried out on the aircraft and a satisfactory review of the aircraft's documentation being concluded by the Licensed Engineer. However, a Permit to Fly for Test may only be valid for a shorter period of time, typically 3 months, and renewal is negotiable.

14.2 The Permit to Fly document will contain limitations and conditions on the use that the aircraft may be put. Usually the following apply but you should not consider the list to be comprehensive or definitive:

a) Public transport and aerial work will not be permitted. However, certain exemptions to this restriction are granted for the purpose of training, public exhibition and demonstration. Full details of which are given in Chapter 6 of CAP 733 – Permit to Fly Aircraft.

b) Aerobatics will not normally be permitted for Microlight aeroplanes, gyroplanes or helicopters.

c) Flight in IMC or at night will not be permitted.

d) The aircraft is only permitted to fly if it has been maintained in a condition fit for flight.

e) The aircraft shall not be flown over any congested area of a city, town or settlement, except to the extent necessary in order to take-off and land in accordance with normal aviation practice at licensed or Government aerodromes.

It may also contain some limitations that are specific to your particular aircraft. The Permit to Fly for Test is liable to contain additional limitations relevant to the flight test programme.

14.3 Permits to Fly are fully described in CAP 733 – Permit to Fly Aircraft.

15 Requesting The Permit to Fly for Test for an Amateur Built Aircraft

When you have completed construction of your aircraft and your Licensed Engineer is satisfied with the standard of construction and subject to you having completed the actions listed below you can request your RO Surveyor to issue a Permit to Fly for Test for the aircraft.

15.1 Actions to Complete Before Requesting the Permit to Fly for Test

Before you request the Permit to Fly for Test you will need to complete the following actions:

a) establish by reference to the Design Surveyor that the design investigation is complete and that we are prepared to issue an approval for the design of your aircraft, subject to the flight test confirming acceptability of the aircraft;

b) assuming you receive a positive response to the first action, then inform the Design Surveyor that you are about to request the Permit to Fly for Test, and therefore request that he issues to the RO Surveyor the AAN approving the design and build standard of the aircraft;

c) To assist the Design Surveyor in doing this you will need to declare the build standard. The build standard comprises a listing of all the major drawings used to construct the aircraft, all the modifications embodied and how approved - you will need to provide a copy of the approval certificates for the modifications. Specify the engine, propeller, instruments, avionics, wheels, tyres, seat belts etc and supply any other information he requests. Before he issues the AAN he will also need to satisfy himself that items e), f), g) and h) below have been completed and agreed the limitations that will appear on the Permit to Test;

d) have registered and marked your aircraft and be in possession of the "Certificate of Registration of Aircraft";

e) have produced and have agreed by the CAA's DPSD Test Pilot your proposed flight test programme (See Paragraph 18.5);

f) have agreed with the CAA's Test Pilot the competency and suitability of the person(s) who will be undertaking the test flying (See Paragraphs 18.7 and 18.8.1);

g) have agreed with the CAA's Test Pilot and the RO Surveyor the arrangements for the management of your flight test programme (See Paragraph 18.7);

h) have produced a preliminary Flight Manual for the aircraft;

i) have produced a maintenance schedule for the aircraft and agreed the maintenance regime with the RO Surveyor;

j) have raised a set of Log Books for the aircraft, its engine and if fitted its VP propeller (See Paragraph 8.3.1);

k) ensure the aircraft has been weighed and that a weight and balance schedule has been produced;

l) if the aircraft is fitted with a radio or other transmitting devices ensure you have an Aircraft Radio Licence for it (See Paragraph 13);

m) ensure all the documentation recording the construction of the aircraft is completed; and

n) ensure you have CAA Form AD261EASA approving each modification of a minor nature. Nevertheless, as a cost effective option instead of pursuing individual approval of each modification you may make arrangements with the Design

Surveyor to have him approve the minor modifications and possibly the major modifications as a job lot. (See Paragraph 7.10)

15.2 Actions to be Completed by the Design Surveyor Before the Permit to Fly for Test is issued

When satisfied that the following actions have been completed the Design Surveyor will issue the Working Draft AAN recommending the Permit to Fly for Test be issued.

a) If not previously approved, then the design investigation has progressed to a stage where test flying may be undertaken.

b) A preliminary Flight Manual has been produced to an acceptable standard.

c) All the flight test arrangements have been agreed with the CAA's Test Pilot and RO Surveyor.

d) Sufficient information and documentation has been made available by the Constructor to sensibly define the aircraft's build standard.

15.3 Actions to be Completed by the RO Surveyor Before the Permit to Fly for Test is Issued

Before the RO Surveyor will issue the Permit to Fly for Test he will need to:

a) be in possession of the AAN produced by the Design Surveyor. The AAN defines the build standard and approves the design of your actual aircraft and recommends the issue of the Permit to Fly for Test;

b) have agreed with the CAA's Test Pilot and you the arrangements for the management of your flight test programme (See Paragraph 18.7);

c) be satisfied that the aircraft still complies with the 51% rule;

d) be satisfied with the standard of the documentation and build records for the aircraft;

e) be satisfied with the provisional maintenance schedule for the aircraft;

f) be satisfied with the weighing report and weight and balance schedule; and

g) conduct a detailed physical inspection of the aircraft.

NOTE: Many of the processes described in this section are equally applicable to aircraft being approved by the BMAA or PFA routes.

16 CAA Inspection of an Amateur Built Aircraft

16.1 General Information About What We Do and Do Not Do For Inspections.

16.1.1 During the construction phase we will inspect your aircraft at predetermined stages. The stages are agreed in advance with yourself and your Licensed Engineer. The selected stages represent events that once you have progressed past them it would not be possible for anyone to perform a meaningful inspection of that particular part of the aircraft, e.g. For a fabric covered wing we would need to inspect the wing structure prior to you covering it. During the stage inspections we will review your documentation and discuss the project in general with you.

16.1.2 When you have requested your Permit to Fly for Test to be issued we will inspect your completed aircraft for general airworthiness. When the inspection takes place the aircraft should be ready to fly, except for having the cowlings, fairings, and panels open for inspection.

16.1.3 Whilst we performs progressive in-process inspections during the building process CAA Surveyors cannot be involved in the building process itself. If you have any queries about the build process you should direct them to the Designer, Kit Supplier, your Licensed Engineer or other knowledgeable person. It may be that you are seeking a deviation from a standard construction method. If so, this should be discussed with your Licensed Engineer who will, if appropriate, seek our agreement to the deviation. Our agreement is more than likely to be granted via the medium of an approved modification.

16.2 Visual Inspection

The RO Surveyor will conduct an onsite, visual, general airworthiness approval inspection of the aircraft, including reviewing the information discussed in paragraphs 15.3 (a) and (b), before issuing a Permit to Fly for Test complete with the appropriate airworthiness and operating limitations. The Surveyor will perform the visual inspection as shown in figure 2, CAA Visual Inspection of an Amateur Built Aircraft.

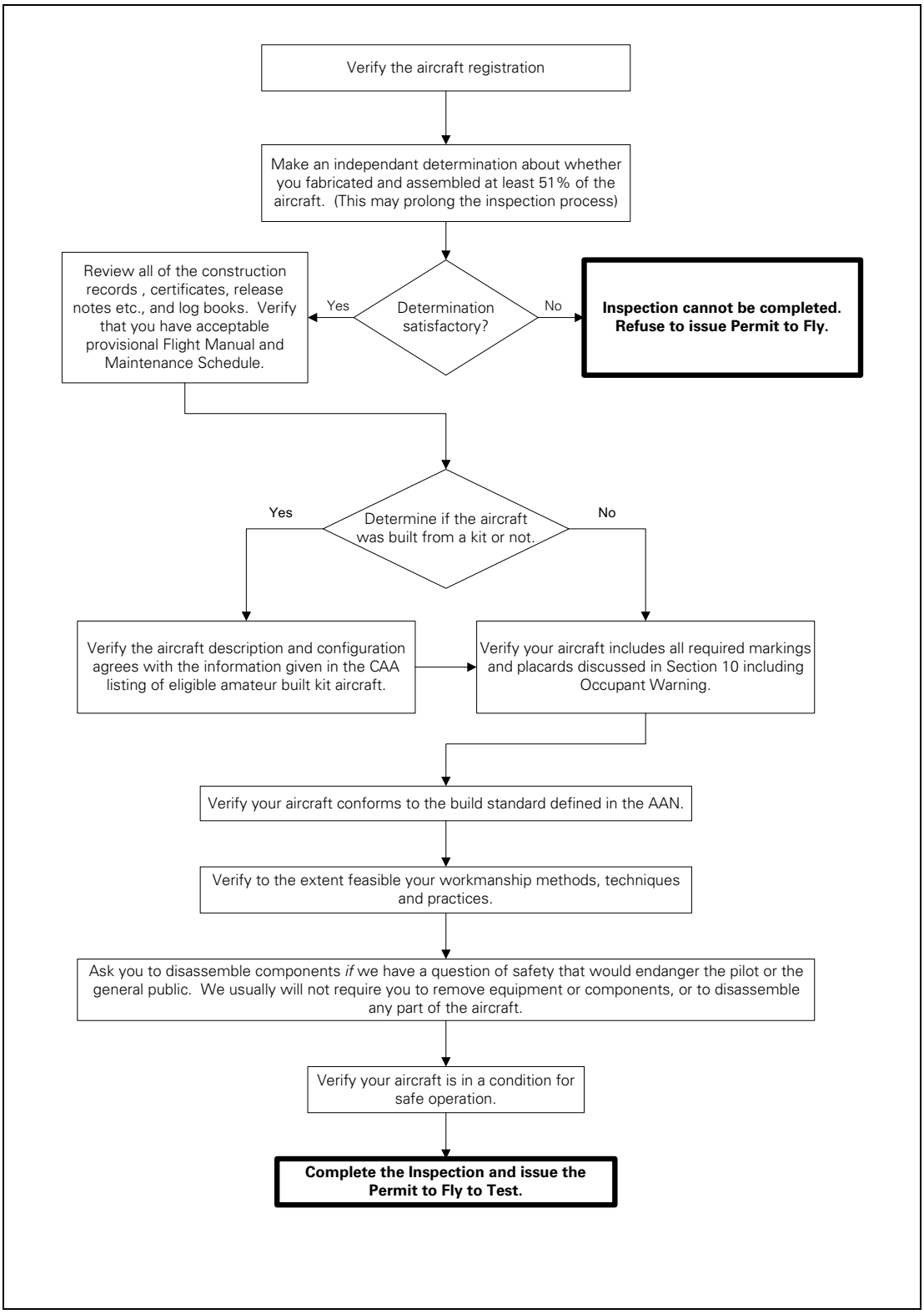

Figure 2 CAA Visual Inspection of an Amateur built Aircraft

16.3 Paperwork Review

16.3.1 The RO Surveyor will review the records detailed in Paragraph 8 of this CAP. In addition he will review the Weighing Report, the Weight and Balance Schedule, the Flight Manual and Maintenance Schedule. He will ensure that any Airworthiness Directives or Mandatory Permit Directives have been complied with and any approvals that need to be issued by the Design Surveyor have in fact been issued. He will also ensure that the Flight Test Schedule has been agreed by the CAA's Test Pilot and that the procedures for managing the flight test programme have similarly been agreed by the CAA's Test Pilot and himself.

17 Issuing the Permit to Fly

17.1 On completion of a satisfactory physical inspection of the aircraft and paper work review which implies the aircraft has been determined fit for flight the RO Surveyor will issue the Permit to Fly for Test.

17.2 Once the flight test programme has been satisfactorily completed and the aircraft has been determined fit for flight the RO Surveyor will issue a full Permit to Fly. However, modifications, repairs and or adjustments may have been made to the aircraft because of the flight test investigation.

Any such changes will have to be undertaken and recorded in exactly the same manner as used for the construction of the aircraft. Before the Permit to Fly is issued, the RO Surveyor will need to satisfy himself of this fact. In order to do that he will undertake a limited review of the aircraft and its documentation in a similar manner to that described in paragraph 16 of this CAP.

This time around for the document review you will have to produce a finalised maintenance schedule that you have had accepted by the RO Surveyor – see paragraph 12 of this CAP. You will also have to produce your flight manual that has been accepted by the CAA's Test Pilot - see paragraph 11 of this CAP.

17.3 Paragraph 14 of this CAP addresses the Permit to Fly.

18 Flight Testing your Aircraft

18.1 Principles

18.1.1 Once your aircraft has been built, and before a full Permit to Fly can be issued, you will be required to show your aircraft is controllable at all its normal speeds during all the manoeuvres the aircraft is designed to execute. You must also show that it has no hazardous operating characteristics or design features and that it can meet its performance objectives.

18.1.2 The performance and handling objectives that your flight test programme will have to meet are normally stated in Section B of the certification requirements applicable to your aircraft (e.g. CS-VLA). In addition to these objectives, there will be a number of additional objectives that you will have to meet to demonstrate the safe performance, handling and limiting factors for your aircraft's systems and engine installation. Also you will be using your flight test programme to determine some of the limitations data required for the Flight Manual, which is normally detailed in Section G of the applicable certification requirements.

18.2 Flight Test Programme

18.2.1 In order to meet the objectives of the above stated principles you will need to perform a structured flight test programme that you have agreed with us in advance. The agreement is sought through the CAA Test Pilot allocated to your project.

18.2.2 If your aircraft is a subsequent example of an aircraft that has been previously approved, then an agreed flight test programme should already exist. Our Test Pilot can advise you on its suitability for use with your aircraft. You will have to bear in mind that even though your aircraft may not be the first of type to be approved by us yours may differ in a number of ways from the preceding examples. If we consider the changes have a potential to impact upon the aircraft's limitations, handling and performance characteristics then you will have to evaluate them via new flight test work.

18.3 Developing a Flight Test Programme

18.3.1 The place to start when developing a flight test programme is the certification requirements applicable to your aircraft. Once you have understood what is required you then need to start on the detail of the test programme. To assist you in this activity for fixed wing aircraft we recommend that you make reference to the FAA publications AC 90-89A – Amateur Built Aircraft and Ultralight Flight Testing Handbook; and AC23-8B - Flight Test Guide for Certification of Part 23 Airplanes. We also recommend that you consult a Flight Test Engineer or Test Pilot to assist in developing the programme. This after is all is what they are trained to do – devise and fly flight test programmes.

18.4 Number of Flight Test Hours

18.4.1 The number of flight-test hours depends on your aircraft's characteristics. See the following table for general guidance. The CAA Test Pilot may decide you need additional hours of flight testing beyond those shown in the Table 3 to satisfactorily demonstrate the handling and performance characteristics of your aircraft.

Table 3 Aircraft Characteristics, Required Flight Testing

Engine and propeller combination that is type certified or approved by an alternative equivalent means	25 hours
Non-type-certificated engine/propeller combination	40 hours
Gliders, balloons, dirigibles and Ultralight vehicles eligible for CAA certification	10 hours, including five takeoffs and landings

18.5 Approval of Your Flight Test Programme

18.5.1 Once you have written up your proposed flight test programme you need to submit it to the CAA's Test Pilot for review and acceptance. If there are items in it that he is not happy with he will advise you and he may suggest improvements.

18.6 Location

18.6.1 You will need to specify the Airfield and location of a flight test area to the RO Surveyor and the CAA's Test Pilot. If the CAA's Test Pilot approves your suggestion, the RO Surveyor will specify it in the limitations on your Permit to Fly for Test.

18.6.2 Usually, the flight test area should be within a 40 Kilometre (25 statute mile) radius from your aircraft's base of operation. The flight test must be conducted over open water or sparsely populated areas with light air traffic so it does not pose a hazard to persons or property on the ground and other airspace users. You can ask us to help you pick a suitable area to ensure adequate airspace for flight-testing.

18.7 Management of your Flight Test Programme

18.7.1 You will need to discuss and agree with the RO Surveyor and the CAA's Test Pilot how you intend to manage the flight test programme.

18.7.2 This will include the facilities and resources you intend to use, who will be doing the test flying as well as proposals to conduct the flight test in progressive stages, and reporting to the CAA's Test Pilot each time a stage has been satisfactorily completed.

18.7.3 Via your Licensed Engineer you will also need to propose and agree the maintenance provisions for your aircraft whilst it is undergoing flight test.

18.8 Conducting the Flight Tests

18.8.1 Conducting flight tests is an exacting and skilled task. If you have not done this type of work before, or, you have little or no experience of the type or class of aeroplane under test, then in the interests of your own safety we strongly recommended that you to find a qualified pilot who is experienced and knowledgeable to do the work for you. In any event the pilot undertaking the tasks needs to be agreed with our Test Pilot before starting any flight test activity.

18.8.2 Dependent on the aircraft in question and the nature of the flight test work you will need to consider the provision of personal parachutes for the flight crew as well as the installation of a spin recovery parachute for the aeroplane, or a ballistic recovery parachute.

18.8.3 The flight test programme must be done in a structured manner one step at a time. Once a phase has been successfully completed move on to the next one.

18.8.4 Sometime during the flight test programme, usually towards the end of it, the CAA's Test Pilot will more than likely want to fly the aircraft and sample its performance and handling characteristics for himself.

18.8.5 During the flight test programme you must carry out all the agreed maintenance activities for the aircraft as they fall due.

18.8.6 It may be that as a result of the flight test activities you will have a need to modify or repair your aircraft. If so, this must be done in conjunction with your Licensed Engineer, who will arrange to get them approved - see paragraph 17.2 of this CAP. You may find that the changes have an impact on the continued validity of the agreed flight test programme. If so, you will need to notify the changes and what impact they have to the CAA's Test Pilot and the RO Surveyor and possibly the Design Surveyor too. As a consequence the Permit to Fly for Test may have to be re-issued.

18.8.7 Once the flight test programme has been completed and the CAA's Test Pilot has accepted your flight test results, the Design Surveyor needs to be informed so that he can finalise any design approvals outstanding for your aircraft. He will also liaise with our Test Pilot to ensure that your flight manual is acceptable to us.

18.8.8 When the Design Surveyor has completed and issued any outstanding design approvals and the flight manual has been approved, the RO Surveyor will issue the full Permit to Fly for your aircraft - see paragraph 17.2 of this CAP.

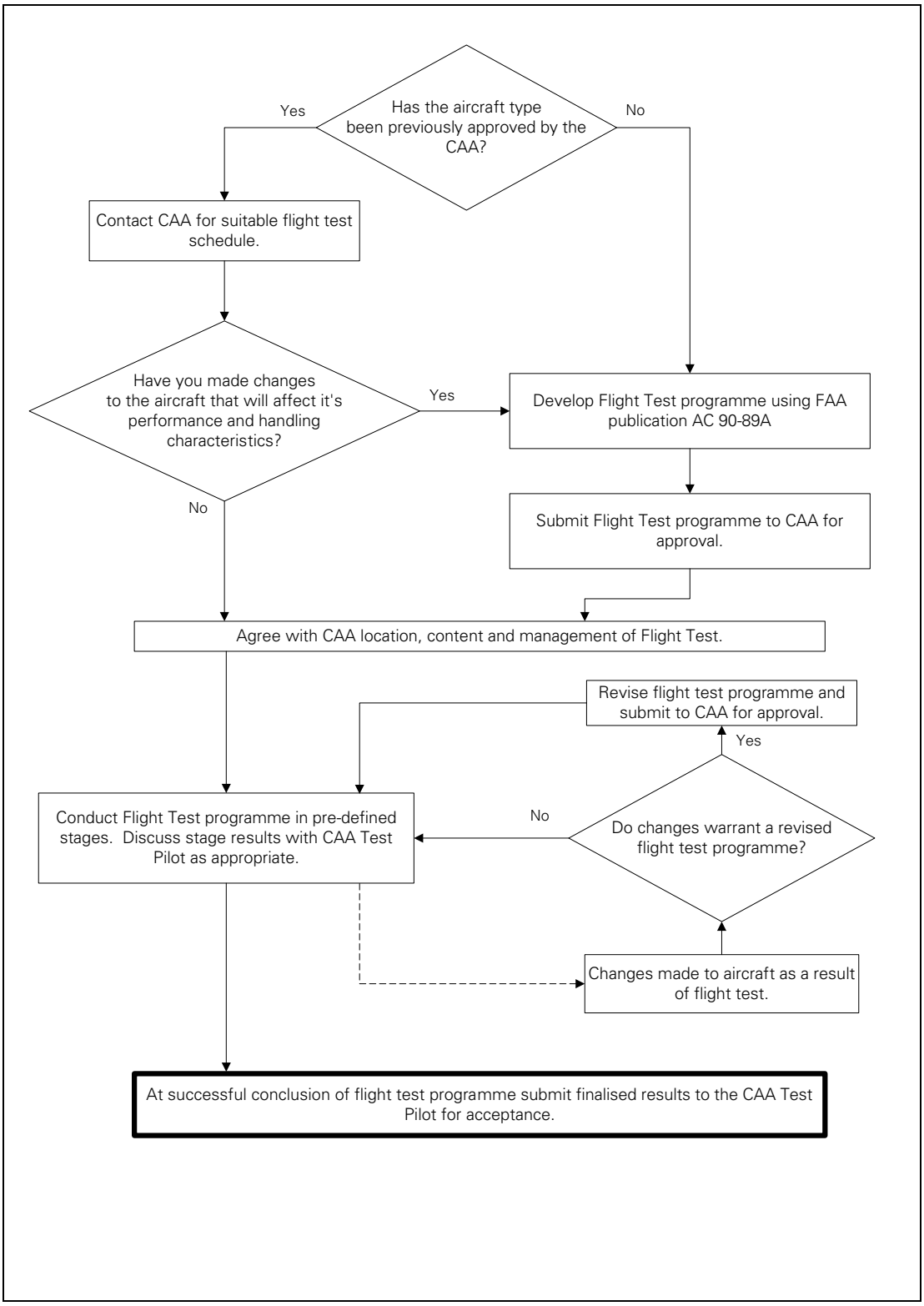

Figure 3 Flight Testing Your Amateur Constructed Aircraft

18.9 Restrictions Whilst Performing Flight Tests

18.9.1 Carrying Passengers

You may not carry passengers while you are restricted to the flight test area or during any portion of your flight test program. We suggest you use a tape or video recorder for recording readings and other similar tasks. If you need an additional crewmember for a particular flight test, then specify this in your flight test programme and have it agreed by the CAA's Test Pilot and the RO Surveyor. When agreed, we will list this need in the operating limitations on your Permit to Fly for Test.

18.9.2 Flight Instruction

You may not receive flight instruction on your aircraft during its flight test phase.

18.9.3 Additional Operating Limitations

In the interests of safety we may impose additional operating and airworthiness limitations on your aircraft for the duration of the flight test phase - see paragraph 14 of this CAP. We will review the limitations with you to make sure you thoroughly understand each one.

19 Safety Recommendations

19.1 Pilot Responsibilities

19.1.1 As a pilot, you should:

a) be thoroughly familiar with the aircraft, its engine and propeller operation, and ground handling characteristics including operation of the brakes. You should test these operations by conducting taxi tests before attempting flight operations. **You must not become airbourne during taxi tests or at any other time without a valid Permit to Fly. If you do so, you will be committing an offence in contravention of ANO 2005 (as amended) Article 8; Article 148(6) refers**;

b) take precautions to ensure emergency equipment and personnel are readily available in the event of an accident before any flight during the flight test phase of an amateur built aircraft approval programme; and

c) refrain from aerobatic manoeuvres unless:

i) you have been properly trained to fly aerobatics;

ii) you have current experience of flying aerobatics; and

iii) you have enough flight experience on type to establish that the aircraft is satisfactorily controllable throughout its normal range of speeds and manoeuvres.

You should document in the flight test programme log, or equivalent, all satisfactorily conducted manoeuvres.

19.2 Airworthiness Limitations

19.2.1 The Airworthiness limitations for your aircraft will be detailed in the flight manual. Additionally, for the flight test phase additional limitations may be included via the flight test schedule. The Permit to Fly may also contain additional airworthiness limitations.

19.2.2 The airworthiness limitations are there to safeguard the aircraft and its occupants.

You must adhere to them at all times.

19.3 **Operating Limitations**

19.3.1 The operating limitations require that you operate the aircraft under the applicable air traffic control and general operating rules of the Air Navigation Order and the Air Navigation (General) Regulations.

19.3.2 Flight under IFR or in IMC for Permit to Fly aircraft is prohibited.

19.3.3 Flight over built up areas by Permit to Fly aircraft is prohibited.

19.3.4 The Permit to Fly may contain additional operational limitations.

19.3.5 The operating limitations are there to safeguard the aircraft, its occupants, other airspace users and persons beneath the flight path. You must adhere to them at all times.

19.4 **Equipment.**

19.4.1 Your aircraft must be equipped as required by Schedule 4 of the Air Navigation Order.

19.4.2 If your aircraft has a Mode C transponder, the aircraft must also have a calibrated airspeed/static pressure system to prevent an error in altitude reporting. You should have the transponder tested and inspected in accordance with the manufacturers instructions by a JAR 145 approved company that has the appropriate ratings to undertake this work.

19.5 **Weight and Balance**

19.5.1 When you have completed your aircraft you will have weighed it and produced, from the weighing report, a weight and balance schedule. Using the weight and balance schedule in conjunction with the aircraft's airworthiness limitations relating to weight and balance, you must ensure that the aircraft is correctly loaded and the Centre of Gravity is within limits at all times.

19.5.2 Failure to operate within the permitted weight and centre of gravity limits could result in failure to achieve minimum take-off performance, handling difficulties, loss of control or structural failure of the aircraft.

19.6 **Rotorcraft**

19.6.1 If you intend to fly a rotorcraft with a fully articulated rotor system, you need to be particularly cautious of ground resonance. If you maintain or allow this condition of rotor imbalance to progress, it can be extremely dangerous and may result in structural failure.

19.6.2 As a rotorcraft pilot, you should complete tests showing that stability, vibration, and balance are satisfactory with the rotorcraft tied down before beginning hover, horizontal, or vertical flight operations.

20 Continuing to Operate your Amateur Built Aircraft

20.1 After you have completed the flight test programme and your full Permit to Fly has been issued, the aircraft is considered safe for continued flight. To continue operating your aircraft safely, you must follow the limitations stated in the flight manual and the Permit to Fly and maintain it in accordance with your agreed maintenance schedule.

20.2 Further information on the operation of Permit to Fly Aircraft can be found in Chapter 6 of CAP 733.

20.3 You need to be aware of your responsibilities with respect to adequate record keeping and maintaining your aircraft in accordance with the agreed maintenance schedule. CAP 520 - Light Aircraft Maintenance provides a considerable amount of

useful information on the latter subject in particular. Chapter 5 of CAP 733 also contains information on this subject.

20.4 The aircraft, engine and (if appropriate) propeller log books must be kept up to date with all flight details accurately recorded on a flight by flight basis as they occur. Also all maintenance, repair and modification activity must be recorded and signed off by appropriately authorised persons, i.e. your Licensed Engineer.

20.5 Maintenance must be performed when due, either on a flight hour or calendar time basis, as detailed in the maintenance schedule. Overhaul and retirement lives must be adhered to and all Mandatory Permit Directives must be complied with as detailed in the Mandatory Permit Directive (MPD) document. MPDs are published in CAP 661 - Mandatory Permit Directives. In addition all Airworthiness Directives applicable to any type certified components required to be installed to the aircraft e.g. a type certified engine on 4 seat aircraft, must be complied with.

20.6 As a licensed pilot and owner of the aircraft you may undertake and self authorise a limited number of maintenance and repair activities. Part 5 of CAP 520 - Light Aircraft Maintenance contains the relevant details of what you can do.

20.7 Your Permit to Fly is only valid for 12 months. Therefore you must renew it on an annual basis. Renewal is normally achieved simultaneously with the aircraft's annual inspection. Chapter 5 of CAP 733 contains further information on this subject.

20.8 Once in service you may have a need to modify or repair your aircraft. We must approve **all** modifications made to amateur constructed aircraft. Also, we must approve **all** repairs that are not acheived by directly replacing the damaged items with identical serviceable parts on a one for one basis or, performed in accordance with an accepted structural repair manual. We approve repairs in the same manner as we do for modifications. However, if your aircraft is under the supervision of the BMAA or PFA then they can be approved by them as appropriate. The approval process for modifications (and repairs) approved by us is discussed in Chapter 4 of CAP 733 – Permit to Fly Aircraft.

20.9 You should where possible monitor information from the aircraft user-groups (e.g. type clubs, manufacturers newsletters) to check whether any in-service difficulties are emerging with the type which may need corrective action.

20.10 You may want to operate your aircraft on Motor Car Gasoline – MOGAS. If you do then you will need to refer to CAP 455 - Airworthiness Notices, Notices:

98 Use of Motor Gasoline (MOGAS) in Certain Light Aircraft;

98A Use of Filling Station Forecourt Motor Gasoline (MOGAS) in Certain Light Aircraft;

98B Use of Filling Station Forecourt Unleaded Motor Gasoline in Microlight Aeroplanes; and

98C Use of Filling Station Forecourt Unleaded Motor Gasoline in Certain Light Aircraft; for appropriate guidance.

21 Approving Aircraft Imported in Partial or Fully Completed Form

21.1 General

21.1.1 You may apply for a permit to fly for a partially or fully completed amateur constructed aircraft that you are importing into the UK for your own personal use.

21.1.2 All of the preceding sections of this CAP are applicable to the approval of imported partially or fully completed amateur constructed aircraft.

21.1.3 The eligibility of your partially or fully completed imported aircraft for consideration for issue of a Permit to Fly will be subject to:

a) acceptable documentary evidence obtained by the previous owner from the Civil Aviation Authority of the country that originally approved the aircraft verifying that the major components or the completed aircraft was certificated/approved as an amateur built aircraft and that it meets the requirements of EU Regulation 1592/ 2002 Appendix II paragraph (c), (the 51% rule); and

b) acceptable documentary evidence obtained by the previous owner from the Civil Aviation Authority or their Authorised Agents of the country where the aircraft was originally constructed verifying they were involved in the acceptance of the build standard and quality of construction of the major components or the completed aircraft; and

NOTE: An Authorised Agent is considered to be an organisation that has formally been given delegated responsibility for the certification/approval of Amateur Constructed Aircraft by its own Civil Aviation Authority, in the same manner as our own BMAA or PFA.

c) the issue of a current domestic flight authorisation (e.g. Special Airworthiness Certificate - Experimental) by the Civil Aviation Authority of the exporting country for completed aircraft; and

d) comprehensive build records being supplied with the aircraft; and

e) a full maintenance and repair history with the maintenance schedule that has been used; and

f) satisfactory compliance with the inspection criteria detailed in Appendix 5; and

g) evidence being made available which shows that the design meets the UK standards for the particular class of amateur built aircraft, or, in exceptional circumstances, that sufficient experience of safe operation has been demonstrated. See BCAR Chapter A3-7 paragraph 3.1; and

h) declaration of the design and build standard of the aircraft; and

i) the equipment standard being acceptable; and

j) the flight manual being acceptable; and

k) the completed aircraft being shown fit to fly by means of documentary review, inspection and flight test.

Some of the points above are discussed in more detail below.

Health Warning!

Attempting to show satisfactory compliance with the conditions stated above can be notoriously difficult. If the evidence presented is inadequate then your application for a Permit to Fly will be refused.

21.2 Proof of Eligibility

21.2.1 Before you complete the purchase of your aircraft it is essential that you obtain documentation described in paragraphs 21.1.3 a) and b). Also we strongly advise you to obtain examples of the build records that will be accompanying the aircraft. For obvious reasons at this stage, copies will be acceptable.

21.2.2 When you are in possession of the documents referred to in paragraph 21.2.1 you need to contact your local CAA AMSD RO and arrange for a documentary review. At the review, we will determine if the documentation will be acceptable to us. We will also make a determination of the eligibility of your proposed purchase for amateur constructed status and advise you of the likely hood of a Permit to Fly application succeeding. The AMSD RO will consult with the CAA Certification and Approvals Department as appropriate in order to reach a conclusion.

21.3 **Proof of Build Quality Acceptable to the CAA**

21.3.1 Amateur constructed aircraft are not manufactured in the type of controlled environment that Type Certificated Aircraft are. Also most countries outside of the UK do not regulate the quality of build or the modification state of amateur built aircraft to the extent that we do in the UK. This means that there is no formally guaranteed minimum acceptable build quality that can be assumed to be inherent in the manufacture of the aircraft. Therefore the only way that an acceptable level of build quality can be determined is by means of examination of the original build records and extensive inspection as detailed in Appendix 5. This inspection needs to be undertaken by your Licensed Engineer, and entered and signed off by him in the aircraft, engine and (if appropriate) propeller log books.

21.3.2 The build records should be at least equivalent to those called for in paragraph 8.

Health Warning!

a) Many years of past experience has shown that because of concerns about the records, build quality and modification state of imported foreign amateur built aircraft, many have been refused a Permit to Fly or, have required extensive re-building before one could be issued.

b) Attempting to show an adequate build quality for a composite aircraft after the manufacturing event is notoriously difficult. Most build records alone are rarely satisfactory nor are simple after-the-event inspections techniques when used in isolation. Ideally the build records for the composite structure need to show conformity with the data published in Appendix 2. If the build records are inadequate and test samples of structural elements were not prepared at the time of original manufacture and supplied as verified data with the rest of the aircraft documents; then complex NDT methods or structural testing of the aircraft may be required. Before you complete the purchase of your aircraft you are urged to discuss with us the evidence you will be making available to demonstrate build quality. If in our opinion the evidence presented is inadequate then your application for a Permit to Fly will be refused.

21.3.3 If an adequate level of build quality cannot be demonstrated to our satisfaction then you may be required to overhaul or re-manufacture the affected parts of the aircraft. This may include carrying out NDT inspections of critical areas of the structure, e.g. welded joints.

21.4 **Maintenance and Repair History**

21.4.1 You should be able to present to us a verified and comprehensive maintenance and repair history for the aircraft along with the maintenance schedule used.

21.4.2 If adequate levels of maintenance and repair history cannot be demonstrated to our satisfaction or we consider the maintenance schedule to be inadequate, then you may be required to overhaul or re-manufacture the affected parts of the aircraft. This may include carrying out NDT inspections of critical areas of the structure, e.g. welded joints.

21.4.3 Inevitably, before a Permit to Fly is issued to your aircraft, you will have to agree with us an appropriate maintenance schedule for it. See paragraph 12.

21.5 Approval of the Design

21.5.1 You will need to get the aircraft design approved by following the process described in paragraph 7.3. However, if the aircraft is of the same or similar design to one that has already been previously approved then the process can be substantially simplified if credit can be given for the earlier work. Once the design has been approved (and the build standard and flight test programme agreed) the Design Surveyor will issue a working draft AAN. (See paragraph 15.2)

Health Warning!

It may transpire that as a result of our design investigations we may impose additional limitations on the aircraft, particularly if the methods of substantiation used in the exporting/original country of approval have been somewhat more optimistic than we would normally expect to see as industry norms. In this event you may find for example that the aerobatic aeroplane you thought you had bought is now prohibited from performing such manoeuvres.

21.6 Declaring the Build Standard

21.6.1 As part of your documentary submission to us in support of your application for your Permit to Fly for your imported aircraft, you will have to declare the design and build standard.

21.6.2 The design and build standard consists of a listing of the original drawings used to construct the aircraft, a listing of all modifications and repairs embodied and a listing of all major equipment fitted, such as the engine, propeller, instruments, avionics, wheels, tyres, seat belts etc.

21.7 Flight Test and the Flight Manual

21.7.1 If the aircraft you are importing is a type we have not previously approved then you will have to arrange for a flight test programme to be conducted in a manner similar to that described in paragraph 18.

21.7.2 If your aircraft is a type previously approved by us then a permit renewal flight test is all that is likely to be required.

21.7.3 A Flight Manual will be required and its content agreed with the CAA's Test Pilot. The subject of flight manuals is discussed in paragraph 11.

21.8 Demonstrating that your Aircraft is Fit to Fly

21.8.1 In order to demonstrate that your imported aircraft is fit to fly you will need to satisfactorily accomplish the following:

a) Have had your Licensed Engineer satisfactorily conduct the inspections listed in Appendix 5 in order to prove an acceptable level of build quality; and

b) If the aircraft was only partially completed on import, have completed construction as per the guidelines of this CAP; and

c) For aircraft fully completed on import, have undergone a comprehensive review of maintenance and repair activity as well as successfully completing an annual inspection in accordance with the accepted maintenance schedule (see paragraph 12); and

d) Have had the design approved by us as per the guidelines of this CAP; and

e) Completed a documentary review for the aircraft to our satisfaction: and

f) Satisfactorily completed an agreed flight test programme.

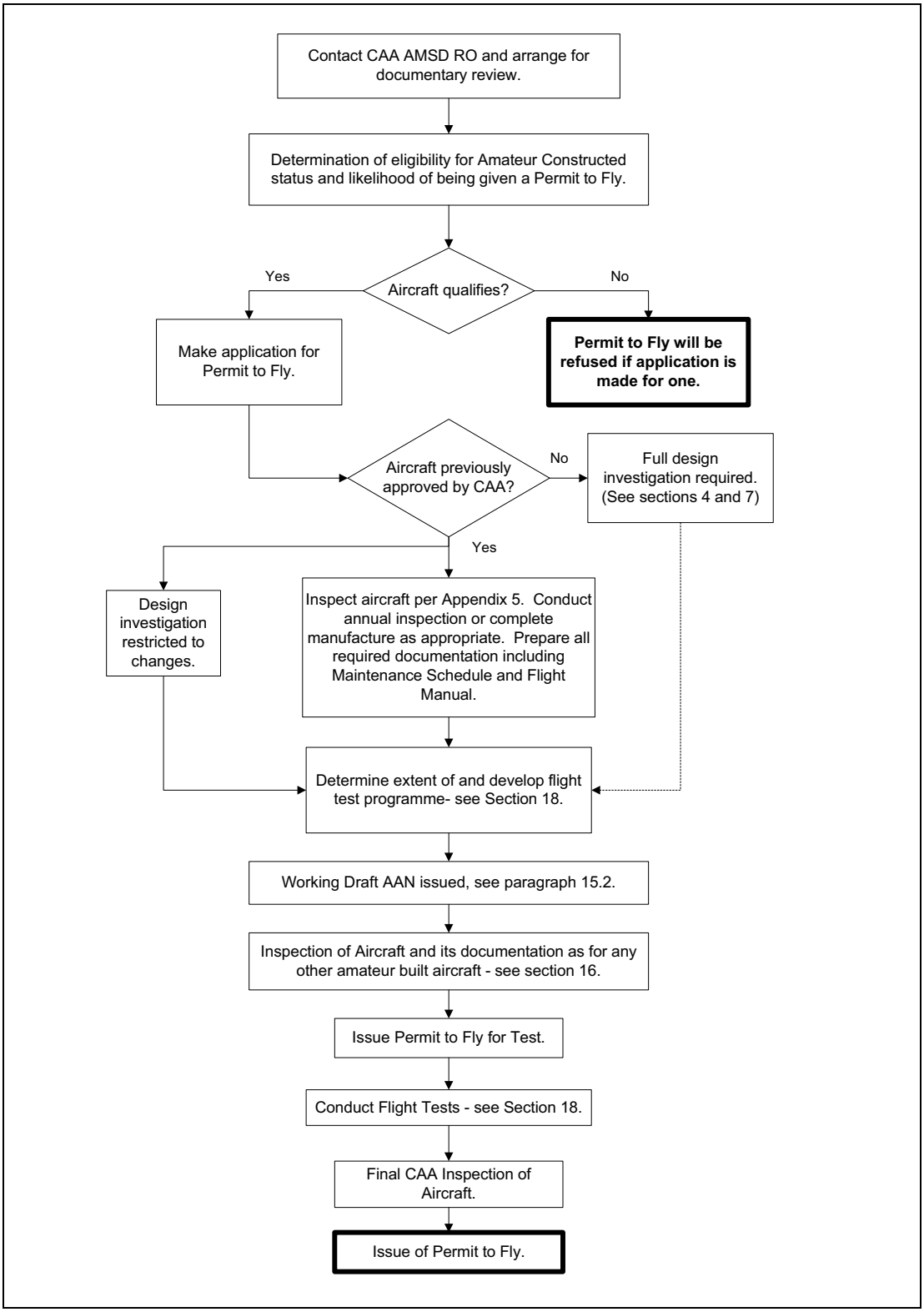

Figure 4 Approving Aircraft Imported In Partial Or Fully Completed Form

21.9 Requirements and Procedures for a UK or EU Citizen Building an Amateur Built Aircraft Outside of the United Kingdom

21.9.1 You should comply with the Civil Aviation Authority rules in the Country or Jurisdiction where you wish to operate the aircraft. If you want to bring your aircraft into the United Kingdom, you will have to apply for a UK Permit to Fly as previously described in paragraph 21. However, short term visits are allowed, see CAP 455 - Airworthiness Notices, Notice No. 52 - **Flight in UK Air Space of Foreign Registered Home-Built Aircraft.**

Appendix 1 Design Investigations

1 Introduction

Before the CAA will issue a Permit to Fly to an aircraft, its design must be shown to satisfy an acceptable 'basis for approval'. The criteria for approval that may be used are dependent upon the aircraft concerned and are listed in CAP 553 - BCAR Section A, Chapter A3-7, paragraphs 3.1 a) or c), 4.3 and 4.5.

Satisfying a basis of approval can be very time consuming and expensive and in most instances will need the assistance of specialist engineers. The less experienced you are in these matters the more time consuming and expensive it can become. Therefore it is recommended that if your project definition is within the terms of approval of the BMAA or PFA then if at all possible you contact them for assistance. If they are unable to assist you then you will have to propose to the CAA your own team of specialist engineers or you may even have to contract the services of a commercial design company approved by the CAA for the purpose. This of course adds to the expense.

2 Contacting the CAA

Determination of a basis of approval and who is acceptable to the CAA for the demonstration of compliance are subjects that are influenced by many variables, which cannot be comprehensively addressed in a guide such as this CAP. Therefore, anyone wishing to approve the design of an aircraft intended for amateur construction via the CAA is strongly advised to make contact with the Design and Production Standards Department as early as is possible. The purpose of the contact is for you to determine the basis of the approval and who is acceptable to us (Levels 1 to 4 of Table A1-2) for demonstration of compliance. At the conclusion of your discussions with us on these matters, ensure you obtain a formal written notification of the approval basis and those persons acceptable before you commence the compliance demonstration process.

3 Basis of Approval

3.1 If you have decided not to follow the BMAA or PFA route then your first action must be to contact the Design and Production Standards Department in order to establish which one of the CAP 553 - BCAR Section A, Chapter A3-7, paragraphs 3.1 a) or c) is applicable to your project. Namely:

a) that the aircraft is of a design that satisfies a code of airworthiness requirements agreed by the CAA as being suitable for the purpose; or

b) that the aircraft has satisfied a standard notified for the purpose by the CAA, or by a person suitably approved by the CAA.

3.2 If the aircraft originates from a foreign country whose standards are acceptable to us and it has been approved by them then we may base our approval on that country's approval providing they have followed a process similar to one we would follow for any design originating in the UK. Which means that sub paragraph c) will most likely apply in this case.

At one time under this route we used to accept service experience (accident and incident records) as a means of assessing the achieved airworthiness of kit and plans built aircraft. But our experience has shown that this method is not as foolproof as we would wish, hence it is no longer an option in its own right for accepting a complete aircraft.

3.3 If neither of the above routes is open to you then sub paragraph a) will most likely apply. Realistically this is the most likely route that will be followed for the majority of aircraft we are asked to approve.

4 Setting a Basis of Approval

Setting a basis of approval can be a complex affair. Figure 1 below demonstrates the methodology used in determining the basis of approval. The principal is that the simplest airworthiness code appropriate to the type of aircraft under consideration is used (See Table 1 below). Where the aircraft has complex or novel features, is aerobatic, or has a high performance or unusual capability, the application of additional requirements or special conditions to assure airworthiness may be necessary.

Where appropriate, the additional requirements should be taken from the published aircraft codes. In some cases, the level of complexity, performance or capability may necessitate the application of most or all of the requirements appropriate to the aircraft type that would be used for granting of a Type Certificate. If parts of another airworthiness code are used to supplement the one being used then a cautionary approach needs to be taken as many of the requirements in an airworthiness code have a degree of interdependence, which can result in a reduced level of safety if not respected.

If the aircraft has 3 or 4 seats, including that of the pilot, then an engine and propeller that are type certified or approved by an alternative equivalent means will have to be used with it.

Table 1 Applicable Certification Codes

Code	Title	Applicability
BCAR Section S[1]	Small Light Aeroplanes	Single seat aeroplanes not exceeding 300 kg MTWA; and two seat aeroplanes (including the pilot's seat) and not exceeding 450 kg MTWA. Wing loading less than 25 kg/sq metre or, for higher wing loadings a stall speed not exceeding 35 knots.
CS VLA	Very Light Aeroplanes	Aeroplanes of two seats or less including the pilot's seat and not exceeding 750 kg MTWA. Stall speed not exceeding 45 knots.
CS 22	Sailplanes and Powered Sailplanes	Sailplanes of two seats or less including the pilot's seat and not exceeding 750 kg MTWA. Powered Sailplanes of two seats or less including the pilot's seat and not exceeding 850 kg MTWA.

Table 1 Applicable Certification Codes

Code	Title	Applicability
CS 23	Normal, Utility, Aerobatic and Commuter Category Aeroplanes.	Normal, Utility, and Aerobatic Category Aeroplanes of 9 seats or less excluding the pilot and not exceeding 5670 kg MTWA. Stall speed not exceeding 61 knots. Commuter Category Aeroplanes: Propeller driven twins of 19 seats or less excluding the pilot and not exceeding 8618 kg MTWA.
BCAR Section T[1]	Light Gyroplanes	Gyroplanes of two seats or less including the pilot's seat and not exceeding 600 kg MTWA.
BCAR Section VLH[1]	Very Light Helicopters	Helicopters of two seats or less including the pilot's seat and not exceeding 750 kg MTWA.
CS VLR	Very Light Rotorcraft	Helicopters of two seats or less including the pilot's seat and not exceeding 600 kg MTWA. (**NOTE:** The weight limit is in process of being increased to 750 kg.)
CS 27	Small Rotorcraft	Helicopters and gyroplanes of 9 seats or less excluding the pilot and not exceeding 3175 kg MTWA.

1. Aircraft approved to these codes are only ever eligible for the award of a Permit to Fly.

5 Demonstrating Compliance with the Basis of Approval

Once we have set the basis of approval you will need to demonstrate compliance with it. A number of approaches to the demonstration of compliance can be used for aircraft intended for amateur construction. For untried designs the CAA will require a full demonstration of compliance against the requirements. Analysis and test will be the necessary means for the demonstration for many of them. However, for many of the system installation requirements physical inspection and/or simplified testing can be used. For imported kits and designs that have a verified satisfactory service experience then some further alleviation in the means of compliance can be permitted.

Using service experience as an alternative is a concession granted by us, and is one way of reducing costs. Nevertheless all methods of compliance need to be discussed and agreed with us before they are used.

Health Warning!

Demonstration of compliance with the UK basis of approval is the responsibility of the applicant for the Permit to Fly, however this will not be possible without the active co-operation of the aircraft designer. Only the original designer has the necessary knowledge and understanding of the design that will be required to answer the fundamental technical questions posed by the airworthiness requirements contained in the basis of approval.

If you do find yourself in the position of fronting an approval exercise for an aircraft designer or kit manufacturer be careful about who pays our fees. You could find yourself in the position of having made all the investment. Once the approval has been granted the aircraft designer or kit manufacturer benefits from you having opened up a market for him at your expense. He reaps the reward whilst you are forgotten by him and left out of pocket.

Many amateur built aircraft emanating from abroad are not designed to comply with any code of airworthiness requirements and therefore may be incapable of being cleared in the UK. Alternatively, they may require considerable modification action or the imposition of operational limitations in order to achieve an approvable standard.

6 Using Service Experience

Using service experience as formal means of compliance is aimed at specific aspects of a design and relates to a rigorous investigation of that experience against individual paragraphs of the requirements. Service experience obviously is only applicable to products that have been or currently are in service; and where a UK approval exercise is concerned then by definition the products must have flown on a foreign register.

For service experience to be eligible for consideration, certain criteria have to be satisfied which includes:

a) adequate number of flying hours;

b) sensible fleet size;

c) minimum number of hours for the fleet leaders;

d) knowledge of the operational, maintenance and overhaul environments that the claimed service experience is relevant to;

e) knowledge of all fatal accidents and the causes there off;

f) knowledge of all airworthiness directives issued and the reasons for them.;

g) knowledge of and causes of all significant defects, and any associated airworthiness campaigns;

h) mean time between failures for all major components and the reasons for those failures;

i) knowledge of component and airframe overhaul histories and any significant trends; and

j) knowledge of individual maintenance histories.

Naturally not all of the above applies to every case, a common sense approach has to be taken. Of course the service experience must be provided by the aircraft's designers or kit manufacturer and be verified; and if possible the Airworthiness Authority in whose country the designer and manufacture resides should make the verification.

The areas where service experience may be appropriate as an alternative means of compliance are analysis and test of simple/conventional structures, landing gear analysis and test, transmission and rotor endurance testing and the testing of fuel and other systems. However, the areas where alleviation by service experience or any other means will not be entertained are flight handling and performance. Full and rigorous analysis, test and demonstration will be expected.

As stated above, an adequate number of flying hours must have been flown and a sensible fleet size must exist, with a minimum number of hours for the fleet leaders. As an example, if 5000 hours fleet usage is required as a minimum to satisfy a specific requirement, then 250 aircraft having flown 20 hours each is clearly unacceptable. So too is one example having flown all of the 5000 hours. What may constitute an acceptable mix could be say, 4 fleet leaders at 750 hours each and a further 8 examples making up the remaining 2000 hours.

7 Who is Acceptable to the CAA to Show Compliance with the Basis of Approval?

Naturally only knowledgeable persons will have the capabilities, background and experience required in order to show compliance with the basis of approval. For Type Certificated aircraft this objective is achieved through the medium of organisations approved in accordance with EU Regulation No.1702/2003 Annex, Part 21 sub-part J, Design Organisation Approval, and sub-part G production Organisation Approval. As amateur built aircraft fall under Annex II of EU Regulation No. 1592/2002 then Part 21 DOA and POA is not necessarily relevant. Nevertheless, the CAA is in the process of developing BCAR A8-21 which is due for publication in 2006/7. It will deal with the subject of DOA and POA for all classifications of Annex II aircraft that fall under its jurisdiction and thus will be applicable to all UK registered amateur built aircraft.

Having said all of that we are aware of the need to minimise the regulatory burden when dealing with genuine amateur one-off build projects. Demanding a formal DOA (and POA) is over bureaucratic for most cases. Therefore, as a guideline, we will consider a defined group of specialists, approved by CAA, with specified responsibilities, but without a raft of formal procedures as being acceptable under some circumstances as detailed in Table 2. The level of organisation appropriate to any particular aircraft is entirely dependent on the complexity of the design. For a simple wood and fabric non-aerobatic aeroplane, Level 1 would be appropriate, whereas as Level 3 is more likely to be appropriate for a helicopter.

Table 2 Persons and Organisations Acceptable to the CAA for Demonstrating Compliance with the Basis of Approval

Level	Description
1.	Individual designer covering all aspects.
2.	Individual with specialist consultation on particular aspects.
3.	Defined group of specialists ("Project Group"), with specified responsibilities (and composites related procedures if appropriate), with the group reviewed and formally accepted by CAA for the purpose, but without formal type support procedures expected of formal DOA.
4.	Design too complex to qualify for levels 1, 2 or 3 so a formal design organisation approval (BCAR A8-21 DOA) will be required.

The above table is equally applicable to aircraft of non-UK origin intended for amateur construction.

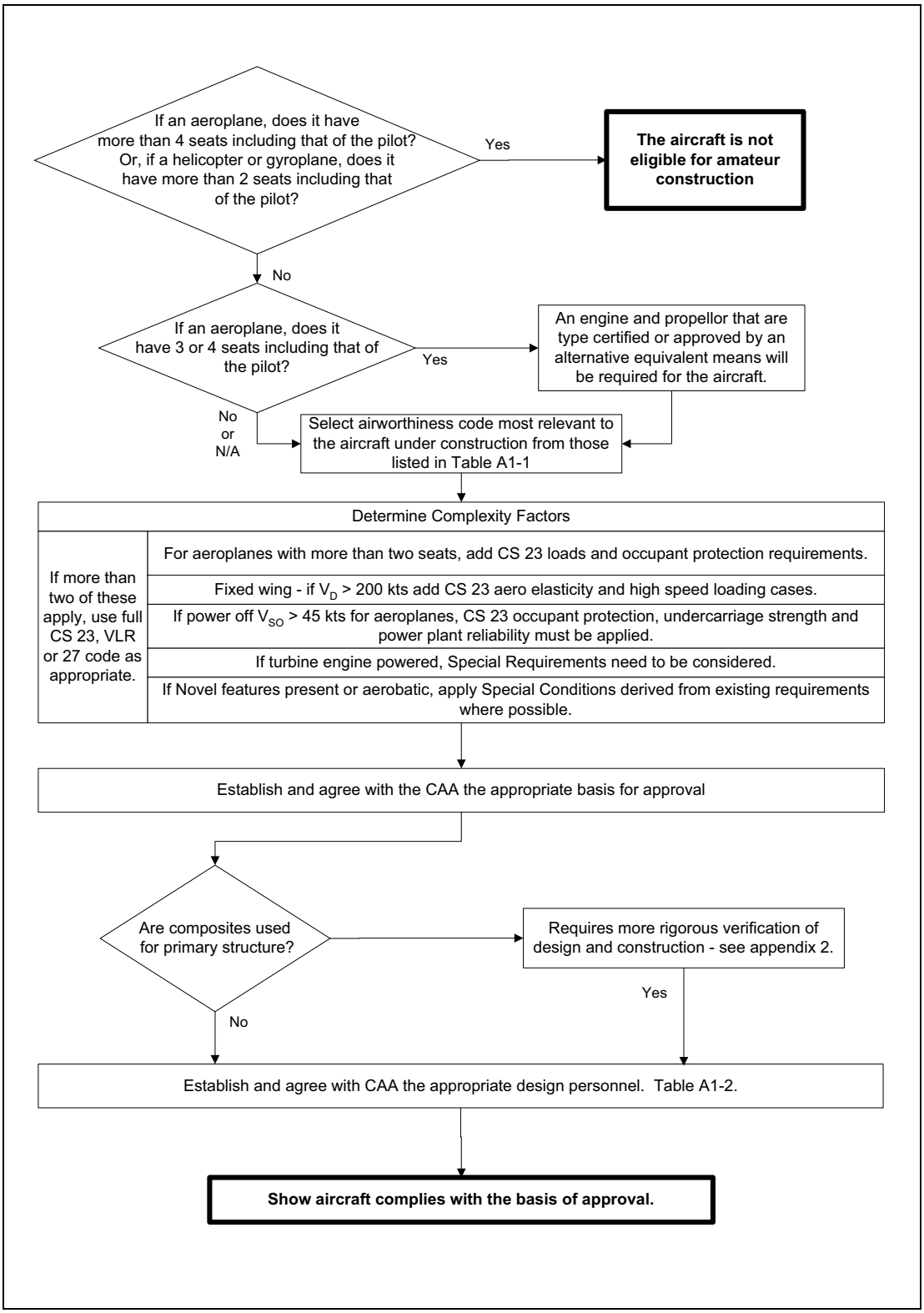
If an aeroplane, does it have more than 4 seats including that of the pilot? Or, if a helicopter or gyroplane, does it have more than 2 seats including that of the pilot?
Yes
The aircraft is not eligible for amateur construction
No
If an aeroplane, does it have 3 or 4 seats including that of the pilot?
Yes
An engine and propellor that are type certified or approved by an alternative equivalent means will be required for the aircraft.
No or N/A
Select airworthiness code most relevant to the aircraft under construction from those listed in Table A1-1
Determine Complexity Factors
If more than two of these apply, use full CS 23, VLR or 27 code as appropriate.
For aeroplanes with more than two seats, add CS 23 loads and occupant protection requirements.
Fixed wing - if V_D > 200 kts add CS 23 aero elasticity and high speed loading cases.
If power off V_{SO} > 45 kts for aeroplanes, CS 23 occupant protection, undercarriage strength and power plant reliability must be applied.
If turbine engine powered, Special Requirements need to be considered.
If Novel features present or aerobatic, apply Special Conditions derived from existing requirements where possible.
Establish and agree with the CAA the appropriate basis for approval
Are composites used for primary structure?
Requires more rigorous verification of design and construction - see appendix 2.
Yes
No
Establish and agree with CAA the appropriate design personnel. Table A1-2.
Show aircraft complies with the basis of approval.

Figure 1

Appendix 2 Approval of the Design and Manufacture of Composite Structures

1 Introduction

In order to minimise the material variability, strict design and process controls have to be applied to all stages of the manufacture of composite structures. The text that follows is a succinct but comprehensive review of those controls.

Obviously not all of the controls listed will be applicable to the simpler types of hand lay up air drying composite systems employed for home use. Nevertheless they will be applicable to complex factory based processes, possibly used in the manufacture of components for kit aircraft. Therefore, the list should be tailored as appropriate to suit the applications under consideration.

2 Design of Composite Structures

During the design approval process for the composite aircraft, the following points will have to be taken into consideration.

a) As required by Appendix 1, a substantiation of the airworthiness of the key structural components of the aircraft must be provided that takes into account the methods of manufacture and the materials used in its construction.

b) The strength substantiation should rationally or conservatively address material degradation due to the effects of temperature and moisture.

c) The material allowable's used in the substantiation should be established from tests or be conservatively based on manufacturers data using additional factors to address variability in build quality and the requirements of b) above.

d) Full scale test evidence to ultimate load is required in support of these substantiations for any key component for which strain levels are greater than those provided in Table 1 below, or where there are questionable or novel design details. The construction of the test specimen must be shown to be representative of the actual materials and construction process to be used in the applicant's aircraft.

Table 1

Material Used	Maximum Strain under ultimate load conditions for the critical failure mode.
Unidirectional Glass in epoxy resin	5,000 micro strain
Unidirectional Carbon fibre in epoxy resin	2,500 micro strain

Further guidance on certification/approval methodologies for composite structures applicable to small aircraft can be found in FAA Technical Document, "Composite Certification Roadmap" produced by the Standards Office of the FAA's Small Aeroplane Directorate.

3 Some Factors Affecting the Strength and Integrity of Composite Structures

3.1 As stated in the introduction to this appendix, because the manufacture of both material and component takes place at the same time, the variability in material properties is substantially greater than for many other material types. Whilst this may be of little consequence for non-load bearing items such as fairings, covers, instrument panel comings etc it is certainly of vital importance where primary (load bearing) structures are concerned. Some of the issues that can give rise to "built in at manufacture" losses of strength are:

a) Incorrect sequencing and orientation of plies;

b) Linear distortion of plies i.e. not running straight;

c) Sharp changes of section within plies, e.g., when embedding a metallic component such as a wing root fitting;

d) Incorrect mixing of resin systems;

e) Too much or too little resin used during lay up;

f) Use of out-dated resin systems and other materials;

g) Improper humidity and temperature control during lay up and curing. This applies equally to the simple hand lay up systems as well as the more sophisticated pre-impregnated material cured in an autoclave; and

h) Poor or no bonding leading to dry plies and voids, caused by trapped pockets of air due to poor lay up techniques or insufficient quantities of resin applied. This type of problem will also be caused by the entrapment of dirt, swarf, grease, chemicals, moisture, etc that will have contaminated the plies as a result of poor storage, handling, preparation and cutting facilities and fabrication environment.

3.2 CAP 562 - Civil Aircraft Airworthiness and Inspection Procedures, Leaflet 6-9 - Inspection of Composite Structures provides further information on defects common to composite structures and how to detect them.

4 Manufacture of Composite Structures

Given that there is considerable potential for building in defects to composite structures that will seriously degrade their strength, then rigorous manufacturing process controls will have to be applied. For aircraft, sub-assemblies and components constructed from composite materials under conditions and procedures monitored by the CAA, or by an organisation approved by the CAA for that purpose, the following apply:

a) A quality plan addressing the workshop environment must be produced that takes into account the issues listed in Table 2 that are **appropriate** to the process being used and the type of structure being manufactured (or repaired) i.e. load bearing or otherwise;

b) An audit of the workshop environment will be conducted by the RO Surveyor (or by a delegated organisation) using Table 2 as guidance. Depending on the type of manufacture being undertaken the RO Surveyor may be accompanied by a Surveyor from the CAA's Structures and Materials Department;

c) Detailed records of the construction process and evidence of adherence to controls agreed with the CAA's Surveyors must be kept; and

d) Evidence will be required that material properties achieved in the construction support those required by the design substantiation. This may be achieved by the provision of a limited number of test results from detailed test specimens produced in conjunction with the aircraft build.

For aircraft, sub-assemblies and components constructed from composite materials under conditions and procedures that have not been monitored by the CAA (or by a delegated organisation), you will be required to provide information that establishes an equivalent level of confidence defined by sub-paragraphs a) to d) above for those items. Therefore it follows that, unless detailed records are kept of the aircraft construction and the workshop environment, there is little possibility that we will be able to accept aircraft or aircraft parts constructed from composite materials that have been manufactured outside of the UK regulatory regime.

Table 2 Composite Material Checklist for Amateur Built Aircraft

Subject Area		Issue/Question
Material Supply and Storage	**1**	Is there control of materials in the workshop that ensures only those intended for aircraft build are available to the constructor?
	2	Is there sufficient formal identification of material? **i.e. Material ID, lot no., batch no., roll no., date manufactured, lab. report refs.**
	3	Do personnel understand environmentally sensitive materials? Have they been trained?
	4	Do they have, and action, instructions for handling the arrival of such materials?
	5	Is re-lifed material accepted? If so, in accordance with what instructions?
	6	Are material specification sheets, or equivalent, available for handling/storage reference, etc?
	7	Are travelling temperature recorders required? If so, how are they managed?
	8	Are materials split and/or kitted? If so, in accordance with what instructions?
	9	Are split/kitted materials clearly traceable to material batch numbers?
	10	Are out time sheets or equivalent produced for every item?
	11	Are bagging instructions and equipment available?
	12	What incoming material sampling instructions are being followed? **The number of samples, and methods, are generally used to confirm material identification and condition. The details vary and are a function of downstream process control, inspection, and testing.**
	13	Are samples clearly identified?
	14	Is honeycomb material stored with minimal stacking in a suitable dry dust free environment?

Table 2 Composite Material Checklist for Amateur Built Aircraft

Subject Area		Issue/Question
Freezers	**1**	How many freezers are on the site? **Identify all of them, their locations, and their functions, e.g. temperatures bands etc. Typically storage temps are room temp, 0C and -18C.**
	2	Is there a quarantine freezer/freezer area and/or are quarantined materials clearly identified?
	3	Are freezer temperatures recorded, reviewed, and stored?
	4	Is the freezer alarmed? **A method to record down time is required if people are not immediately informed of problem.**
	5	How are material lives managed following freezer failure? **Out time equivalent to failure duration should be subtracted from total out time available.**
	6	Are materials stored such that damage is minimised, e.g. limitations on stacking etc? **Careful stacking restrictions are important for film adhesives.**
	7	Do all materials have a freezer inventory card? **This should include ID, date received, batch no. roll no., freezer ID, and clear in and out date and time records.**
	8	Are rebagging instructions available? Most matrix systems & prepregs should be stored sealed.
	9	Are all bags sealed properly in the freezer?
	10	Are clear thawing instructions available that account for differing thermal masses etc? **Typically, a thin tape may require min. 2hrs at room temperature, whilst a roll may require 24hrs. Thawing time is necessary before breaking the seal to avoid risk of condensation contamination.**
	11	Is a clearly marked, and environmentally acceptable, area allocated for thawing?
	12	Are kits clearly identified and traceable back to incoming batch materials?
	13	Have out times been correctly tracked for kits?
Cutting	**1**	What cutting methods are being used? **Check equipment tolerances against drawing requirements, control of material orientation, and identification of ply numbers etc.**
	2	If templates are used, are they identified, maintained, and is orientation in use controlled?
	3	Are materials cut with any unprotected surfaces, i.e. no backing paper etc? **If so, check cleanliness - clean room environment, gloves etc.**

Table 2 Composite Material Checklist for Amateur Built Aircraft

Subject Area		Issue/Question
Tooling	**1**	Are tools clearly identified?
	2	Are they maintained? If not, then ensure that a visual inspection is completed before every use. Is acceptable/ unacceptable damage clearly understood?
	3	Are thermocouples to be attached to the tool? If so, are locations with respect to monitor channels clear?
	4	Do tools of differing materials (differing thermal mass) exist for any particular form? **If so, ensure that this has been accounted for in the cure cycle, autoclave loading etc.**
	5	What cleaning methods have been used? **An MEK, or equivalent (ketone, toluene, acetone), wipe is usually used. However, abrasive methods may have been used, e.g. glass bead.**
	6	What release agents are applied?
	7	Does the mould/part use an external release agent? If so, is it an approved material combination? **NOTE:** some matrices have a release agent within the formulation. Some release agents may react with future production steps and/or degrade the matrix.
	8	If the agent leaves the mould with the part, what further part cleaning is required? **NOTE:** t Plastic film may also be used as release material, e.g. FEP, TFE, PVA, Dacron etc
	9	Are there adequate numbers of vacuum ports? Are they sensibly located to ensure uniform pull down without leaving isolated/trapped pockets?
	10	Are tools stored in a relatively clean location that does not require excessive stacking etc?
	11	Is tooling clearly identifiable so as to avoid similar parts being interchanged by mistake?
Lay-Up Area	**1**	Does lay-up area have monitored and/or controlled and recorded environment, e.g. temperature, humidity, positive pressure, particulate count? If so, are the acceptable limits clearly defined and obvious to the inspector? If so, are the appropriate actions detailed should the limits be exceeded? **NOTE:** Typical temp: Humidity range is 65F RH63% - 75F RH46%
	2	Is the workshop clean and cleaned regularly?
	3	Is the assembly area remote with respect to other potentially contaminating activities, e.g. painting, machining etc?
	4	Are clean gloves, overshoes, and hair protection used in the assembly area?

Table 2 Composite Material Checklist for Amateur Built Aircraft

Subject Area		Issue/Question
	5	Is adequate equipment available to reduce the need to move it into/out of the clean area?
	6	Are the floors sealed and clean?
	7	Are airflow sources remote from contamination sources, e.g. kitchen vents etc?
	8	Is lighting adequate for the job?
	9	Is lay-up area adequately close to the materials sources and the autoclaves, ovens etc? **The risk of contamination and/or damage to the part, bag etc. should be minimised.**
	10	Is scrap clearly segregated?
Lay-Up	**1**	Are drawings, instructions etc. agreed to be in accordance with the basis upon which the design is being approved?
	2	How are ply orientations identified on the material and in drawings? **NOTE:** Different conventions exist, so check for understanding of personnel involved.
	3	Is a staged process required (thicker parts in particular)? If so, are stages well defined? **NOTE:** Typical staging may include heat applications to 150F for 20-30mins under vacuum.
	4	Do personnel ensure that no backing materials have been left in the part, e.g. backing count?
	5	Are samples required; if so, what instructions are they prepared in accordance with? **NOTE:** Somewhere in the process there should be representative mechanical tests to confirm correct lay-up and/or cure.
	6	For wet lay-up, are epoxy materials weighed and mixed in accordance with clear instruction?
	7	How is matrix material distributed through the fibres, e.g. squeegee, roller etc.?
	8	Are available working periods for the material defined and understood?
	9	What release materials are being used, e.g. Tedlar tape? Is it being used correctly?
	10	What measures are taken to avoid release material cross contamination? **No silicon sealant should be used local to any bonding surfaces.**

Table 2 Composite Material Checklist for Amateur Built Aircraft

Subject Area		Issue/Question
Bagging	**1**	Are bagging, bleed, and breathe material configurations identified and prepared? **Typical disposable bag materials include nylon or Kapton polymide film. If reusable bags are used, then check cleaning and damage inspection procedures. Typical bag sealers include Zinc Chromate Sealing Compound, Butyl Tape, GS43 etc.**
	2	Are defined caul plates to be used? **Caul plates may be used for profiling and/or thermal mass. A change of plate, which easily may happen in production environment, may not have considered both issues.**
	3	Are thermocouple and vacuum port locations clearly defined and channels identified? **Check that vacuum and thermocouple entry points to bag are sealed properly.** **Are the parts suitably protected from the vacuum ports, e.g. using layers of padding? Enough vacuum ports should be used to avoid airtraps - complex parts are most vulnerable.**
	4	Is equipment calibrated and are dials scaled to allow necessary finesse when reading?
Autoclave Cure	**1**	Is the cure cycle clearly defined?
	2	Are vacuum and thermocouple channels matched with the parts?
	3	Is there a clear understanding of the way to manage and consequences of failure of vacuum and /or thermocouples during cure?
	4	Are acceptable cure parameter limits defined, e.g. temperature, vacuum, time, heat rate etc, and are they evident to the operator? **Check against specification.**
	5	Are records kept of each cure cycle applied to a component?
	6	Is the oven assisted by vacuum applied to the bagged part? **Parts cured without vacuum assistance are likely to be poor and of inconsistent quality.**
Other Cure Methods	**1**	For all cure methods there should be validation of the method (first articles etc), and a means to ensure repeatability, and calibration and heat surveys as applicable.
E.G. Light Oven		**For example take a careful look at light bank heated ovens and the associated parts and surveys. Control of the light bank positions should be clearly controlled for each job.**
Debagging & Trimming	**1**	Are cooling temperatures, rates, and times clearly defined and followed? **Failure to follow the guidance can result in deformation and failure of the part.**

Table 2 Composite Material Checklist for Amateur Built Aircraft

Subject Area		Issue/Question
	2	Are the tools used for debagging and trimming fully defined and available? **It is important to use the correct tools, e.g. use of an incorrect drill, router, grinder and/or operating speeds may result in blind side fibre break out and delamination.**
	3	Have the samples been clearly identified?
	4	Does clear guidance exist regarding transportation of the part? **Are these instructions followed?**
	5	Are items requiring further curing suitably stored with all future bond surfaces protected?
	6	Are completed parts suitably stored prior to inspection, painting etc.?
Inspection	**1**	Are there defined inspection methods and allowable's?
	2	How are these methods validated?
	3	Is the lighting adequate to complete the called inspections?
	4	Are there sufficient inspections planned to address the various stages of construction?
	5	Are the inspection techniques appropriate to the complexity of the construction?
	6	Is all equipment calibrated, and are appropriate reference materials available?
	7	Have production methods allowed production to drawing requirements, e.g. edge margins etc.?
	8	Are test samples representative of the aircraft components?
Personnel	**1**	Cleanliness - are hand washing facilities, eating facilities, smoking areas, etc remote from sensitive areas? Are approved barrier creams in use?
	2	Clothing - are lint free gloves, overalls, and hair protection required and in use?
	3	Do personnel appear competent in performing the tasks they are completing?
	4	Are personnel aware of what would be an unacceptable standard of workmanship?
	5	Do personnel notify potential quality issues or deviations to all responsible parties?
	6	Is there a means by which deviations can be substantiated?

Appendix 3 Commercial Assistance During the Construction of an Amateur Built Aircraft

1 Introduction

This appendix provides information and guidance on what constitutes acceptable practices and levels of involvement with respect to commercial assistance provided to constructors of amateur built aircraft. The information is relevant to builders of aircraft fabricated from either plans or kits intended for approval as amateur built, manufacture of kits designed to be assembled into aircraft by amateur-builders, and persons providing assistance to amateur builders.

2 Background

EU Regulation 1592/2002 Annex II paragraph (c) defines an amateur built aircraft as an aircraft of which at least 51% is built by an amateur, or a non-profit association of amateurs, for their own purposes and without any commercial objective.

'At least 51% is built by an amateur' is colloquially known as 'the 51% rule' and for reasons of brevity, this colloquialism has been used through out this CAP.

'Own purposes' is generally understood to mean for the **education and recreation of the constructors**.

In respect of the above, the CAA, in association with the BMAA and the PFA, has identified a need to address the practice of fabrication and assembly of amateur built aircraft for profit (see this Appendix and Appendix 4).

3 Consistency of Approach by the CAA

In order to approach the issue of commercial assistance in a consistent manner all aircraft kits, and plans built aircraft will be subjected to a systematic evaluation, using the checklist detailed in Appendix 4 of this CAP to ensure that the intent and spirit of the 51% rule has not been violated.

Where this CAP is concerned, the concept of commercial assistance is restricted to assistance with the physical activities necessary to fabricate the aircraft. Payment of compensation to the Licensed Engineer assigned to the project in respect of his supervisory and administrative duties is not considered commercial assistance, and neither is compensation paid to persons for undertaking design services, certification/ approval investigations and flight test work in support of the issue of a Permit to Fly for the aircraft.

4 Obtaining Commercial Assistance

There is nothing to stop an amateur builder from obtaining commercial assistance with the construction of his aircraft providing the finished product does not violate the 51% rule. Indeed, in some instances it would be the sensible course of action where a specific task is critical to the safety of the aircraft, and the constructor does not posses the requisite specialist skills or equipment in order to produce an adequate result. Examples for consideration are the welding of wing struts, heat treatment of material before and after forming, and complex machining. But do bear in mind that

this work will still need to be signed off by your licensed engineer and inspected by your CAA Regional Office Surveyor.

In order to satisfy this safety objective a Kit Manufacturer may supply critical items in a partially or completely fabricated state. To do so will be classed as commercial assistance, except in the case of partially completed items where the amateur builder undertakes 51% or more of the required operations, fabrication and or labour effort himself in order to complete them, excluding painting and trimming.

Construction of the aircraft in a commercially run Builder Centre will not be classed as commercial assistance provided that the constructor does the work himself and the finished product is compliant with the 51% rule. One of the advantages of using a Builder Centre is that specialist tooling and equipment along with expert advice will normally be available, and if used properly should result in a safer product.

The amateur builder, in the fabrication of specific parts or assembly and the completion of certain tasks or processes involved in the construction of the aircraft, may obtain commercial instructional assistance. The instruction may be obtained in a Builder Centre or through individual arrangements with a third party, including the Licensed Engineer overseeing the project. During all instructional activity, the amateur-builder must be present to accomplish the tasks himself and all subsequent fabrication and assembly of parts for which commercial instruction is being rendered.

Tasks completed by the amateur-builder would be identified in the Appendix 4 check-list (or in the assembly manual) under AMATEUR. For example, assume fabrication of the wing ribs is listed on the checklist or in the assembly manual as a task that the amateur-builder is required to complete. Instructional activity could be provided to build the first few ribs with the remainder to be completed by the amateur-builder.

The amateur-builder is not expected to have fabricated every component that makes up the completed aircraft. Non-checklist items include the fabrication of the engines, propellers, wheels and brake assemblies, and standard aircraft hardware. The builder may be required to accomplish installation of these items if they are checked in the AMATEUR column of the checklist.

Commercial assistance may be obtained for non-checklist items on a kit that has been evaluated by the CAA. A non-checklist item is a task or process that is not listed in the checklist. These items also include painting and the installation of interior upholstery or avionics beyond basic regulatory requirements. Such a task or process would not be required to be personally completed by the amateur-builder for the aircraft to be eligible for a Permit to Fly.

5 Commercial Assistance on Incomplete Aircraft

Commercial assistance does not include the instance where a partially completed aircraft is sold to another builder and the second or subsequent builder completes the aircraft. In such a case, the work performed by the first builder will count toward completion under the 51% rule by the second builder. The second or subsequent builder should obtain as much detailed information and documentation, e.g., logbooks, material receipts, pictures, etc., from the original builder as possible. This information will be helpful in the CAA's determination of compliance with the 51% rule requirement for the aircraft.

Appendix 4 Evaluation of Amateur Built Aircraft for Compliance with the 51% Rule

1 Introduction

Before a Permit to Fly can be issued to an amateur constructed aircraft the aircraft must be formally evaluated to show that it is compliant with EU Regulation No.1592/ 2002 Annex II paragraph (c), the 51% rule. This is achieved by assessing who actually undertook the manufacturing activities. The assessment is made by using the formal checklist to be found at the end of this appendix.

2 Evaluation of Aircraft Kits

Aircraft kits will be initially evaluated by the Certification and Approvals Department of the CAA's Design and Production Standards Division (DPSD), or the BMAA or PFA on the CAA's behalf. Aircraft kit manufacturers should submit a letter to the CAA DPSD at Gatwick, the BMAA or PFA requesting a kit evaluation. The purpose of the evaluation is to determine if the completed aircraft is capable of meeting the 51% rule.

The kit is evaluated by means of a physical inspection using the checklist found at the end of this appendix. If it is found to comply with the 51% rule a Letter of Eligibility is sent by the organisation who conducted the evaluation to the kit manufacturer. The kit is then acceptable and will be included in the Listing of Eligible Amateur Built Aircraft Kits. The BMAA or PFA will have to submit a copy of their Letter of Eligibility for the kits they have evaluated to the CAA's DPSD before they can be added to the listing.

The listing is published by the CAA's DPSD through the internet site at www.caa.co.uk. The purpose of the listing is to assist Amateur Builders, Licensed Engineers, CAA Surveyors and the BMAA and PFA by eliminating the duplication of evaluations for the 51% rule determination. However, the letter SHOULD NOT be construed to mean the kit or its manufacturer is CAA, BMAA or PFA certified, certificated, or approved, and it is not appropriate to represent it as such.

If the kit is of foreign origin and has previously been evaluated by the Airworthiness Authority of the country of origin of the kit, then the CAA may accept that Airworthiness Authority's Letter of Eligibility as being acceptable for its own purposes. This will only be acceptable if the Airworthiness Authority is acceptable to the CAA and the evaluation was conducted in accordance with Appendix 4 of this CAP, or FAA AC20-139 using FAA Form 8000-38. In this instance, the Kit Manufacturer should request the relevant Airworthiness Authority to write to the CAA requesting UK validation of its own Letter of Eligibility. A certified copy of its own Letter of Eligibility, plus a certified copy of the evaluation checklist and a statement of which of the above processes was used should be included with the validation request. If we are satisfied with the submitted Letter of Eligibility, we will add the kit to the UK listing without further showing.

If the kit manufacturer later offers an option or makes changes to the kit that decreases the amount of fabrication and assembly required by the builder, the manufacturer should request a new Letter of Eligibility. The kit manufacturer would provide a revised checklist and a description of the option or change to the CAA, BMAA or PFA as appropriate with drawings and/or photographs as necessary. If the

appropriate organisation determines that the revised kit still meets the 51% rule, it will issue a new Letter of Eligibility for the amended checklist without conducting a physical inspection or complete re-evaluation of the kit. If the appropriate organisation determines that the option or change is of sufficient magnitude, a physical inspection and revaluation of the kit will be performed.

3 Completed Kit-Built and Plans-Built Aircraft

For individual completed kit built and plans built aircraft, the RO Surveyor will undertake the evaluation as necessary before issuing the initial Permit to Fly. If the aircraft fails the evaluation then a Permit to Fly will be refused.

When a kit has been evaluated and published in the listing of eligible amateur built aircraft kits, and no commercial assistance was used in the construction of the aircraft using the evaluated kit, the RO Surveyor will not be required to make another 51% rule determination for the completed aircraft.

During final inspection for compliance with the 51% rule a plans-built aircraft must be evaluated using the form at the end of this appendix as a guide. If the builder intends to utilise commercial assistance, the form at the end of this appendix can be submitted to the RO Surveyor before construction, listing the tasks or processes for which commercial assistance is proposed. It should also show the intended fabrication and assembly tasks the builder will perform. On the basis of this pre-construction checklist, a builder of a plans-built aircraft should be able to obtain an evaluation in writing from the RO Surveyor of the effect that the proposed commercial assistance will have on the 51% rule for the completed aircraft.

A person may provide commercial assistance to a builder of a plans built aircraft or un-evaluated kit. This assistance or task must be listed in the KIT MANUFACTURER column on the checklist when the completed aircraft is presented for evaluation/ approval to the RO Surveyor.

4 Commercial Assistance not Requiring Re-Evaluation of the Completed Aircraft

Certain types of commercial assistance are acceptable and will not adversely affect compliance with the 51% rule. Acceptable forms of commercial assistance are described in Appendix 3, paragraph 3.

5 Commercial Assistance Requiring Re-evaluation of the Completed Aircraft

If commercial assistance other than that described in Appendix 3, paragraph 3 is performed on the items listed in the checklist under AMATEUR on a evaluated kit, the CAA accepted 51% rule evaluation previously performed will be invalid for that specific aircraft project. Consequently, it may result in a complete re-evaluation of the fabrication and assembly of that aircraft. This could put the amateur built status of the aircraft in jeopardy. In other words, the aircraft will be treated as a non-evaluated kit and subject to complete evaluation by the CAA when presented for issue of a Permit to Fly as an amateur built aircraft. The builder should obtain a pre-construction evaluation of proposed commercial assistance in writing from the RO Surveyor to preclude approval problems at the completion of a project.

6 Non-Evaluated Kit Aircraft

An aircraft constructed from a non-evaluated kit must be evaluated upon completion for compliance with EU Regulation No. 1592/2002 Annex II paragraph (c), the 51% rule, by the RO Surveyor. When conducting the evaluation the RO Surveyor will use the procedures in this Appendix 4 as a guide.

7 Information Supplied by Industry to Prospective Customers

Kit manufacturers are encouraged to include a document explaining the intent and purpose of EU Regulation No. 1592/2002 Annex II paragraph (c), the 51% rule, in their information packages. Prospective customers would then be made aware of their responsibility and limitations under the EU Regulation. The information package should summarise the process used to determine kit eligibility and the inspection of the completed aircraft. Additionally, the customer should be advised of the need for and the availability of flight training, as well as the value of participation in the PFA's Pilot Coaching Scheme.

8 Information Supplied by Industry to Purchasers

Kit manufacturers are encouraged to include a copy of the amateur built regulation and to remind the purchaser that they will be fabricating and assembling the aircraft for their own educational or recreational purposes. In addition to the aircraft assembly manual, the kit manufacturer should reference this CAP regarding acceptable commercial assistance and the use of a builder centre for help and instruction during construction of an aircraft. The manufacturer should inform purchasers of the help available to them through the various organisations associated with sports aviation.

Appendix 4, Annex A - Instructions for the Fabrication/Assembly Operation Checklist

1 Purpose

This appendix provides instructions for completing the sample form detailed in Figure 1 below.

2 Guidance

This form may be used by any person to establish the eligibility of an aircraft in order for it to qualify for a Permit to Fly as an amateur built aircraft.

Prepare the form as follows:

a) For an aircraft under construction enter the registration, constructors serial number and appropriate Airworthiness Approval Number (AAN) or HADS as appropriate.

b) Enter the aircraft make and model by name or number.

c) Enter whether kit or plans built.

d) Enter the type of aircraft, e.g. Fixed Wing Landplane, Helicopter, Microlight etc.

e) Enter the document name and date, e.g. Master drawing list, assembly manual etc with latest revision.

f) For an aircraft under construction, enter the name and address of the constructor. For an evaluation of a kit at the kit manufacturer's request, enter the kit manufacturer's name and address.

g) Mark the specific tasks required to fabricate and assemble the aircraft. Mark, an "X" under the column heading "Accomplished By" in the appropriate space when the task is performed by the AMATEUR. If the task is performed by the kit manufacturer or by a person providing commercial assistance, a mark will be placed in the KIT MANUFACTURER column. Additional blank lines are provided to list any tasks not on the checklist. If a task is listed and not applicable to the construction of the aircraft enter N/A in the appropriate space. See also paragraph 3 below for further interpretation of 'accomplished by amateur'.

h) In the comments box enter the proportion of the total number of "X"s under the AMATEUR column as a percentage of the total number of "X"s in both the KIT MANUFACTURER and AMATEUR columns. If the percentage is 51 or greater then the aircraft is compliant with EU Regulation No. 1592/2002 Annex II paragraph (c) and eligible to be issued with a Permit to Fly as an amateur constructed aircraft.

i) Use the comments box to enter any additional comments, information or statements, as necessary.

j) Print or type the name of person performing the evaluation of the kit or aircraft.

k) The person performing the evaluation of the kit or aircraft should sign their name in the signature block.

l) Enter the date the evaluation was performed.

3 Interpretation of "Accomplished by Amateur"

If the Amateur undertakes complete fabrication of an item or a series of items, then this warrants an "X" in the Accomplished by Amateur column. However, there will be some cases where judgement will be required in determining if the Amateur builder constructed the items or not, particularly in the case of kit built aircraft, the overriding principle of which is that the Amateur, in the fabrication of the part or a series of parts should have performed 51% of the required operations, fabrication and/or labour effort himself in order to complete them, excluding painting and trimming. See also Appendix 3, paragraph 3.

As an example let us consider checklist item "Fabricate wing ribs and cores" where 20 wing ribs are required for the construction of both wings.

a) The constructor makes some himself and has some made commercially or, buys them ready made, as part of the kit. As long as the constructor can show that he actually made 11 or more of them then this will equal more than 51% of the effort required and thus qualify as amateur built and result in an "X" being placed against "Fabricate wing ribs and cores" under AMATEUR.

b) All 20 wing ribs are supplied with the kit in a partially fabricated form, or commercial assistance has been sought to undertake the basic forming actions of, say, forming the edge flanges. In this instance, judgement will be required on the part of the assessor in determining if the remaining operations needed to complete fabrication of the parts is equal to or greater than 51% of the total effort required. Obviously drilling off a couple of rivet holes is not, but cutting out lightening holes and manufacturing and assembling reinforcing angles to the rib's web is a good contender.

Table 1

Fabrication/Assembly Operation Checklist

Aircraft registration ..... CSN ..... AAN No. .....

Aircraft Model ..... Kit or Plans Built? .....

Type of Aircraft .....

Document Reference and Date .....

Constructor/Kit Manufacturer .....

Address .....

..... Post Code .....

		Accomplished By	
		Kit Manfctr	Amateur
	FUSELAGE		
1	Fabricate special tools and fixtures.		
2	Fabricate longitudinal members, cores or shells.		
3	Fabricate bulkheads or cross members.		
4	Assemble fuselage basic structure.		
5	Fabricate brackets and fittings.		
6	Install brackets and fittings.		
7	Fabricate cables, wires and lines.		
8	Install cables, wires and lines.		

Table 1

9	Fabricate fuselage covering or skin.		
10	Install fuselage covering or skin.		
11	Fabricate windshield / windows / canopy.		
12	Install windshield / windows / canopy.		
	WINGS		
1	Fabricate special tools or fixtures.		
2	Fabricate wing spars.		
3	Fabricate wing ribs and cores.		
4	Fabricate wing leading and trailing edges.		
5	Fabricate drag / anti-drag truss members.		
6	Fabricate wing brackets and fittings.		
7	Fabricate wing tips.		
8	Assemble basic wing structure.		
9	Install wing leading and trailing edges.		
10	Install drag / anti-drag truss.		
11	Fabricate cables, wires and lines.		
12	Install cables, wires and lines.		
13	Fabricate wing covering or skin.		
14	Install wing covering or skin.		
15	Fabricate wing struts and wires.		
16	Install wing struts and wires.		
	FLIGHT CONTROLS		
1	Fabricate special tools or fixtures.		
2	Fabricate aileron spars.		
3	Fabricate aileron ribs and cores.		
4	Assemble aileron structure.		
5	Fabricate aileron leading and trailing edges.		
6	Assemble aileron leading and trailing edges.		
7	Fabricate aileron brackets and fittings.		
8	Install aileron brackets and fittings.		
9	Fabricate aileron coverings or skins.		
10	Install aileron coverings or skins.		
11	Fabricate aileron trim tab(s).		
12	Install aileron trim tab(s).		
13	Install and rig ailerons.		
14	Fabricate flap spars.		
15	Fabricate flap ribs and cores.		
16	Assemble flap structure.		

Table 1

17	Fabricate flap leading and trailing edges.		
18	Assemble flap leading and trailing edges.		
19	Fabricate flap brackets and fittings.		
20	Install flap brackets and fittings.		
21	Fabricate flap coverings or skins.		
22	Install flap coverings or skins.		
23	Install and rig flaps.		
24	Fabricate elevator spars.		
25	Fabricate elevator ribs and cores.		
26	Assemble elevator structure.		
27	Fabricate elevator leading and trailing edges.		
28	Assemble elevator leading and trailing edges.		
29	Fabricate elevator brackets and fittings.		
30	Install elevator brackets and fittings.		
31	Fabricate elevator coverings or skins.		
32	Install elevator coverings or skins.		
33	Fabricate elevator trim tab(s).		
34	Install elevator trim tab(s).		
35	Install and rig elevator.		
36	Fabricate rudder spars.		
37	Fabricate rudder ribs and cores.		
38	Assemble rudder structure.		
39	Fabricate rudder leading and trailing edges.		
40	Assemble rudder leading and trailing edges		
41	Fabricate rudder brackets and fittings.		
42	Install rudder brackets and fittings.		
43	Fabricate rudder coverings or skins.		
44	Install rudder coverings or skins.		
45	Fabricate rudder trim tab(s).		
46	Install rudder trim tab(s).		
47	Install and rig rudder.		
	EMPENNAGE		
1	Fabricate special tools or fixtures.		
2	Fabricate spars.		
3	Fabricate ribs and cores.		
4	Fabricate leading and trailing edges.		
5	Fabricate tips.		

Table 1

6	Fabricate brackets and fittings.		
7	Assemble empennage structures.		
8	Install leading and trailing edges.		
9	Install fittings.		
10	Fabricate cables, wires and lines.		
11	Install cables, wires and lines.		
12	Fabricate empennage covering or skin.		
13	Install empennage covering or skin.		
	CANARD		
1	Fabricate special tools and fixtures.		
2	Fabricate canard.		
3	Assemble canard structure.		
4	Install and rig canard.		
	LANDING GEAR		
1	Fabricate special tools and fixtures.		
2	Fabricate struts.		
3	Fabricate brake system.		
4	Fabricate retraction system.		
5	Fabricate cables, wires and lines.		
6	Assemble wheels, tyres, brakes and landing gear.		
7	Install landing gear components.		
	PROPULSION		
1	Fabricate special tools and fixtures.		
2	Fabricate engine mount.		
3	Fabricate engine cooling system / baffles.		
4	Fabricate induction system.		
5	Fabricate exhaust system.		
6	Fabricate engine controls.		
7	Fabricate brackets and fittings.		
8	Fabricate cables wires and lines.		
9	Assemble engine.		
10	Install engine and items listed above.		
11	Fabricate engine cowling.		
12	Install engine cowling.		
13	Fabricate propeller.		
14	Install propeller.		
15	Fabricate fuel tank(s).		

Table 1

16	Install fuel tank(s)		
17	Fabricate fuel system components.		
18	Install fuel system components.		
	MAIN ROTOR DRIVE SYSTEM AND CONTROL MECHANISM(S)		
1	Fabricate special static and dynamic main rotor rigging tools.		
2	Fabricate / assemble main rotor drive train.		
3	Install main rotor drive train assembly.		
4	Fabricate / assemble main rotor shaft and hub assembly.		
5	Install main rotor shaft and hub assembly.		
6	Align main rotor shaft drive train, shaft and hub assembly.		
7	Fabricate main rotor rotating controls.		
8	Install main rotor rotating controls.		
9	Fabricate main rotor non-rotating controls.		
10	Install main rotor non-rotating controls.		
11	Rig main rotor rotating and non-rotating controls.		
12	Fabricate main rotor blades.		
13	Install main rotor blades on main rotor hub.		
14	Statically balance and rig main rotor system.		
15	Dynamically track and balance main rotor system.		
	TAIL ROTOR DRIVE SYSTEM AND CONTROL MECHANISM(S)		
1	Fabricate special static tail rotor rigging tools.		
2	Fabricate vertical trim fin.		
3	Install vertical trim fin.		
4	Fabricate horizontal stabiliser.		
5	Install horizontal stabiliser.		
6	Fabricate tail rotor drive system.		
7	Install tail rotor drive system.		
8	Fabricate tail cone or frame.		
9	Install and rig tail cone or frame.		
10	Rig vertical trim fin.		
11	Fabricate tail rotor shaft and hub assembly.		
12	Install tail rotor shaft and hub assembly.		
13	Fabricate tail rotor rotating and non-rotating controls.		
14	Install tail rotor rotating and non-rotating controls.		
15	Rig tail rotor rotating and non-rotating controls.		
16	Fabricate / assemble tail rotor blades.		
17	Install tail rotor blades.		

Table 1

18	Statically balance and rig tail rotor system.		
19	Dynamically track and balance tail rotor system.		
	COCKPIT / INTERIOR		
1	Fabricate instrument panel.		
2	Install instrument panel and instruments.		
3	Fabricate seats.		
4	Install seats.		
5	Fabricate electrical wiring, controls / switches.		
6	Install electrical wiring, controls / switches.		
	SUPPLEMENTARY		
1			
2			
3			
4			
5			
6			

Comments		
Print Name	Signature	Date

Appendix 5 Inspection of Imported Aircraft

1 Introduction

This appendix details the **minimum** inspection requirements needed to establish the build quality and level of airworthiness of partially or fully completed imported amateur constructed aircraft. As the applicant, it is your responsibility to define what inspections and tests will be carried out to show that the aircraft is airworthy. You should pay particular attention to safety critical features of the design. Identify what these features are and how you intend to establish that they are in an airworthy condition. It is recommended that you get help from people who have appropriate expertise if you don't have it yourself.

In some instance you may be required to undertake specialised inspections and tests in order to assist this process. These may include radiography of welded joints, metallurgical tests to establish specification and temper of metallic components and the structural testing of composite structures. During the inspection process you are advised to make reference to CAP 562 - Civil Aircraft Airworthiness Information and Procedures in order to determine acceptable methods and practices applicable to the inspection of aircraft and their components.

Of course, you may also be required to overhaul engines, propellers, gearboxes, rotors and other mechanisms. For completed aircraft you are advised to conduct the inspections listed below at the same time as the annual inspection that will have to be performed in order for the aircraft to qualify for its Permit to Fly. If required you should add additional tasks to those defined here following your assessment of the aircraft. Also we may call for additional inspections or rectification work that we feel is necessary in the interest of safety and standards.

As no two aircraft are exactly alike the level of rectification work required following these in depth inspections will vary from aircraft to aircraft.

You should pay particular attention to the requirements of CAP 562 - Civil Aircraft Airworthiness Information and Procedures, Leaflets:

11-27 Disposition of Scrap Aircraft Parts & Materials

11-28 Return to Service of Aircraft Items Recovered from Aircraft Involved in Accidents/Incidents

for all aspects of the aircraft under consideration.

2 Airframe

For aircraft that are imported disassembled (as most are) a thorough internal and external inspection of all components must be carried out prior to assembly. In order to facilitate an adequate internal inspection of the wings you may find it necessary to remove fuel tanks, tip fairings, ailerons, flaps etc. Internal inspection of fuselages can usually be made possible by removal of seats and cockpit furnishings. For fabric covered aircraft not provided with access panels, you will have to cut inspection holes. These are best made good afterwards by the installation of removable inspection panels to allow subsequent inspections to be carried out.

Once access has been gained then the internal inspection itinerary needs to include corrosion and rot, integrity of glue lines, damage, unauthorised modifications and

repairs, conformity with drawings, security and proper installation of components, loose objects and general condition in respect of wear and tear. Maintain a special look out for damage sustained during dismantling, storage and shipping, and inspect control surfaces internally where possible. When this is not possible, and inspection of the rest of the aircraft has led to doubt then you will have to take measures to facilitate such inspections.

Before assembly will be the best time to inspect attaching bolts and other hardware for condition and suitability. Be aware that serious damage can result from improper assembly techniques. For an imported assembled aircraft these inspections are just as important although a little more difficult. It may be necessary for you to dismantle the aircraft to achieve the required standard of inspection.

Be vigilant for signs of damage that may have been caused by heavy landings or collisions with ground objects.

Rigging and symmetry checks should be carried out and the results recorded.

You should pay particular attention to the requirements of CAP 455 - Airworthiness Notices, Notices:

50 Deterioration of Wooden Aircraft Structures

73 Corrosion of Aircraft Structures

and CAP 747 - Mandatory Requirements for Airworthiness, Generic Requirement 8 Cotton, Linen And Synthetic Fabric-Covered Aircraft.

3 Control Systems

You must dismantle and check all flight control systems. This includes helicopter swash plates, spiders and similar mechanisms and their attachments. Bearings should be checked, particularly for wear and corrosion, and, if serviceable, lubricated. All bolts should be withdrawn and checked for wear and corrosion, cables removed and checked for corrosion and fraying throughout their length. Pulleys and guides should be checked for wear and damage. These inspections are usually best done with the aircraft dismantled.

Care should be taken during re-assembly to ensure proper routing, tensions and locking of cables. Full rigging checks of all controls must be carried out and the results recorded.

4 Engine and Engine Installation

You should carry out a thorough inspection of the engine, propeller reduction gearbox (if fitted) and engine installation. All cowlings should be removed. All systems should be checked and serviced as necessary. Pay particular attention to the operation of engine controls (full and free movement) and satisfactory operation of carburettor heat systems. A cylinder compression check should be carried out and results recorded.

Flexible hoses should be checked. A pressure test may be desirable. The engine bearer frame is another area that needs careful inspection and rubber mounts should be checked for condition. Conduct a torque loading check of all nuts and bolts securing the engine bearer frame to the fuselage, and the engine to the frame.

Be vigilant for signs of damage that may have been caused by heavy landings or collisions with ground objects.

Engine ground runs should be carried out and results recorded. If there is no reliable documented history of the engine available, it may be necessary to internally inspect the engine. Contact the RO Surveyor for guidance in these circumstances.

You should pay particular attention to and comply with the requirements of CAP 562, CAAIP, Leaflet:

11-2 Carbon Monoxide Contamination in Aircraft.

5 Propeller

You should check the propeller for condition. We will need to be satisfied that the propeller fitted is suitable for a particular engine/airframe combination. Conduct a torque loading check of all nuts and bolts securing the propeller to its mounting flange.

You should note the requirements of CAP 747 - Mandatory Requirements for Airworthiness, Generic Requirement 17 - Maintenance Requirements for Variable Pitch Propellers Installed on Aircraft Holding a UK Certificate of Airworthiness.

6 Helicopter and Gyroplane Rotor and Transmission Systems

You will have to carry out a thorough inspection of the gearbox and rotor installations. All cowlings should be removed. All systems must be checked and serviced as necessary.

If there is no reliable documented history of fatigue and overhaul lives consumed, it may be necessary to scrap or overhaul the affected components. Contact the RO Surveyor for guidance in these circumstances.

Main and tail rotor blades should be minutely examined for condition, paying particular attention for evidence of spar damage, corrosion, delimitation, security of balance weights, and evidence of repairs, which if found need to be thoroughly investigated as to their suitability.

Gearboxes should be investigated internally for condition, in particular corrosion; it may be necessary to partially dismantle the gearboxes to achieve this objective. If oil filters and chip plugs are fitted then they should be examined for accumulations of metallic particles. If any are found the gearbox may have to be overhauled.

The nuts, bolts and pins etc. used to secure the main and tail rotor-heads to their respective gearboxes and the rotor blades to their respective rotor-heads should be removed, and, along with the attachment areas, should examined for condition, in particular corrosion and thread damage. None should be permitted.

Gyroplane pre-rotator assemblies should be examined for condition, in particular the state of drive cables, mountings and attachments, couplings, gears, and the engagement/disengagement mechanism and controls.

Rotor-head bearings should be checked for condition, particularly notchiness if ball or roller bearings; and delamination and deterioration if elastomeric. If the bearings are in poor condition, it is liable to be a good indicator of general rotor-head condition and a full overhaul of the rotor-head may be required.

Dampers should be checked for condition and serviceability.

Drive shafts and their bearings and couplings, freewheel units, clutches, drive chains, drive belts and drive belt tension mechanisms etc should be checked for condition

and serviceability. Belts, chains, and tensioners should be checked and adjusted for correct values of free play and tension.

Flexible hoses should be checked. A pressure test may be desirable. The gearbox mounting structure is another area that needs careful inspection. Conduct a torque loading check of all nuts and bolts securing the gearboxes to the fuselage.

A full lubrication of all rotor and transmission system components will have to be accomplished, including changing gearbox oils.

Once the helicopter has been fully reassembled then you will have to do a full track and balance of the rotor systems.

7 Duplicate Inspections

These are required following the work carried out to engine controls and flying control systems.

8 Fuel System

You must inspect the fuel system throughout. Fuel tanks should be inspected internally for cleanliness. Fuel filters should be checked for cleanliness. Fuel vents, fuel drains and fuel cocks should be checked for satisfactory operation. Condition of all pipes should be checked, paying particular attention to grommets, proper routing and security. The whole system should be leak-checked. UK equivalent fuel grades should be marked adjacent to fuel fillers. Fuel capacities should also be marked adjacent to the fuel tank fillers, and the units used must be the same as those used on the fuel gauges. Fuel flow checks should be carried out and results recorded.

9 Electrical System

You must inspect the battery for condition and security, and functionally check all electrical circuits. Corrosion around the battery area from electrolyte spillage is a particular hazard. Check that fuses and circuit breakers are of the correct ratings.

10 Instruments

You should check all instruments for security of installation and clarity in presentation. Instruments should be checked for satisfactory operation and to be making sensible indications. The altimeter(s) and the ASI(s) should be removed and calibration checked using proper test equipment.

Altimeters reading in inches of mercury should be changed for an altimeter reading in milli-bars or a reference table installed. The Pitot and Static systems should be leak-checked and checked for proper routing etc. A compass swing should be carried out using proper calibration equipment and a deviation card fitted. Where it is not obvious instruments should be placarded as to their function and mode of indication. You should pay particular attention to the requirements of CAP 455 - Airworthiness Notices, Notice:

54 Instruments with Unusual Presentation.

and CAP 562 - CAAIP, Leaflets:

11-22 Appendix 31-1 Altimeters in Aircraft

11-22 Appendix 31-2 Vertical Speed Indicators on Imported Aircraft

11 Radio Installation

If the aircraft is, or is to be, fitted with permanently installed navigation and communications equipment then normal modification approval procedures apply. Contact the RO Surveyor for advice.

NOTE: All permanently installed navigation and communications equipment is required to be of a type approved by the CAA.

12 Cockpit Labels

All switches and controls should be labelled as to their function and mode of operation. See also "Aircraft Markings" below.

13 Seat Belts

The minimum requirement for seat belts for an aircraft in the UK is for a harness made up of a lap and one diagonal strap. In exceptional circumstances, if you can prove that it is impractical to satisfy this minimum requirement then you may apply for an exemption to allow a lap strap only. If the aircraft is to be cleared for aerobatics a four or five point harness will be required. Normal CAA modification procedures apply when fitting replacement seat belts.

You should note the requirements of CAP 455 - Airworthiness Notices, Notice:

12, Appendix 62 Seat Belts in Light Aircraft – Orientation of Stitched Joints.

14 Airworthiness Directives and Mandatory Permit Directives

You must show and certify full compliance with all applicable Airworthiness Directives published by the Airworthiness Authority of the country of design of your aircraft or by the CAA, and Mandatory Permit Directives published by the CAA. This applies equally to airframe, engine, propeller and accessories such as magnetos, instruments, seat belts, etc. If compliance can be traced to original log books then this will be adequate but if not re-certification of compliance will be necessary.

Manufacturers Service information in the form of Service Bulletins, etc. are not mandatory but they are good advice and should be taken into account.

15 Painting of Aircraft

If you are repainting your aircraft then you should pay attention to the requirements of CAP 747 – Mandatory Requirements for Airworthiness, Generic Requirement 10: Painting of Aircraft.

16 Aircraft Marking

Your aircraft must be marked in the manner described in paragraph 13 of the main text of this CAP.

17 Weighing of Aircraft

Regardless of any weight schedules previously prepared, you must weigh the completed 'ready to fly aircraft' and a raise a new weight schedule, which must be placed in the Flight Manual. A copy must also be given to the RO Surveyor.

Appendix 6 Useful Addresses and Web Sites

Civil Aviation Authority

Corporate Headquarters, Aircraft Register and Directorate of Airspace Policy
CAA House
45-59 Kingsway
London
WC2B 6TE
Telephone: 020 7379 7311

Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex
RH6 0YR
Telephone: 01293 567171
www.caa.co.uk

The contact section of our website contains details of all our HQ and Regional offices, including location maps as well as telephone and fax numbers and much more.

British Microlight Aircraft Association

British Microlight Aircraft Association
The Bullring
Deddington
Banbury
Oxford
OX15 0TT
www.bmaa.org
Telephone: 01869 338888
Fax: 01869 337116
General enquires: **general@bmaa.org**
Aircraft technical enquires: **cto@bmaa.org**, Tel: 01869 336006
Safety and Inspection enquiries: **tech.safety@bmaa.org**

Popular Flying Association

PFA (Ulair) Ltd
Turweston Aerodrome
Nr Brackley
Northants
NN13 5YD
www.pfa.org.uk
Telephone: 01280 846 786
Fax: 01280 846 780
General enquiries: **penny_sharpe@pfa.org.uk**
Engineering enquires: **engineering@pfa.org.uk**

European Aviation Safety Agency

Postal address (for letters only):
European Aviation Safety Agency
Postfach 10 12 53
D-50452 Cologne
Germany

Visitors' address:
European Aviation Safety Agency
Ottoplatz, 1
D-50679 Cologne
Germany
www.easa.eu.int
Telephone: ++49 221 89990 0000

Federal Aviation Administration

800 Independence Avenue SW
Washington, DC 20591
USA.
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The Stationary Office/TSO

See "About TSO" section of their web site for addresses of their offices and locations of their sales outlets.

www.tso.co.uk

Appendix 7 Useful Publications

Below are listed some official publications that will be of use to the amateur aircraft constructor. The list is not exhaustive. Many of the CAA, EASA and FAA publications can be downloaded for free in PDF format from those organisation's websites. The name of the sponsoring/publishing organisation is given in brackets after the publication title. Address and web site information for the CAA's publisher and all the organisations listed below are given in Appendix 6.

1 UK Air Law

- CAP 393 – Air Navigation: The Order and Regulations (CAA)

2 EU Regulations

- EC 1592/2002 - "Basic Regulation" (EASA)

3 Obtaining Permits to Fly

- CAP 523 – The Display of Nationality and Registration Marks on Aircraft: Guidance for Owners (CAA)
- CAP 553 - BCAR Section A - Airworthiness Procedures Where the CAA has Primary Responsibility, Chapter A3-7 (CAA)
- CAP 733 - Permit to Fly Aircraft (CAA)

4 Certification Codes and Supporting Publications for the Design and Construction of an Aircraft

- CAP 482 - BCAR Section S - Small Light Aeroplanes (CAA)
- CAP 523 - The Display of Nationality and Registration Marks on Aircraft: Guidance for Owners (CAA)
- CAP 553 - BCAR Section A – Airworthiness Procedures Where the CAA has Primary Responsibility for Type (CAA)
- CAP 643 - BCAR Section T – Light Gyroplanes (CAA)
- CAP 747 – Mandatory Requirements for Airworthiness (CAA)
- CAP 750 - BCAR Section VLH – Very Light Helicopters (CAA)
- CS-Definitions – Definitions and Abbreviations (EASA)
- CS-E – Engines (EASA)
- CS-VLA - Very Light Aeroplanes (EASA)
- CS-VLR - Very Light Rotorcraft (EASA)
- CS-22 - Sailplanes and Powered Sailplanes (EASA)
- CS-23 - Normal, Utility, Aerobatic and Commuter Aeroplanes (EASA)
- AC 23-8B - Flight Test Guide for Certification of Part 23 Airplanes (FAA)
- AC 90-89A – Amateur Built Aircraft and Ultralight Flight Testing Handbook (FAA)
- Technical Document: Composite Certification Roadmap, sponsored by the Standards Office of the Small Airplane Directorate. (FAA)

5 Modification of an Aircraft

- CAP 553 - BCAR Section A – Airworthiness Procedures Where the CAA has Primary Responsibility, Chapter A2-5 (CAA)
- CAP 733 - Permit to Fly Aircraft (CAA)
- AC 43.13-2 Acceptable Methods, Techniques and Practices – Aircraft Alterations (FAA)

6 Maintenance and Repair Practices and Schedules

- CAP 398 - Aircraft Log Book (CAA)
- CAP 399 - Engine Log Book (CAA)
- CAP 400 - Variable Pitch Propeller Log Book (CAA)
- CAP 411 - Light Aircraft Maintenance Schedules (Aeroplanes) (CAA)
- CAP 412 - Light Aircraft Maintenance Schedules (Helicopters) (CAA)
- CAP 520 - Light Aircraft Maintenance (CAA)
- CAP 455 – Airworthiness Notices (CAA)
- CAP 543 - Time Lifed Components (CAA)
- CAP 562 – Civil Aircraft Airworthiness Information and Procedures (CAAIP) (CAA)
- CAP 661 - Mandatory Permit Directives (CAA)
- BMAA/AW/306 Pooleys Microlight Aircraft & Engine Log Book (BMAA / Pooleys)
- PFA Airframe Log Book; ISBN 1-84336-100-0 (PFA)
- PFA Engine Log Book; ISBN 1-84336-101-9 (PFA)
- AC 43.13-1 Acceptable Methods, Techniques and Practices - Aircraft Inspection and Repair (FAA)

7 Exporting/Importing Aircraft to/from the USA or Countries that follow USA FAA Practices

- AC 20-27F Certification and Operation of Amateur Built Aircraft (FAA)
- AC 20–139 Commercial Assistance During Construction of Amateur Built Aircraft (FAA)

8 BMAA and PFA Publications

Both organisations publish extensive lists of useful information leaflets and forms for the benefit of their respective members, who are seeking approval of an amateur constructed aircraft via those organisations. The content of some of them may be of use to amateur constructors who are following the CAA Route for approval of an aircraft.

9 Commercially Available Books

There are a variety of commercially available books aimed at the amateur constructor. Both the BMAA's and PFA's Technical Staff can advise you of suitable publications appropriate to your needs.