

Ex-Military Aircraft

Design, restoration and continuing airworthiness approval

CAP 1640



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Foreword

This publication provides guidance for those who are seeking to obtain a Permit to Fly for an ex-military aircraft, or who wish to restore, maintain and operate such an aircraft issued with a Permit to Fly. It is applicable to an aircraft that may not have been designed and manufactured to specified civil standards as is generally the case of ex-military aircraft; and is ineligible for the issue of a Certificate of Airworthiness.

The Convention on International Civil Aviation signed in Chicago on 7 December 1944 requires aircraft registered in Contracting States to be provided with a Certificate of Airworthiness for international flight. The United Kingdom, which is a Contracting State to the International Civil Aviation Organisation (ICAO), has undertaken to implement national regulations that are, wherever possible, compliant with the ICAO standards. The Civil Aviation Authority (CAA), which acts on behalf of the British Government by virtue of the powers delegated to it under the Civil Aviation Act, develops and administers the UK regulations.

The primary national regulations relating to the airworthiness of aircraft are contained in the Air Navigation Order 2016 (ANO) Part III where it is stated that all aircraft operating in UK airspace shall have a valid Certificate of Airworthiness, but that if a British registered aircraft is unable to satisfy the requirements for the issue of a Certificate of Airworthiness, it may, instead, be issued with a United Kingdom Permit to Fly.

The Permit to Fly contains additional operational restrictions on the use of the aircraft and does not satisfy the requirements for international flight. Due to this limitation, British registered aircraft with a UK Permit to Fly require permission to fly within the airspace of another country. Similarly, foreign registered aircraft operating on airworthiness documents which are not ICAO compliant will also require the permission of the CAA to fly within UK airspace. Guidance on the principles that should be applied in the case of any application for a Permit to Fly is contained in the British Civil Airworthiness Requirements (BCARs). In particular, BCAR Section A Chapter A3-7 deals with design and construction standards and Chapters A8-23, 24 and 25 are concerned with the maintenance and continuing airworthiness management of ex-military aircraft.

The European Aviation Safety Agency (EASA) became operational on the 28th September 2003 and has assumed many of the functions previously undertaken by the National Aviation Authorities (NAAs) of the EU Member Nations. Many of the aircraft which fly on a UK Permit to Fly are excluded from regulation by EASA, by Annex II to EU Regulation (EC) No. 216/2008, which is the legislation enabling the formation of EASA. Such excluded aircraft remain subject to national requirements. In essence, this means that any such aircraft which has been flying on a Permit to Fly will continue to require a Permit to Fly issued by the CAA under the ANO.

The EASA Basic Regulation may be found at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02008R0216-20130129>

Glossary

AAN	Airworthiness Approval Note
AD	Airworthiness Directive
AAIB	Air Accident Investigation Branch
ANO	Air Navigation Order
AP	Aviation Publication
ARB	Airworthiness Requirements Board
ASI	Air Speed Indicator
AVGAS	Aviation Gasoline
BCAR	British Civil Airworthiness Requirements
CAA	The Civil Aviation Authority
CAAIP	Civil Aircraft Airworthiness Information and Procedures
CAMO	Continuing Airworthiness Maintenance Organisation
CAP	Civil Aviation Publication
CARS	Civil Aviation Regulations (Canada)
CASA	Australian Civil Aviation and Safety Authority
CASR	Civil Aviation Safety Regulations (Australia)
CG	Centre of Gravity
CofA	Certificate of Airworthiness
CofV	Certificate of Validity
DAP	CAA Directorate of Airspace Policy
DLS	CAA Design Liaison Surveyor
DOA	Design Organisation Approval
EASA	European Aviation Safety Agency
EFIS	Electronic Flight Instrument System
FAA	United States Federal Aviation Administration
FADEC	Full Authority Digital Engine Control
FAR	Federal Aviation Regulation

FBW	Fly By Wire
FI	Fatigue Index
FM	Flight Manual
FRC	Flight Reference Cards
GAU	General Aviation Unit
GR	Generic Requirement
HP	Horse Power
HUD	Head Up Display
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
LAA	Light Aircraft Association
LAMS	Light Aircraft Maintenance Schedule
LTC	Limited Type Certificate (US)
MAA	Military Aviation Authority (UK)
MDC	Mini-Detonation Cord
MOD	UK Ministry of Defence
MPD	Mandatory Permit Directive
MSN	Manufacturer's Serial Number
MTMA	Maximum Take-Off Mass Authorised
MTWA	Maximum Take-Off Weight Authorised
NAA	National Aviation Authority
NATO	North Atlantic Treaty Organisation
NDI	Non-Destructive Inspection
NDT	Non-Destructive Test
NZCAA	New Zealand Civil Aviation Authority
OEM	Original Equipment Manufacturer
OCM	Organisational Control Manual
PFRC	Permit Flight Release Certificate

PMA	Parts Manufacturing Authorisation
PMR	Permit Maintenance Release
POH	Pilot's Operating Handbook
PtoF	Permit to Fly
RAF	Royal Air Force
RO	CAA Regional Office
SB	Service Bulletin
SoD	State of Design
SoR	State of Registry
SSAC	Safety Standards Acknowledgement and Consent
STI	Special Technical Instruction
TCA	Transport Canada – Air
TC	Type Certificate
TCDS	Type Certificate Data Sheet
TCH	Type Certificate Holder
TP	Test Pilot
TRA	Type Responsibility Agreement
USAF	United States Air Force
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

Chapter 1 Introduction

- 1.1 The CAA is keen to continue to support the scale of restoration of ex-military aircraft that has developed over the last fifty years or more. However, such restoration must be managed throughout the life of the project in an appropriate manner that ensures that results in an airworthy product, that is properly defined, and compliant with the relevant requirements.
- 1.2 The restoration of ex-military aircraft varies considerably from the transition of a just out of service aircraft into the civil environment to a more substantial recovery of a severely damaged World War II aircraft, complete with bullet holes, fire damage and corrosion. Accordingly, the aircraft will have different demands to ensure that airworthiness is achieved to allow a Permit to Fly to be issued. As such, each ex-military aircraft is regarded as being unique. Whilst a number of the type may have qualified for a Permit to Fly, the circumstances surrounding the nature of the individual aircraft's history requires separate consideration. Each aircraft therefore has its own Airworthiness Approval Note (AAN) covering the history, any work done on transition to the civil system and the conditions associated with the issue of the Permit.
- 1.3 This CAP has arisen from a review of relevant material, both in the UK and overseas, in the wide context of the approval of Permit to Fly aircraft and, in particular those of military origin that have not previously been type certificated. This is a summation of the methods by which CAA will approve such aircraft and brings together all available information regarding restoration, maintenance and operation of ex-military aircraft. It is intended that the CAP will be a dynamic document that can be updated on a regular basis to take account of latest practices and information available.
- 1.4 This CAP takes into account, where possible, how other similar civil aviation authorities with such fleets go about their approval processes, in order to arrive at a coherent, transparent guidance document that facilitates the approval of ex-military aircraft. It is therefore intended that this CAP will give clear guidance both to applicants and CAA Surveyors as to the expectations from submission to approval. It aims to make clear the roles and responsibilities placed on the design, maintenance and continuing airworthiness management organisations and of the expectations of CAA Surveyors. This should allow the most expedient route to approval whilst maintaining appropriate levels of CAA oversight.
- 1.5 Additionally, this CAP contains guidance on standards parts, standard modifications and flight test approvals.

Purpose and scope

- 1.6 Within the United Kingdom, the operation of aircraft and the conduct of associated aviation activities are governed by the various legislative requirements contained in the United Kingdom Air Navigation Order 2016 (ANO). This requires that, except when operating in accordance with the provisions contained in Articles 24(3), 33(2), 40, 41 and Schedule 4 of the ANO, an aircraft must be registered and have a valid Certificate of Airworthiness issued by the State of Registry. The CAA is responsible for the airworthiness of aircraft that are on the British register and requires compliance with the standards and detailed requirements contained in the British Civil Airworthiness Requirements (BCARs) together with European (EASA) and other International (ICAO) Regulations as appropriate.
- 1.7 An aircraft will normally be issued with a Certificate of Airworthiness by its 'State of Registry', and this document attests to that National Aviation Authority being satisfied with the design and workmanship and the materials used in the construction of the aircraft. After a 'State of Design' has investigated all aspects of an aircraft's design, construction and flight characteristics, it will issue a 'type certificate', and it is compliance with this document that forms the basis on which individual Certificates of Airworthiness will subsequently be issued.
- 1.8 There are many aircraft, including aircraft of military design and service, which are not able to qualify for the issue of a Certificate of Airworthiness. In such cases, the CAA may issue a Permit to Fly which confirms that an aircraft is safe to fly, considering its overall design, construction and maintenance, but not to the extent provided for by the level of assurance that an aircraft with a Type Certificate and Certificate of Airworthiness could achieve. Due to this reduced level of airworthiness assurance, to ensure that an acceptable level of safety is maintained, additional limitations and conditions may be placed upon the operation of these aircraft.
- 1.9 An individual aircraft of military design and service may qualify for the initial issue of a Permit to Fly if the following are addressed to the satisfaction of the CAA:
- 1.10 The aircraft conforms to a design that was accepted by the recognised national authority of the state of design to fly within defined limitations.
- 1.11 The aircraft type has/had accumulated sufficient evidence of safe operation to demonstrate that such aircraft are safe to fly subject to whatever conditions may be appropriate.
- 1.12 An assessment of the aircraft demonstrates that any features with potentially unsafe failure modes are sufficiently reliable.
- 1.13 Manuals and procedures approved for the aircraft's military service are available.

- 1.14 A Through-Life-Total-Support approach is implemented. A through-Life-Total-Support approach will require the applicant to consider the implications posed by the differences in the operation and maintenance environment of the proposed PtoF operation compared to that of the original national (military or aviation) authority authorised operation, and demonstrate that the civil implementation achieves an equivalent level of safety, that is acceptable to the CAA.
- 1.15 The applicant demonstrates that the aircraft complies with the requirements of the relevant aircraft classification of BCAR A8-25 Supplement 2 that are broadly defined as Simple, Intermediate or Complex, and demonstrates that all of the objectives required by its classification are satisfied.
- 1.16 Notwithstanding the content of the ANO and BCAR A3-7, the aircraft of military design and service may continue to qualify for the Permit to Fly if all of the above conditions remain valid and the subsequent civil-registry service safety record has continued to demonstrate that the aircraft is safe to fly, subject to the original or amended limitations.

Issue and revalidation of a permit to Fly

- 1.17 Although a Permit to Fly is often thought of as embodying a lesser standard of airworthiness than a Certificate of Airworthiness, a Permit to Fly will only be issued on the basis that the aircraft to which it relates is airworthy. Under the provisions of the ANO, ex-military aircraft, which are eligible for the issue of a Certificate of Airworthiness, or are the subject of 'type certification' in another state, will not be eligible for the issue of a Permit to Fly. This means that a Permit to Fly will normally only be issued to ex-military aircraft which are not eligible to hold Certificates of Airworthiness because they have either never been type certificated or the type certificate holder has withdrawn its support for the aircraft type.
- 1.18 A Permit to Fly will only be issued after the CAA has investigated the aircraft. This investigation will cover those elements necessary to make sure that the aircraft is fit to fly and has no adverse operating or handling characteristics. When issued, the Permit to Fly will be non-expiring and will be revalidated by a Certificate of Validity, which will be conditional upon the completion of the periodic maintenance, inspections and checks. The actual process of Permit issue and revalidation varies according to aircraft type, the conditions under which the individual aircraft operate and the privileges of the associated approved organisation.

Permits to Fly and approved organisations

- 1.19 Before a Permit to Fly can be issued, the build standard, history and the intended operational use of the aircraft will be investigated. This process remains consistent irrespective of the basis upon which the application for a Permit to Fly is to be made.

- 1.20 The CAA has developed a number of different processes to deal with the specific needs of the industry, which reflect the varying nature of operations and the classifications of the various types of aircraft that may be eligible for a Permit to Fly.
- 1.21 Depending on the class and weight of an aircraft, the CAA may require the ex-military aircraft to be maintained and supported by organisations that have been approved according to BCAR Section A, Chapter A8-23, 24 and/or 25 as appropriate. In the main this is for those fixed wing aircraft above 2,730 kg and helicopters, or where the CAA believes this will assist or progress the application. However, these BCAR A approvals are equally relevant to other ex-military aircraft if applicable.
- 1.22 The initial Permit to Fly and Certificate of Validity will be issued by the CAA following the submission of design reports by the organisations approved under BCAR A8-25 and after a survey conducted by the CAA. Full Permit issue will follow flight tests taken place under a Permit to Test issued against a Working Draft of the AAN – see Appendix 1. Subsequent Certificates of Validity will be issued following recommendations for revalidation by the relevant BCAR A8-25 approved organisation. Aircraft which are not maintained under the control of an approved organisation will be investigated and surveyed directly by the CAA for the purpose of issuing a Permit to Fly, and the associated Certificates of Validity will be issued or re-issued subject to periodic and satisfactory inspection by the CAA.
- 1.23 There is also scope to cater for organisation approval privileges that will allow revalidation of a Permit to Fly without the CAA's direct involvement. This follows the CAA's drive to put such activity within the capability of approved organisations, allowing the CAA to concentrate its resources on the oversight of the organisations and the proportionate risk.

BCAR A8-23, A8-24 and A8-25 Approvals

- 1.24 The current requirements for the airworthiness support of ex-military aircraft are generally contained in BCAR A8-23, A8-24 and 25. These approvals replace the previous two main sub-elements of BCAR A8-20, E4 and M5 with those being subsumed and built upon. The requirements initially applied to aircraft above 2730 kg MTOW but, in order to provide greater flexibility for companies to manage their aircraft below that weight limit, the requirement was amended to cover any weight aircraft. The requirements, which approve organisations to carry out certain functions, have worked well since they were introduced and the approvals have contributed to the manner in which aircraft are initially issued with Permit to Fly and thereafter maintained to airworthy standards.

- 1.25 When BCAR A8-20 was introduced, the CAA included provision for the organisation to assist in defining the aircraft configuration. This organisation would review the build standard of the aircraft in relation to the original military standard and record the differences from that standard. The organisation catalogued the conformity of this build standard, the modification standard and the maintenance history, and the operational history of the type in order to provide a report from which the CAA could draft the Airworthiness Approval Note (AAN) that would support Permit to Fly issue.
- 1.26 In general, this worked well but there appeared to have been some confusion as to what the E4 element of the approval represented. This is now clarified by the transfer of the E4 element to BCAR A8-25 Supplement 2. This allows the organisation to compile a substantiation report on the aircraft, its history, build standard, modifications, equipment fit to help the CAA draft the AAN that will eventually clear the aircraft for Permit issue. This is not a design approval and confers no privileges in respect of the approval of modifications or changes at any level. Therefore, there is no need for specific design expertise to support a Supplement 2 as the path available for design approval is contained within BCAR A8-21. There are a number of existing BCAR A8-21 companies that currently work on ex-military aircraft. The issue is therefore not with the availability of design capability but that such companies have not been used previously by A8-25 organisations.
- 1.27 The move towards a system where all non-expiring Permits could be revalidated through an approved organisation utilises the A8-25 approval to support the process to advantage. This approval has been developed into a CAMO arrangement such that there is a situation that better supports continuing airworthiness management processes. This is as important for Permit aircraft as it is for those with a CofA. By changing the design report element, it provides greater clarity of function, introduces provision to give industry a CAMO style capability and allows CAA to reduce its direct involvement in processes that can be adequately managed by approved organisations with appropriate CAA oversight.
- 1.28 The other aspect is the A8-23 and A8-24 approval. These provide catch all approvals covering a variety of different processes under their umbrellas. These include the normal activities associated with maintenance but more importantly for this sector it permits considerable (in some cases total) restoration of unairworthy projects. However, it ought to be recognised that there is a considerable difference between routine support and a total rebuild.

- 1.29 These approvals provide for maintenance of the aircraft and the scope of approval will normally relate to specific aircraft types. The previous A8-20 M5 approval did not provide any commercial manufacturing capability and the parts could not be sold onto third parties therefore the manufacture of parts or components to support ex-military restorations for other organisations required a further approval, such as that currently available under BCAR A8-2 or A8-21. It is noted that the provisions of A8-21 were not written with Permit to Fly aircraft in mind and therefore the requirements may be seen as being over-burdensome when applied to ex-military aircraft support organisations.
- 1.30 A8-23 and A8-24 allow maintenance, overhaul, repair and restoration but introduce limited scope such that fabrication can take place. The need to exercise sub-contract control over external support arrangements with unapproved organisations is strengthened and an additional rating under A8-23/24 has been developed to cover the fabrication activity, thereby negating the need to hold separate A2 approvals in all cases. This is further explained in Chapter 4 and Appendix 5.
- 1.31 There is no reason why BCAR A8-23/24 cannot be used for the purposes of performing maintenance on engines, propellers or equipment for ex-military aircraft. It is relatively straightforward to build in a capability to cover these ancillary tasks to allow these to be covered separately from a complete aircraft approval. This provides for a greater degree of flexibility.
- 1.32 For ex-military aircraft revalidation shall be recommended by an appropriately approved organisation, e.g. to BCAR A8-25. The revalidation process will, normally, involve maintenance inspections and test flying to ensure that the aircraft is still able to meet the requirements of the Permit.
- 1.33 Once expired, the Certificate of Validity must be renewed before further flying is carried out. However, where necessary a Permit to Fly for test purposes may be issued, or the aircraft may be flown on 'A' or 'B' conditions under the control of an organisation suitably approved by the CAA for that purpose.

Limitations of use of a Permit to Fly aircraft

- 1.34 In recognition of the lack of compliance with some of the standards of airworthiness, the issue and continued validity of a Permit to Fly will reflect the limitations under which an aircraft is permitted to operate, and will normally be more restrictive than the operating conditions permitted in the case of a comparable aircraft operating on a Certificate of Airworthiness. Examples of limitations are as follows:
- a. An aircraft flying in accordance with a permit to fly may only be flown by day and in accordance with the Visual Meteorological Conditions unless the prior permission of the CAA has been obtained.
 - b. Limitations may be placed upon the numbers of persons permitted to be carried in the aircraft, either in general, or in specific operational circumstances.

- c. Aircraft will be required to be placarded showing operating limitations and conditions.
- d. Aircraft will normally be restricted to flights within UK airspace unless the prior agreement of the country in which the flights are to be made is obtained.
- e. Aircraft will not normally be permitted to fly over congested areas.

Eligibility of Ex-military aircraft

- 1.35 If an aircraft is of military origin and is not eligible for a Certificate of Airworthiness, the CAA may consider an application for a Permit to Fly. Aeroplanes of greater than 2,730 kg MTWA, and rotorcraft of any weight, will be required to be supported by a maintenance organisation approved under BCAR Section A, Chapter A8-23 or A8-25. Aeroplanes of 2,730 kg MTWA or below will not normally require the involvement of a BCAR A8-23/24 maintenance organisation.
- 1.36 Ex-military aircraft have often been designed to requirements that differ substantially from those of civil aircraft. Consequently, the design review of an ex-military aircraft will consider associated issues such as the operational role of the aircraft and the accident record. If, on the basis of this evidence, the CAA is satisfied that the aircraft is fit to fly, it may be granted a Permit to Fly.
- 1.37 Ex-military aircraft will be classified as 'simple' (e.g. Auster AOP-9, Harvard, Hurricane or P-51), 'intermediate' (e.g. Grumman F7F, de Havilland Vampire or Westland Wasp) or 'complex' (e.g. Buccaneer and Vulcan) according to the definitions shown in BCAR Section A, Chapter A8-25 Supplement 2. These classifications reflect the differences in technology, operational equipment and the flying and handling characteristics of the aircraft concerned. The more complex an aircraft is, the greater the level of organisational and operational support that will be required and, unless the CAA agrees alternative provision through a suitably competent design organisation, the continued involvement of the manufacturer will be required. Further guidance on how the CAA determines complexity is given in Chapter 3.
- 1.38 The CAA will issue Permits to Fly for ex-military aircraft after consideration of the recommendations and inspection reports submitted by the relevant BCAR A8-25 organisations, and will liaise with the BCAR A8-25 organisations concerning the detail, form and content of the inspections to be undertaken for this purpose.
- 1.39 In the case of ex-military aeroplanes of 2,730 kg MTWA or below, the CAA may interface directly with the applicant. The applicant will be expected to provide the CAA with sufficient information for development of an Airworthiness Approval Note

(AAN) to record the basis upon which a Permit to Fly can be issued. Note that the information required will be similar to that outline under Paragraph 5.2 above. The CAA may then, following the conduct of a satisfactory survey and investigation, and a satisfactory test-flight, issue a Permit to Fly.

Ineligible aircraft

- 1.40 Aircraft which are eligible for the grant of a Certificate of Airworthiness will be required to comply with the appropriate internationally recognised standards and will not normally be considered for the issue of the United Kingdom Permit to Fly. This includes all series built aircraft that have been built for civil use. It should be noted that an acceptance by another National Authority of an aircraft, without a Certificate of Airworthiness, to fly on a permit does not constitute a right for that aircraft to qualify for a UK Permit to Fly.
- 1.41 Aircraft may also be ineligible for other reasons, such as an unacceptable safety record.

Chapter 2 Qualifying for the Initial Issue of a Permit to Fly

General

- 2.1 The process associated with the issue of a Permit to Fly follows the same basic steps irrespective of the aircraft type, whether it is dealt with directly by the CAA, or by an approved organisation. The details are contained in BCAR Section A, Chapter A3-7 (or in BCAR Section B, Chapter B3-7 for foreign products) and include the following requirements:
- a. The aircraft must be UK registered.
 - b. An application for a Permit to Fly must be made
 - c. The need for an application of an AAN and a Special Survey along with a Permit to Fly application
 - d. The aircraft design standard must be reviewed and documented.
 - e. The standard of maintenance must achieve an airworthy condition to ensure that the aircraft is fit to fly.
 - f. The aircraft must be inspected at various stages during its restoration.
 - g. The need for the owner/Maintenance Organisation to generate a visit programme for both Airworthiness Surveyor and Design Surveyor as appropriate
 - h. The need for comprehensive records of the project on an ongoing basis
 - i. The method by which the organisation has assured itself of how it has sourced all of the available data to carry out a restoration project and how it handles the parts, particularly if the owner provides parts
 - j. The aircraft must be test-flown to an agreed schedule.
 - k. The aircraft build standard, modification records, maintenance record and operating history shall be available.
- 2.2 A Permit to Fly will not be issued to an aircraft which has formerly been issued with a Certificate of Airworthiness by an ICAO contracting state, unless it is no longer possible to fulfil the requirements for the issue of a Certificate of Airworthiness.
- 2.3 Guidance on when a former CofA aircraft may be eligible for a Permit to Fly is given at: <http://www.caa.co.uk/General-aviation/Aircraft-ownership-and-maintenance/Types-of-aircraft/Orphan-Aircraft/>

Major Restoration Projects

- 2.4 The recovery of a severely corroded airframe, or part of one, can often act as the initiation point for restoration of an aircraft that requires rebuild virtually from first principles. This is therefore taken as the worst-case scenario. It is recognised that the restoration will often be performed within a BCAR A8-21, A8-23, A8-24 and/or A8-25 approved organisation. This means that the organisation will have demonstrated an overall competence in ex-military aircraft maintenance that will allow the CAA to take a degree of confidence that the project will be managed appropriately.
- 2.5 In many cases, the availability of replacement parts is severely restricted, particularly with regard to structural components. The solution often therefore requires manufacture of replacement parts to drawings that may be available, or by reverse engineering. This introduces issues of material substitution, as many of the original specification materials may no longer be available. It is important therefore that the restoration is project managed around a defined progressive programme of decisions and activities. To this end, the work can be substantiated and the decisions on alternative manufacture or materials can be seen and demonstrated.
- 2.6 Where necessary, if the approval is not held in house, the support of an appropriately approved BCAR A8-21 design organisation will be needed to substantiate the decisions. This is important, as material substitutions will often require careful consideration with regards to all aspects of the intended use of the material (see also the discussion paper on material substitution). The cataloguing of changes is also required to allow a proper aircraft design standard to be determined for Permit issue. This means that the work has to result in a progressive picture of what is being done, why and how it is substantiated as the project proceeds.
- 2.7 It is most practical to develop communication pathways with the CAA during such extensive rebuilds to ensure that agreement on the actions being taken is given. Too often, the CAA is presented a fait accompli with aircraft where the substantiation for the changes performed is not available, leading to repetition of the work and disputes. Keeping the CAA informed periodically, or consulting on key decisions will help ensure that there is no ambiguity over the project's status. The lack of CAA involvement at the appropriate time could also lead to the aircraft having to be dismantled to some extent to allow structural surveys of modifications or repairs to be reviewed.
- 2.8 It is inevitable that with ground up restorations, parts and sub-assemblies will be bought in from sub-contract organisations. It is crucial that the organisation demonstrates its oversight of these sub-contractors and its rigour in this can be demonstrated to the CAA. This will ensure that the organisation is certain of acceptability of the items it receives and that they can be accepted by CAA for use on the restored aircraft.

Aircraft Identity and Provenance

- 2.9 Inspection of project: There is no set threshold minimum for the amount of original material needed for the aircraft to be considered genuine, but there must be something recognisable and tangible as the start material. To ascertain whether or not sufficient material exists, the aircraft will need to be inspected. It should be anticipated that as a minimum, primary structure is available – generally, although not exclusively, from the fuselage – to establish a viable start point.
- 2.10 The applicant should arrange as early as possible in the restoration process for the CAA Design Surveyor and Airworthiness Surveyor to view the project. This will allow CAA assurance that there is a sufficiently viable amount of material for the restoration to be treated as original rather than a replica, even if subsequently further parts are replaced or fitted in order to make the aircraft airworthy. If it is deemed that there is insufficient material for the aircraft to be treated as original then it will have to be declared as a replica.
- 2.11 Data plates: Most, although not all, aircraft have a data plate fitted that records certain manufacturers information including the Manufacturers Serial Number (MSN). This data plate information should be used to determine the provenance of the aircraft being restored. The existence of the data plate can be an important part of establishment of the correct identity of the aircraft. Where the data plate is no longer in existence reliance may be placed on the evidence of historians and published information to gain confidence in the identity of the airframe.
- 2.12 Conversely, some early types originating before the Second World War (such as early Hawker biplanes) did not have data plates. In such cases assessment of the remains is usually sufficient to gain satisfaction that the aircraft is genuine. Additionally, where the original data plate is not available it is permissible for the aircraft restoration company to manufacture a replacement data plate. This data plate should include the aircraft serial number and manufacturer's name. The use of a replacement data plate should be included in the aircraft records. In cases where an original data plate was not fitted the CAA will verify that it has not previously approved another aircraft as a restoration from the same wreckage.
- 2.13 MSN vs. Military Serial: The aircraft should be identified by its Manufacturers Serial Number (MSN) as this is a constant that remains with the aircraft throughout its life. The applicant should always attempt to identify this. Ex-military aircraft are also often referred to by their military serial (e.g. XL598) and this is sometimes employed to identify them in favour of fuselage serial numbers.
- 2.14 The manufacturers serial number identity is the preferred identifier as the military serial numbers applied to the aircraft may change (for example on export to

another country). However, it is recognised that in some instances the MSN and the Serial Number are the same. For a limited number of aircraft, there is no record of the original MSN (for example some Spitfires built under sub-contract had the initial RAF serial applied as an MSN on the data plate). In these instances, the initial serial should be used as the identifier. This will not be acceptable where it is known that there is a definitive MSN to Serial tie-up.

- 2.15 Donor airframes: In some countries where re-use of the same registration is possible, further use of the registration may occur but on further example(s) of the same type, for example where the original has been written off. This could lead to a situation where effectively a donor aircraft is used in its entirety with only the registration paperwork remaining of the original aircraft. This is not acceptable to the UK CAA and genuine provenance of the actual aircraft will have to be demonstrated and recorded in the Applicant's design report submission.
- 2.16 However, provided that there is no conflict with the aircraft it is painted to represent (it is not acceptable to have two aircraft painted with exactly the same scheme and serial) the aircraft does not have to be physically marked as the donor aircraft, this only needs recording in the documentation.

Replicas and Reproductions

- 2.17 A replica aircraft is a copy of an aircraft of historical significance that has been constructed to the original design. It may be possible for such a replica to be considered for the issue of a Permit to Fly, provided that it is not intended to be series manufactured. Approval for the construction of replicas will normally be limited to single examples which conform to the original design. There are exceptions to this, for example where the original manufacturer has re-opened a new production line based on the original drawings and jigs. Any design changes, which, for example, might be to improve the safety characteristics, or to allow substitution of obsolete materials, should be discussed and agreed with the CAA. Examples of these would be the new build Yak-3 and Yak-9 aircraft (albeit powered by Allison engines in place of the original Klimov units).
- 2.18 Replicas of ex-military aircraft may be accepted for the issue of a Permit to Fly using similar investigation processes to an original aircraft. Aspects to be considered when deciding whether a replica may be accepted include:
- a. The likely number to be constructed;
 - b. The design standard adopted, including modification to the original standard; and
 - c. The production facilities and processes.
- 2.19 Other reproduction aircraft may be considered. These are a reasonable facsimile in appearance and construction of an aircraft made with similar materials, and having substantially the same type of powerplant and operating systems. An example of

this is the Yak-11 conversion to Yak-3/Yak-9 facsimile. In this case, as the original manufacturer and construction methods are not employed, the CAA will need greater assurance of the design and construction methods. For example, a material substantiation for the increased loads due to the change in capacity would be required – engine bearers, primary structure etc.

Flight Test and B Conditions

- 2.20 Each aircraft is required to have a flight test at the end of its restoration. In general this will be conducted by a suitably experienced pilot following discussion on the required Flight Test Schedule. It is however recognised that some specialist restoration and maintenance organisations have the same requisite capabilities as BCAR A8-9 organisations conducting flight trials under B Conditions. It is therefore considered that organisations that can demonstrate they have the necessary capabilities and arrangements in place that they could apply for an A8-9 B Conditions approval in order to allow themselves to self-authorise flight tests within the scope of their business.
- 2.21 Guidance on conducting Check Flights, eligibility of pilots and the relevant Schedules is contained with CAP 1038:
<http://publicapps.caa.co.uk/docs/33/CAP%201038%20JAN17.pdf>

Chapter 3 Criteria for the Issue of a Permit to Fly

General

- 3.1 Before an aircraft can be issued with a Permit to Fly, its design must be shown to satisfy an acceptable 'basis for approval'. The criteria for approval that may be used are dependent upon the types of aircraft concerned and are listed in BCAR Section A, Chapter A3-7.
- 3.2 Part of the basis for approval of ex-military aircraft is service experience (BCAR Section A, Chapter A3-7, paragraph 3.4). However, although it can be difficult to determine the numbers of accidents that have occurred, their causes and the aircraft utilisation, all of which will be relevant to an assessment of airworthiness, the onus is on the applicant or BCAR A8-25 Organisation to establish this information. When assessing service experience, incidents can be ignored if it is clear that they were due to specific military operations that would not occur in civil use. The service experience acceptance criteria depend on a number of factors including the complexity criteria (see BCAR Section A, Chapter A8-25) and the mass of the aircraft.
- 3.3 Service experience can be useful in determining that an aircraft or component is safe, but it has to be used with caution and cannot be used where it conflicts with the need to meet specific requirements.
- 3.4 In the case of the first of a new aircraft type to come on the register, an in-depth test flight will be needed to show compliance with the flight requirements. As noted in Chapter 2 Paragraph 1.5, in general this will be conducted by a delegated suitably experienced pilot following a briefing on the required Flight Test Schedule, or by a contracted CAA Test Pilot.

Complexity Categories - Determination and Consequences

- 3.5 If the CAA has not previously accepted an example of the type, the company A8-25 Supplement 2 signatory will normally propose a complexity category (BCAR A8-25 Supplement 2 Paragraph 1.2). In some cases, such classifications are easily assessed, but others may be very marginal. The company signatory may be required to make presentations to the CAA in order to justify the complexity classification. These presentations will include sufficient information on the design features of the type (including such as technical descriptions and Pilots Notes etc.) to justify the proposed classification. Specialised support and additional maintenance arrangements that may also be required are factors for consideration during classification.

- 3.6 In cases where the decision between Intermediate and Complex is marginal, these decisions are referred to an internal CAA Review Panel with a formal paper produced by the DLS based on the information of Paragraph 3.5 as noted above. In such cases, it is usual to cover the acceptability of the safety record concurrently.
- 3.7 Criteria for the classification by the CAA of ex-military aircraft as 'simple', 'intermediate' or 'complex' will be made according to the definitions shown in BCAR Section A, Chapter A8-25. However, to determine complexity category the following may be helpful:
- a. To distinguish between *Simple* and *Intermediate*:
 - *Simple* types are single piston engined fixed wing types only
 - All ex-military rotorcraft are at least *Intermediate*
 - The inclusion of ejection seats would render an aircraft at least *Intermediate*
 - b. The distinction between *Intermediate* and *Complex* classifications is not so definite and some distinguishing features that help the CAA determine classification are:
 - An aircraft may be classified *Complex* if the maintenance involvement is judged to be difficult or high, either because of packaging density within the airframe or because of the sheer extent of it. Examples include the Lightning, Harrier/Sea Harrier, Jaguar and the Vulcan respectively.
 - The general philosophy is that if powered flying controls are fitted, manual reversion must be possible in order to be able to control the aircraft away from populated areas or crowds in the event of a power control failure. This is why the AAN for the Sabre accepts the F-86A only as being eligible for the issue of a Permit to Fly in the *Intermediate* category. However, a dual powered system may be regarded as an acceptable alternative.
 - Auto-stabilisation systems (i.e. active control) that are required full-time would make the aircraft *Complex*.
 - Reheat does not necessarily render the aircraft *Complex*, as the system may consist of little more than a High Pressure pump and in cases of civil approval maximum weights achievable will be such that take-off performance would not be compromised significantly by failure of the system. For example, the MiG-17 has reheat and has been accepted for approval. However, the required use of throttleable reheat or the requirement for reheat on the remaining engine in the event of an engine failure would render the aircraft in the *Complex* category.
 - If the whole fuel system operates at high pressure (e.g. Lightning) this will incline the classification towards *Complex*.

- Reliance on integrated digital controls (such as Fly by Wire/Fly by Light), Electronic engine controls (FADEC), or reliance on EFIS/HUD will incline the classification towards *Complex*.
- Reliance on blown flying controls such as fitted to the Buccaneer will lead to the classification as being *Complex*.
- Reliance on reaction controls during any phase of flight to be approved will render the aircraft *Complex* (e.g. the Harrier in the hover).
- Use of advanced materials (e.g. Carbon Fibre Reinforced Composite or metal matrix composites/aluminium lithium) in primary structure will incline the classification towards *Complex*.

3.8 In the event of an aircraft being classified as *Complex*, the formal involvement of the original manufacturer (or a suitable, CAA accepted, equivalent design organisation) is required in the continued airworthiness support of the aircraft to be approved. This is to be written into the BCAR A8-25 exposition, countersigned by the OEM, and will cover OEM agreement of:

- a. Safety record;
- b. Design submission for initial approval;
- c. Justification of any post-service modifications;
- d. Continued airworthiness of the aircraft including particular aspects, which rendered the aircraft *Complex*;
- e. Confirmation of acceptability at each Permit renewal (at least annually).

3.9 Some types may only be considered supportable by the military service who operated them (where the service has taken on type airworthiness responsibilities) or by the original manufacturer. The Exposition of organisations approved to support *Complex* aircraft should include procedures detailing the necessary interface with the manufacturers providing support for the aircraft and of its critical equipment, and/or potentially an acceptable Military Authority. The nature and depth of such procedures will be subject to the agreement of the CAA. These procedures will also be required in the exposition referred to in subparagraph d) above.

3.10 In all cases where the type continues to be actively supported by the manufacturer (for example when the type is still in operational service), arrangement should be made where possible with the manufacturer to provide copies of all continued airworthiness information (i.e. Safety Bulletins, ST Instructions etc.) to the organisation and the CAA.

Assessment of Safety Record (BCAR A3-7/B3-7 Appendix 1 Paragraph 2.1)

- 3.11 A formal assessment of the safety record is not necessary on types classified *Simple*, unless they are known to have a poor record, or they embody a highly unusual or hazardous feature such that the CAA considers this kind of justification is warranted. Additionally, for simple types detailed records may not be available to substantiate a quantifiable safety record. However, the reputations of such aircraft are generally known and these aircraft have been accepted on this basis, and subsequent examples accepted on the basis of precedent. If a new type were to be considered, the DLS knowledge of the type may be supplemented by a literature survey, consultation with recognised experts etc. in order to make a qualitative assessment as to the acceptability of the type on the basis of service experience.
- 3.12 Investigation of *Intermediate* and *Complex* aircraft of a specific type that the CAA has not previously accepted will commence with a demonstration that the aircraft type has a safety record in service acceptable to the CAA for its intended use. Combat losses or those directly attributable to specifically military operational causes may be discounted but appropriately qualified personnel should make a review employing such judgements. Aircraft loss rates are required, rather than fatal loss rates as such, since the occupants may have ejected. Data should be presented per million flying hours. Data should be such that the statistical nature of the basis of acceptance of the type remains valid i.e. the larger the fleet and the more flying hours, the better. Copies of the military records used to produce the statistics should be provided to the CAA for it to make its assessment of what may be discounted.
- 3.13 The organisations procedures should include presentation of the safety record (total loss and fatal accidents per million flying hours) to the CAA for assessment prior to commencement of the main investigation of design and build standard. The design signatory accepted by the CAA for the purpose will make such presentations.
- 3.14 It may be found that a particular aircraft was hazardous in specific operational circumstances, or that particular modifications rendered the aircraft hazardous. In this event, it may be that application of revised limitations may render the aircraft type acceptable to the CAA. For example, the Sea Vixen's record suffered by the inclusion of carrier borne operations, with their hazardous nature and lack of diversion availability, particularly when coupled with a fuel system that was difficult to handle manually. The aircraft safety record was rendered acceptable with such operations prohibited, and with the fuel system to be operated in automatic mode; complexity was agreed by the ARB as *Intermediate*.

- 3.15 More stringent targets may be set for *Complex* types. In the case of *Complex* aircraft, in most cases, the CAA will require that the OEM support such safety record submissions. The Design Liaison Surveyor will provide written confirmation of both complexity category and acceptability of the safety record (and of any appropriate provisos) to the applicant once these are agreed.

Chapter 4 Modifying or Repairing a Permit to Fly Ex-Military Aircraft

Who to apply to for approval of a modification or repair

- 4.1 Applications for the approval of modifications or repair in respect of Permit to Fly aircraft shall be made to the CAA. In the case of a minor modification, approval may be via an appropriate BCAR A8-21 organisation. Ex-military aircraft overseen by CAA will require a submission for major alteration to be made via an appropriately approved company.

Contents of an application for a modification

- 4.2 In general, all applications should contain the following:
- a. Drawings, systems diagrams and schematics.
 - b. Justification, including structural evidence as appropriate.
 - c. A report showing compliance with the relevant paragraphs of the applicable certification standard.
 - d. If necessary, a proposal for any ground and flight testing that may be required before the modification can be approved.
 - e. A revised mass and balance report for the modified aircraft (or if not yet modified, a prediction of the effect on mass and centre of gravity).
 - f. Maintenance manual/inspection schedule changes.
 - g. Flight Manual/Pilot's Notes changes.
 - h. Requirements for Continued Airworthiness information.
- 4.3 Modifications are treated according to whether they are classified as 'major' or 'minor'. In some cases, modifications may be very minor, such as replacement of fittings with NATO standard, for compatibility with western aerodrome equipment and services, or replacement of metric instruments with UK standard. Precise definitions will vary between organisations. Classification will be agreed or made by the CAA or by an A8-21 organisation. The following relative differences should be considered:
- a. A Major Modification is one that involves a change to the state of an aircraft which affects the design of the primary structure, flying controls, aerodynamic surfaces, (in most cases) engine(s), flight characteristics or its ground handling. Alternatively, the term may be applied to a collection of minor changes that in combination result in a complex situation.

- b. A Minor Modification is a change in the design or construction of an aircraft that does not meet the above classification. Appendix 2 to BCAR A8-21 should be referred to for guidance.

Where to find help in preparing a submission for a modification

- 4.4 An applicant, particularly when a major modification is involved, should enlist the help of either a professional engineer or a CAA approved design company. The CAA should be consulted as to whether the individual or company is acceptable.
- 4.5 For Major Modification applications to the CAA, the application should come from an approved design organisation. These are listed on the CAA website.
- 4.6 To approve a design change that has an impact upon the aircraft's operation, a qualitative risk assessment will be necessary. Any amendments to original limitations and procedures specified in the Military Aircrew Manual will need to be established and implemented via a Supplement, which will be referred to in the AAN. For more substantial modifications, design substantiation will normally be submitted by an appropriate design approved organisation. An example would be justification of new replacement materials employed in a restoration of a *Simple* type. In this latter case, the basis of approval would be retention of equivalent strength. In other cases, an appropriate basis of approval must be identified and agreed with the CAA. Appropriate parts of BCAR Section K, JAR-23 and CS-23 have been employed for this in the past.

Standard Parts and Standard Modifications

- 4.7 Ex-military aircraft are dealt with as complete entities. This means that the final AAN for Permit issue provides a consolidated clearance of the various modifications that have been embodied on that aircraft. This may not necessarily make it clear whether a series modification, i.e. one which can be applied in a more generic sense to aircraft of the same or similar type, is approved for other aircraft. However, where identical modifications have been approved previously *for the same type and applicant* due account of this is taken when assessing the application of the modification to the subsequent aircraft. Additional expanded guidance will be included in Appendix 5 and also may be found within CAP 1419.

Standard parts: Standard parts may be used under certain controlled circumstances.

- 4.8 Standard Parts – Critical nature

Bolts or fasteners used in areas of a critical nature which are replaced by bolts or fasteners of equal, or improved, specification with regard to dimensional tolerances and material properties should be authorised by modification procedure, (CAA Mod procedures apply), or be in accordance with the product support publications of the aircraft Type Certificate Holder or Type Design (See CAP 562, Leaflet 1-14).

In the event of an Airworthiness Approval Note (AAN) applying to a particular restoration project the Airworthiness Surveyor will ensure conformity with the AAN.

4.9 Standard Parts – Non-critical nature

It may be acceptable to replace original bolts or fasteners used in areas of a non-critical nature with items of equal, or improved, specification with regard to dimensional tolerances and material properties.

In the event of an Airworthiness Approval Note (AAN) applying to a particular restoration project the Airworthiness Surveyor will ensure conformity with the AAN.

4.10 Standard Modifications: As ex-military aircraft are not treated as series aircraft, modifications have to be justified for each individual aircraft. However, it is recognised that in some cases identical modifications have hitherto had to be submitted for subsequent aircraft of ostensibly same types. It is therefore considered that certain modifications, such as specific material substitutions or the use of standard additional systems on engines may be given a standard approval provided the initial modification is submitted by a suitably approved organisation and the item released under a suitable approval. It is recognised that it would be beneficial if, when a modification is the same as that previously approved in every respect, it could be used on subsequent aircraft without further approval. This saves unnecessary investigation on the part of the CAA and cost to the industry. However, the limiting factor is that the modification has to be the same in each respect. Any change invalidates the modification approval, however insignificant it may appear. Agreed examples:

- a. Hurricane
 - i. Fuselage, centre section etc. material replacement;
 - ii. Hydraulic pump fitment;
 - iii. Installation of 24v electrical system.
- b. Spitfire
 - i. Nested spar materials;
 - ii. Engine pre-oil system

4.11 Modification ownership: The applicant for the AAN normally owns the data approved under the modification. This clearly imposes restrictions on who can use this data as it clearly becomes propriety data. This ownership of data also leads to a potential overlap in modification requests and clearances. This may be an issue for the ex-military community to consider as it may be beneficial to have the ability to use certain modifications on vintage and ex-military aircraft on a series basis without re-investigation.

4.12 Use of a standard modification may be used subject to the 'owner's agreement' provided the applicable modification information and components are made available.

- 4.13 Material replacements: It is not CAA practice to insist on material release from CAA approved sources for aircraft operating on a Permit to Fly. Some material specifications employed in the 1940s and 1950s may be difficult to match with modern materials. If the original material is unobtainable, the applicant should contact a suitable DOA for an alternative specification, unless this has previously been approved. For components of a critical nature, premium selection procedures may apply. Premium selection is such as the testing of each length of tube or material used to ensure it meets the required properties.

Fabrication Element under the A8-23/24 Approval

- 4.14 For many organisations that held the A8-20 approval, and who were involved in ground up restorations, the capability for fabrication already existed. What has been required therefore is reinforcement of the importance of using the correct manufacturing/fabrication techniques and processes. With the introduction of BCAR A8-23 (specifically Paragraph 9.3) and A8-24 (specifically Paragraph 5.1), the ability for suitably approved organisations to manufacture or fabricate components and assemblies has been introduced. A capability list and procedures for this should be included in the company exposition for agreement and approval by the assigned GAU Airworthiness Surveyor. Guidance and Advisory Material will be developed in relation to this and included within this CAP when available.
- 4.15 Additional expanded guidance will be included in Appendix 5.

Chapter 5 Maintenance Inspection and Revalidation of an Aircraft Issued with a Permit to Fly

Background

- 5.1 Air Navigation Order Article 40(3) states that a National Permit to Fly shall be issued by the CAA 'subject to such conditions relating to the airworthiness, operation or maintenance as it thinks fit'. Article 41 has provision for the Permit to Fly to cease to be in force if a Mandatory Permit Directive is not complied with or any inspection or maintenance required as a condition on the Permit to Fly is not completed.
- 5.2 Paragraph 8.2 of BCAR Chapter A3-7 refers to a Permit to Fly containing in certain cases 'any relevant maintenance requirements that are to be complied with'. Paragraph 9.2 refers to the issue of a Certificate of Validity and Appendix 4 in turn makes reference to all maintenance being carried out in accordance with the accepted maintenance programme.

General

- 5.3 Every aircraft requires periodic inspection and maintenance in order for it to remain in an airworthy condition. Whether used extensively or not, it will suffer from exposure to conditions that may initiate the onset of corrosion and general deterioration. This will be particularly true when it is routinely kept outdoors, or when used infrequently. Aircraft that are flown on a regular basis will accumulate normal wear and tear of moving components and this can extend to include static components through exposure to flight and ground loads and vibration. Extensive flying will obviously expose the aircraft to more extensive wear and in some cases may require additional inspections to be made. For example, an aircraft used for training or landing practice will require more detailed and regular inspection and in particular of the undercarriage and brake systems.
- 5.4 The basic premise upon which a Permit to Fly is issued and is kept valid is the satisfactory continuing airworthiness status of the aircraft. This can be achieved in a variety of ways but it is a fundamental principle of established airworthiness system to maintain the aircraft in accordance with a predetermined inspection regime supported by a number of maintenance interventions such as lubrication and/or component changes. Where a manufacturer supports the permit aircraft by virtue of it being an ex-military type or an ex-type certificated aircraft it is likely that the maintenance requirements may have been defined already. It is important therefore that some consideration be given to what maintenance is required in order that the aircraft's airworthiness can be assured.

- 5.5 The responsibility rests with the aircraft owner who must ensure that the aircraft is serviced and inspected periodically. Maintenance must be carried out methodically to a maintenance schedule agreed with the CAA to ensure that the inspections are timely and appropriate. For very basic aircraft, this may be a simple schedule of visual inspection points based on a manufacturers schedule and submitted to CAA. More complex aircraft may, however, require a detailed maintenance schedule that takes into account the specific recommendations of the aircraft or component manufacturer, including where appropriate, component overhaul requirements and the accomplishment of structural non-destructive inspection (NDI) techniques.
- 5.6 A record of the inspections and checks, as well as any defects found, must be kept so that a history of the aircraft can be built up. The entries of work carried out should be recorded in the aircraft engine and propeller log books, as required by Article 227 of the Air Navigation Order 2016 (ANO). The entries required are those listed in Schedule 7 of the ANO and must include details of inspections, repairs, replacements, modifications and overhauls carried out. It should be noted that whilst the log books may contain a summary of the work carried out, the extent to which this can be done may be dependent upon the existence of more detailed inspection worksheets. These will, in turn, form part of the aircraft log book and must be retained.
- 5.7 If as part of the process of qualifying for the issue of a Permit to Fly a Permit to Test or Ferry is required, these are issued by the CAA.
- 5.8 If a Permit Flight Release Certificate (PFRC) is required in accordance with BCAR Section A, Chapter A3-7, the whole aircraft is to be certified for flight by an authorised person.
- 5.9 If any maintenance is carried out, except that carried out by the pilot, while a PFRC is in force, a 'Permit Maintenance Release' (PMR) will be required to certify the work carried out.
- 5.10 When a Permit to Fly (other than a Permit to Fly for test or ferry purposes) is issued:
- a. The aircraft will also be issued with a 'Certificate of Validity' (C of V) which will then be re-issued annually.
 - b. A PFRC will not be required, if the C of V remains valid.
 - c. A PMR will be required following any maintenance other than that covered by paragraph 2.10.
 - d. If the C of V is allowed to expire, a 'Permit to Test', a PRFC and a PMR will be required.

- 5.11 Unless the aircraft is maintained under the auspices of an organisation approved under BCAR A8-23/24 (where the responsible persons are authorised under the terms of the organisation approval), the PFRC and PMR must be certified by a person authorised by the CAA in accordance with BCAR Section A Chapter A3-7.
- 5.12 For aircraft below 2730 kg MTWA operated on a Permit to Fly, pilot maintenance may be carried out in accordance with either the prescribed repairs and replacement privileges in the ANO, Section 3 Part 4; Regulation 12; or for those aircraft with a Permit to Fly validated by a person approved by the CAA for that purpose, pilot maintenance may be performed to the extent permitted by the procedures of that organisation. For pilot maintenance, the issue of a Permit Maintenance Release (PMR) is not required.

Maintenance of aircraft formerly issued with a Certificate of Airworthiness

- 5.13 An aircraft that would have normally qualified for a Certificate of Airworthiness may have been issued with a Permit to Fly if it was no longer being supported by a type certificate holder or manufacturer. These aircraft were manufactured under a type certificate and the design and maintenance documented. An example would be the Harvard/T-6 series where some are eligible for a CofA and some for a permit to Fly depending on the manufacturer.
- 5.14 The documentation provided by the manufacturer will, normally, consist of maintenance manuals, service manuals and other service information. A structural repair manual giving details of permitted repairs on the aircraft structure may also be available. An aircraft owner must not deviate from the procedures in these manuals, unless the change is supported by the manufacturer or another organisation and is approved by the CAA.
- 5.15 Owners of aircraft which have been manufactured according to a type certificate or an equivalent standard, will normally be required to use the appropriate replacement parts specified by the original manufacturer. Where the manufacturer is no longer supporting the aircraft type it may be possible to obtain alternative parts which can be used in lieu of the original specification; these will include items made under a Federal Aviation Administration (FAA) Parts Manufacturing Authorisation (PMA) for use on products of American origin. Unless specifically approved by the CAA, PMA parts may not be used on an aircraft originating in a State of Design other than the USA. Unapproved parts, those not approved either by the manufacturer or through a PMA approval, may not be used unless approved for installation on that specific aircraft according to a suitably approved minor or major modification.
- 5.16 Where the manufacturer lists details of overhaul periods or the limited life of certain critical components, these shall be complied with unless otherwise agreed by the CAA. Where the manufacture has not listed lives of such as engines or propellers, these may need to be agreed with the Design Surveyor in terms of Fatigue Index/Calendar time based on the usage and recorded in the AAN.

- 5.17 Airworthiness Directives, mandatory modifications and inspections, or airworthiness instructions of a mandatory nature, which are applicable to an aircraft type operating under a Certificate of Airworthiness, will apply to aircraft of the same type even if these are operated on a Permit to Fly (Reference CAP 661 MPD 1995-001 R5).

Maintenance of ex-military aircraft: Maintenance Schedules/Programmes

- 5.18 A maintenance schedule is an identified compilation of actions such as inspections etc. that provide a means of detecting the likely degradation of the aircraft structure, its systems and any defects that may occur in service. It is the primary means of determining the aircraft's continuing airworthiness status.
- 5.19 A generic schedule, such as the CAA LAMS document, provides a range of basic inspections and checks that could be customised to reflect the specific needs and systems installed in a particular aircraft. This is important as the installed equipment, and therefore the inspections needs, can vary between two examples of the same aircraft type. However, LAMS does not provide a suitable schedule for most ex-military aircraft, or any aircraft above 2730 kgs. It is important for ex-military aircraft that the original manufacturer's recommendations are followed as well as any military requirements that may have supplemented them. This ensures that the military in service experience of the type is reflected in the maintenance and inspection required to sustain airworthiness.
- 5.20 This position is often written in as an element of the associated AAN. It should be noted that the AAN, as it defines the status of the aircraft with regard to Permit issue belongs to the aircraft and not the applicant or maintenance organisation. The maintenance provision is however not always visible and it is recognised that it would be better to have some basic requirements for a maintenance schedule rather than something derived from the wording in an AAN. This will therefore be included in the Permit to Fly Conditions.
- 5.21 The continuing airworthiness requirements are normally specified and outlined in the AAN. This often relates only to the original military servicing schedules, which were based upon manufacturer's programmes and much higher levels of annual utilisation. In some cases, the AAN refers to use of the CAA LAMS schedule, despite the weight and complexity of the aircraft, e.g. Spitfire, not aligning with that simplistic approach. It is therefore essential that schedules or programmes are developed that reflect the most appropriate information for the specific operation.
- 5.22 An ex-military aircraft will have been maintained in accordance with well-defined maintenance programmes and schedules which took into account the operational environment and the way the aircraft were used. They may have included specialised checks such as non-destructive testing and also have maintenance actions on operational equipment. It is important that all of these requirements, where appropriate, are complied with during the maintenance.

- 5.23 The maintenance data will be agreed by the CAA and this will be referenced in the AAN associated with the issue of the Permit to Fly. In the case of ex-military aircraft this will normally refer to the military publications for the aircraft type. The maintenance schedule for the aircraft will need to be reviewed and amended to take account the utilisation and type of operation. The flying hour related tasks may need to be converted to appropriate calendar periods.
- 5.24 Some aircraft are fitted with fatigue meters to record details of the usage spectrum during each flight. This data is used in conjunction with defined procedures to calculate the used life of the aircraft which take into account the method of operating. An example of this is aerobatic flying which may accumulate fatigue at three or four times the rate of normal flying. This method of working ensures that due attention is paid to maintenance activities according to the use of the aircraft. Where fatigue meters are not fitted or are unserviceable, the CAA may still require usage factors to be considered and taken into account, dependent upon the original design criteria and this will be recorded in the AAN.
- 5.25 Ex-military aircraft may have specific life limits for the aircraft structure or critical components defined by the manufacturer, these limits must not be exceeded. Where the manufacturer permits further operation for a period dependent upon the embodiment of additional modifications by more comprehensive and in-depth maintenance checks, these must be carried out before an extension to the operating life will be agreed. There will be no extension of aircraft life limits beyond those that are defined and supported by the manufacturer.
- 5.26 Ex-military aircraft may have safety equipment necessary for the type and nature of military operations, primarily ejector seats. BCAR Section A, Chapter A8-25 requires special provision for the maintenance of this equipment to be included in the maintenance programmes. It is also required that appropriate organisations are available to provide for the overhaul of these items. Ex-military aeroplanes above 2,730 kg MTWA and ex-military rotorcraft of any weight are required to be maintained by organisations approved to BCAR A8-23/24. This imposes restrictions on the level of maintenance that may be performed by the owner.
- 5.27 Spares for ex-military aircraft should, whenever possible, be obtained from original sources or through known and reputable distributors as verified by an organisation's Quality Audit system. It is important that the owners of ex-military aircraft ensure that spares conform to the original design standard, are compatible with the modification standard of the aircraft, are serviceable and within specified operational and storage limitations. Additional information relating to procurement of spares can be found in BCAR A8-23/24.

- 5.28 Where the aircraft is one which is of an historic/vintage nature, original spares may not be available. Agreement from the CAA must be obtained to manufacture spares to original drawings through an approved supplier such as (but not exclusively limited to) a BCAR A8-21 manufacturing organisation. An organisation that is approved under BCAR A8-23/24 may also be able to manufacture certain items locally as agreed by the CAA. Where the aircraft is being extensively restored or substitutions are being made for materials that are no longer available, the agreement of the CAA must be obtained.
- 5.29 Where the aircraft is ex-military and not required to be maintained in accordance with BCAR Section A, Chapter A8-23/24, the CAA will oversee the project directly to agree the maintenance that is required and to authorise the nominated engineering staff. Alternatively, the aircraft may be transferred to LAA oversight if within the scope of their terms of approval. In either case, the owner remains responsible for ensuring that the required maintenance is carried out.

Low Utilisation and Calendar Lives

- 5.30 It is clear from the manner in which permit aircraft are operated that in many cases the actual utilisation of the aircraft is very low – often less than fifty hours per year. In addition, the history of these aircraft can include extended periods parked or in storage. This does not reflect the expected utilisation upon which a manufacturer may have developed an outline schedule of inspections. In practice, there is a danger therefore, that critical inspections may be not be accomplished for a number of years simply because they are hourly based and the utilisation is less than that expected.
- 5.31 For maintenance schedules to be effective there clearly needs to be a balance between the required inspections and its likely effectiveness taking into account the time between inspection events. If the utilisation does not reach the expected annual figure upon which the schedule is based then an alternative inspection strategy needs to be considered and adopted.
- 5.32 In some instances, this requires hourly-based inspection items to be reviewed and a calendar backstop implemented. However, the aim should not be to end up with a prescriptive and restrictive schedule but one which provides that balance between the low utilisation and the likely onset of deterioration.
- 5.33 Some manufacturers made provision for low utilisation schedules when, for example, a product was in military service. That low utilisation was never anticipated at the levels being seen on many permit aircraft. Care must therefore be taken in interpreting data, which at first glance appears to suit operational circumstances. Consideration therefore needs to be given for the provision of additional guidance on the effects of extreme instances of low utilisation on manufacturer's data and their impact on modern maintenance schedules.

- 5.34 There are many instances where lives have been set for components, such as seals etc. where the continuation of an hourly-based inspection/replacement regime does not account for a potential degradation of the seal material due to system inactivity or the resulting calendar period. The same applies to the overhaul lives for ancillaries such as fuel and air system components. There have been several accidents where such degradation or failure of fuel system components has been a causal factor. There is therefore a need for the identification of overhaul lives for seals, fuel components and other ancillaries as well as the process for approving replacement degraded seals, fuel components and other ancillaries.
- 5.35 In many cases, additional inspections may provide an element of compensation for this. However, the need to replace seals or internal components within such as fuel and other control systems needs to be carefully considered, irrespective of the apparent satisfactory operation of the system at a point in time. For example, air system leaks such as on bleed valve scheduling controls are also a concern, and have been identified by AAIB as possible contributors to past events. A philosophy of adopting a condition monitoring approach on older aircraft is not necessarily acceptable. The aircraft and its systems were not designed with such a philosophy in mind. Some trending of basic performance parameters may however contribute to ensuring continued airworthiness.
- 5.36 The need to consider component lives is also very much true for engines and rotatable/finite life components. In many cases, these critical components are no longer subject to support from the manufacturers. The normal continuing airworthiness information that would be promulgated with such support is therefore missing, particularly with regard to the effects or implications of ageing aircraft and systems. In addition, there is little information available from service regarding the current condition of these components. In addition to the manufacturers recommended overhaul periods, calendar lives may need to be applied for preventative maintenance. These limits will be specified in the AAN raised for the aircraft.
- 5.37 Whilst the CAA has published some data with regard to engine overhaul lives, e.g. GR24, this document applies only to piston engine designs up to 400HP and does not cover all the designs which are fitted to ex-military aircraft. There is ongoing concern over the potential effects of corrosion on both critical and non-critical engine components within engines found on ex-military jets operating on permits. The failure of a non-critical part (e.g. single blade, gear drive shaft) will usually result in the loss of the aircraft. Even on twin engine aircraft, the loss of performance if one engine fails following a non-critical part failure can result in loss of aircraft in certain phases of flight). Likewise, the full effects of ageing on the early design of some light aircraft engines, e.g. the Gipsy Major, are not well known, particularly if the issue of availability of spares is accounted for.

- 5.38 There is therefore a need for amendment of GR24 to address higher powered piston engines and the issue of separate requirements to address turbine design engine overhaul life limits in Permit aircraft. CAA will carry out these initiatives in conjunction with Industry. Additionally, the CAA has issued CAP 562 “Civil Aircraft Airworthiness Information and Procedures”, Leaflet 70-80, “Guidance Material for Ageing Engine Continuing Airworthiness”, and a further two MPDs relating to ageing engine issues, 2016-001 and 2016-002.
- 5.39 Further Guidance will be issued in Appendix 6 to this CAP
- 5.40 There is a shortage of information on ageing aircraft systems and wiring, particularly in ex-military aircraft. This too gives rise to a cause for concern. It is recognised that where extensive restoration has taken place the original components will have been refurbished and perhaps wiring replaced. However, there are many instances for this to remain an issue where little has been done to the aircraft and its original build standard. This was highlighted in the Haddon-Cave report following the Nimrod Review that drew particular attention to the degradation over time of such components including seals. Guidance will be therefore established for ageing aircraft, system and wiring.
- 5.41 Further Guidance will be issued in Appendix 6 to this CAP

Approval of Maintenance Schedules

- 5.42 A maintenance schedule for a Permit to Fly aircraft does not always have to be approved by the CAA but it does need to be suitable for the intended purpose. Most maintenance schedules for permit aircraft are accepted. It is therefore incumbent on the aircraft owner/operator to ensure that the requirements are met, in conjunction with the certifying engineer. However, it is also incumbent on the CAA to ensure a consistent approach in how maintenance schedules are accepted or approved, both at initial issue and for subsequent amendments.
- 5.43 As experience has been gained on generating bespoke maintenance schedules, the information in the AAN may have become out-dated. Additionally, as noted above the AAN is applicable to the specific aircraft and if it changes operator, the maintenance might need to be revised. There is therefore a requirement to review existing AANs where it is known that there is changed or more appropriate maintenance that can be referred to.
- 5.44 The general requirements for the approval of maintenance schedules and programmes are in BCAR Section A Chapter A6-1 Supplement 4. Whilst these are applicable to aircraft operating on a Certificate of Airworthiness, the general principles behind the maintenance schedule development still apply.

- 5.45 BCAR Section A, Chapter A3-7 specifies that an applicant for a Permit to Fly must demonstrate how the aircraft has been maintained and overhauled, including those elements relating to lifed components. It also states that applicants must demonstrate how they will provide the competence and the resources necessary to maintain the aircraft in the future. In this respect, a maintenance schedule will go some way to satisfying these requirements.
- 5.46 BCAR Section A, Chapter A8-25 also contains information on what is expected of the organisations in respect of the development of maintenance schedules for ex-military aircraft, and include information on typical features of these aircraft, such as ejector seats, their pyrotechnics and the procedures to be followed.
- 5.47 The Light Aircraft Association (LAA) will provide additional guidance to their members regarding acceptable programmes for aircraft under their control.

Service information provided by manufacturers

- 5.48 A manufacturer can take account of the in-service experience of all of its fleet, providing that any significant evidence of defects or deterioration has been reported to them. The continuing airworthiness information published by them, whether it is a maintenance manual, service bulletins or other service information can make the difference in ensuring the aircraft is maintained properly.
- 5.49 An aircraft in service may suffer a failure of a component, or of a system, which gives rise to concern about the continuing airworthiness of the aircraft type. In the case of a type certificated aircraft the manufacturer may issue service information. This may take the form of a service bulletin, or service letters, etc. that define the inspections, modifications or other work which is considered necessary to determine if the failure condition is present or to correct an unsafe condition. These inspections may be classified as 'mandatory'.
- 5.50 For aircraft that were type certificated but are now operating on a Permit to Fly, the National Aviation Authority (NAA) of the State of Design will normally issue an 'Airworthiness Directive' or equivalent notice to address potential hazards. For such aircraft the CAA will normally require compliance with these Airworthiness Directives, as notified in CAP 661 'Mandatory Permit Directives'.

Mandatory Permit Directives and Airworthiness Directives

- 5.51 The other key issue to bear in mind is the mandatory information promulgated by the State of Design or the State of Registry. This could be Airworthiness Directives or Mandatory Permit Directives and is to be ignored at peril. Whilst it is accepted that a Permit to Fly aircraft does not need to meet ICAO international standards, it is erroneous to believe that because a type certificated engine is installed in a Permit aircraft the AD can be ignored. ADs and MPDs ought to be included in any maintenance schedule for the aircraft type.

- 5.52 MPD1995-001 R5 Applicability of ADs to UK PtoF aircraft (of a type that previously operated on a UK CofA) addresses this.
- 5.53 It is necessary for the owner to ensure that mandatory inspections and Airworthiness Directives for the aircraft, engines and its components are carried out. Where the CAA identifies an unsafe condition, on an aircraft type with a Permit to Fly, a 'Mandatory Permit Directive' will be issued requiring inspection of the aircraft for that particular defect and its rectification. The LAA also issue safety bulletins as part of their continued airworthiness support for those types operating within their organisation. This may also result in a CAA MPD.
- 5.54 Where the aircraft is supported by a manufacturer but is not designed and built to a type certificated standard, e.g. an ex-military aircraft, the manufacturer may identify a hazardous condition and issue appropriate service literature. However, the NAA of the State of Design will not normally issue an airworthiness directive since the aircraft is not type certificated. In such a case the UK CAA will consider the content and implications of the service literature that has been issued and, if appropriate, will issue a Mandatory Permit Directive (MPD) for the aircraft based upon that information. The MPD will state the work that is required and the timescales in which it must be accomplished.
- 5.55 Where the aircraft is not supported by a designated manufacturer or type certificate holder the CAA may still decide to issue an MPD to address an unsafe condition. This will, in the absence of specific inspection criteria issued by the manufacturer, normally result from a defect report or an occurrence report sent to the CAA. The CAA will decide the nature of the inspection required and issue an MPD to detail the work required.
- 5.56 Certain equipment, such as the engine or propeller may be to a type certified design, in which case, the requirements of any airworthiness directive in respect of that equipment should be complied with.

Maintenance and installation of radio equipment

- 5.57 Attention is drawn to the installation and maintenance of radio equipment. In accordance with ANO Article 77:
- a) It must be of a type approved for use by the CAA;
 - b) It must be installed in an approved manner;
 - c) It must be maintained in a serviceable condition, with appropriately authorised radio engineers certifying for any such work.
- 5.58 Approval of the radio installation in an aircraft with a Permit to Fly forms part of the aircraft radio licence issued by CAA Directorate of Airspace Policy. Changes to

radio equipment are mods and require approval by the CAA or an approved organisation. This can be part of the initial approval or may be a standalone modification. It is acceptable to CAA for the removal of redundant radio/avionic equipment providing the system is made safe by such as capping cables, removing fuses and the prevention of re-instatement etc. This should be covered by a modification submission as it may affect such as the Weight and Balance Schedule. This may in certain circumstances be a standard modification. See Appendix 5 for guidance on this.

Chapter 6 Operation of a Permit to Fly Aircraft

General

- 6.1 Permits to Fly contain certain conditions that govern the manner and extent to which the aircraft may be operated. These include the limitations on the operation of the aircraft, such as speeds, engine performance etc. Other issues that may be addressed are take-off and landing performance, the number of occupants and limitations on areas that can be over flown and under what flight conditions. There may also be specific limitations associated with the design standard, for example a 10,000 ft. operating height restriction when there is no oxygen system fitted.
- 6.2 All ex-military aircraft of greater than 2,730 kg MTWA are required, as a condition of the Permit to Fly, to operate in accordance with CAP 632 – Operation of 'Permit-to-Fly' Ex-Military Aircraft on the UK Register. CAP 632 requires that operators define various operational parameters and constraints in an Organisational Control Manual (OCM). The OCM is subject to agreement by the CAA before operations can commence. The CAA will audit operations at regular intervals, normally annually, to ensure compliance with both the operational constraints of the Permit to Fly and the method of operations as detailed in the OCM.
- 6.3 Aircraft operating under a Permit to Fly are generally not allowed to carry out commercial air transport flights.
- 6.4 The operation of an aircraft is normally restricted to recreational or private flying, but commercial work may be permitted in the following circumstances:
- a. Flying displays, associated practice, test and positioning flights or the exhibition or demonstration of the aircraft, when only the minimum crew should be carried – Article 11 of the ANO 2016 refers. Pilots must consult CAP 403 – Flying Displays and Special Events: A Guide to Safety and Administration Arrangements.
 - b. Flying training in ex-military aircraft with a Maximum Take-off Mass Authorised (MTMA) exceeding 2,730 kg. In order to facilitate proper pilot conversion training in ex-military aircraft, depending upon the particular circumstances, the CAA may grant an exemption to the provisions of the ANO 2016, in order to permit full remuneration for pilot conversion training (aerial work) to be undertaken in ex-military aircraft when these are operated under the terms of CAP 632.
- 6.5 Certain other activities which would previously have been classed as aerial work may be carried out by Permit to Fly aircraft subject to specific limitations as follows:

- a. Flights classed as non-commercial under Article 141 of the ANO, undertaken for the purpose of giving instruction, when the only payment made is for the services of an instructor;
- b. Operation under the Safety Standards Acknowledgement and Consent framework.

Operational limitations

- 6.6 The operational limitations applicable to aircraft with a Permit to Fly are contained in the following documents:
- a. Article 42 of the ANO 2016; for those limitations of a general nature that are applicable to all classes of aircraft operating on a Permit to Fly. The principal limitation is that Permit to Fly aircraft are restricted to flight by day and in accordance with Visual Flight Rules (VFR) unless the prior permission of the CAA has been obtained. Permission for flights under Instrument Flight Rules (IFR) will only be given in exceptional circumstances, such as, to meet a long-distance ferry requirement. In such a situation, the alleviation would be subject to agreement on aircraft instrumentation and pilot qualifications. Assessment and approval of any design aspects necessary for flight under IFR will also be required.
 - b. The individual aircraft's Permit to Fly; for those limitations that are applicable to either that individual aircraft or that class of aircraft. In particular, restrictions on flight over congested areas will be contained in the individual Permit to Fly as well as other specific conditions such as altitude limitations.
 - c. CAP 632 - Operation of Permit to Fly Ex-Military Aircraft on the UK Register, which deals with the operational control of ex-military aircraft with an MTMA in excess of 2,730 kg.

Alleviations from the commercial air transport or aerial work requirements applicable to aircraft operating on a Permit to Fly

- 6.7 To reflect the lower category of airworthiness certificate afforded by a Permit to Fly compared to a Certificate of Airworthiness there are a number of restrictions and prohibitions on the use of an aircraft with a Permit to Fly as detailed in the Air Navigation Order 2016. Examples of these are shown below:
- 6.8 Hiring of aircraft. The following applies:
- a. An aircraft issued with a Permit to Fly may not be hired – Article 42 refers.
 - b. An aircraft issued with a Permit to Fly may not undertake commercial operations except in particular circumstances – Article 42 refers.
 - c. An aircraft issued with a Permit to Fly may fly for the purpose of the giving of flying instruction provided this is done under the auspices of a flying club and in

accordance with the conditions listed on the individual Permit to Fly – Article 42 refers.

- 6.9 Charity flights are not permitted with passengers if the aircraft is operating on a Permit to Fly - Article 12 of the ANO and CAP 1330 refer.

<http://publicapps.caa.co.uk/docs/33/CAP%201330%20Charity%20Fight%20InFocus%202EdFINAL.pdf>

- 6.10 Cost sharing is permitted for aircraft operating on a Permit to Fly subject to compliance with the requirements in Article 13 of the ANO.

International flights by aircraft operating on a Permit to Fly

- 6.11 The Permit to Fly is not an internationally recognised document and aircraft operating on them are not certified to an internationally recognised standard. The Permit to Fly is, therefore, only valid within the UK airspace unless:
- a. an exemption has been granted by the CAA permitting a flight or flights abroad (this exemption is normally given as standard wording on the Permit to Fly), and
 - b. permission in writing has been obtained from the national aviation authority of each country that is to be overflown, or in which a landing is to be made, for the flight or series of flights.

Safety Standards Acknowledgement and Consent

- 6.12 As referred to in paragraph 6.5 above, CAA has developed a framework by which passengers may buy rides in single piston engined simple ex-military aircraft that have a Permit to Fly. This is described in detail in CAP 1395:

<http://publicapps.caa.co.uk/docs/33/CAP%201395.pdf>

- 6.13 One key aspect is that there will be increased utilisation of these historic aircraft and therefore a consequent effect on maintenance and inspection schedules. Other aspects that will be considered over and above the basic Permit to Fly assessments will be items such as:
- Occupancy assessment: A Safety Review to include, but not be limited to, an analysis of whether hazards and risks have been identified and responded to through appropriate mitigating strategies.
 - A plan to mitigate risks as they become known, or to correct an unsafe condition or practice. This includes, but is not limited to, risks in design, manufacturing, maintenance and operations.
 - A detailed explanation of all supporting and historical safety-related data, such as: Maintenance history, airworthiness status, operational failure modes, ageing aircraft factors, and civilian and military accident rates.

- Operator history, including accidents and incidents, regulatory compliance and Authority surveillance history.
- Maintenance records, including modifications.
- The aircraft's operational history, including the operator's proposed mitigation of known risks.
- Operating limitations to enhance safety, clarify, and remediate differences in like aircraft.
- An assessment and, if necessary, required changes to passenger safety in terms of configuration (potentially including restricting seats to fore-and-aft), seats, crashworthiness, head impact criteria, fire detection and emergency egress, etc.
- Demonstration of the passenger's ability to egress each aircraft in the event of an emergency in which the crewmember(s) is unable to assist.

Chapter 7 Publications

Classification as an Annex II Aircraft/Mandatory Permit Directives etc.

CAP 747 – Mandatory Information

http://publicapps.caa.co.uk/docs/33/CAP747_21JUL17_BM.pdf

Obtaining Permits to Fly

CAP 553 – BCAR Section A - (Chapter A3-7).

<http://publicapps.caa.co.uk/docs/33/CAP553BCARAI8A115Dec17.pdf>

Modification of an aircraft

CAP 553 – BCAR Section A.

CAP 562 – Civil Aircraft Airworthiness Information and Procedures (CAAIP).

http://publicapps.caa.co.uk/docs/33/CAP562_Issue%20Amendment2_15%20December%202017.pdf

CAP 1419 – Standard Modifications

<http://publicapps.caa.co.uk/docs/33/CAP%201419%20MAR17.pdf>

LAA Technical Leaflet 3.01 – Modification of LAA aircraft?

<http://www.lightaircraftassociation.co.uk/engineering/TechnicalLeaflets/Mods%20and%20Repairs/TL%203.01%20Approval%20of%20Prototype%20Modifications.pdf>

Certification Codes

CAP 553 - BCAR Section A.

CAP 554 - BCAR Section B.

http://publicapps.caa.co.uk/docs/33/CAP554_Sept_2014_print.pdf

Maintenance and repair practices and schedules

CAP 553 – BCAR Section A (Chapter A8-23, 24 and 25).

CAP 554 – BCAR Section B.

CAP 562 – Civil Aircraft Airworthiness Information and Procedures (CAAIP).

CAP 661 - Mandatory Permit Directives.

<http://publicapps.caa.co.uk/docs/33/CAP661.PDF>

Airworthiness Directives of the NAA (for non-UK aircraft)

UK Air Law

CAP 393 - Air Navigation: The Order and the Regulations (ANO).

[http://publicapps.caa.co.uk/docs/33/CAP393Ed5Am2_JUN2017_BOOKMARK\(e\).PDF](http://publicapps.caa.co.uk/docs/33/CAP393Ed5Am2_JUN2017_BOOKMARK(e).PDF)

Flying Abroad

ICAO Annex 8.

LAA Technical Leaflet 2.08 – Permit Aircraft Flying Abroad.

<http://www.lightaircraftassociation.co.uk/engineering/TechnicalLeaflets/Operating%20An%20Aircraft/TL%202.08%20Travelling%20abroad%20in%20a%20Permit%20Aircraft.pdf>

Operations

CAP 632 – Operation of Permit to Fly Ex-Military Aircraft on the UK Register.

<http://publicapps.caa.co.uk/docs/33/CAP%20632%20Permit-to-Fly%20Ex-Military%20Aircraft.pdf>

CAP 403 – Flying Displays and Special Events: A Guide to Safety and Administration Arrangements.

http://publicapps.caa.co.uk/docs/33/CAP403_E14_A1_MAY2017.pdf

CAA Website: www.caa.co.uk

APPENDIX 1: The Airworthiness Approval Note (AAN)

- A-1.1 The CAA General Aviation Unit Airworthiness Design and Certification Surveyor compiles the Airworthiness Approval Note based on either the applicant's or the A8-25 Supplement 2 organisation's design report. Much reliance is placed on the design report; however, CAA will review this carefully and carry out its own research as necessary for omissions as well as additional information. Reliance is placed on the approved A8-25 organisation to hold adequate records to justify the approval of each individual aircraft, so that CAA records need not be so comprehensive.
- A-1.2 The AAN will follow a set format that is applicable to all National approvals (albeit that not all are applicable to ex-military aircraft) and the headings and their contents are described below. This intended to allow both the applicant and the CAA to fully understand the reasons behind the information required and how this is important in the approval process.

Introduction

- A-1.3 The AAN will state the purpose for which the AAN is being issued.
- A-1.3.1 The AAN will summarise the history of the aircraft as part of the introduction. This is a means of attesting to the veracity of the identity as well as showing why some aspects of investigation may have been necessary and for genuine ex-military aircraft the level of restoration and maintenance work carried out for Permit to Fly issue
- A-1.3.2 The history of the aircraft may influence aspects of investigation. For example, if an aircraft has been employed as an experimental "test bed" it will be necessary to review how it has been returned to an acceptable "service standard" i.e. with experimental modifications removed.
- A-1.3.3 Restorations: Some restorations may involve a fundamental rebuild with most of the structure being replaced. In extreme cases where little of the original structure is retained, it may be known as a "data plate restoration". As long as the GAU Design and Certification Surveyor is satisfied that the aircraft involved is a genuine specimen, so that in essence the provenance or identity is established and retained, the project is accepted as a restoration rather than as a replica. This distinction may be extremely important in the eyes of the owner/collector.

NOTE: Applicants records should include all available supporting data for the history – for example copies of the log book, manufacturing records, military records etc.

Aircraft Build Standard/Modification Definition

- A-1.4 The AAN will describe the aircraft. It will make reference as necessary to a Type Certificate Data Sheet and if available, such as the build definition, drawings, mod leaflet, installation instructions etc.
- A-1.5 Description: The description section of the AAN is usually kept brief, referring to manuals for detail. It is recommended that the design organisation include much more detail in their report for the information of the Surveyor, as this will reduce the number of questions during the approval process. Items considered include:
- a. Whether the aircraft was previously type-certificated and there is a TCDS;
 - b. The configuration and construction method of the aircraft, such as whether the aircraft is a biplane or monoplane of wood or metal construction.
 - c. Control actuation – rod, cable, chain operated etc.
 - d. Pneumatic and hydraulic systems.
 - e. Fuel system and tankage;
 - f. Electrical system.
 - g. Powerplant: For each engine fitted, the report will identify last release to service, source of limitations/ratings, time between overhauls and time attained (whether in cycles or hours, units should be compatible for comparison). For turbine engines, the time both attained and remaining on critical Group A (Life Limited) parts should also be recorded. Where applicable, engine calendar time remaining will also be identified. Permanent company records will include a copy of each engine release to service and the last logbook page showing hours/cycles attained. Some engines may require special provisions or additional limitations (for example, Goblin engines employed early “stainless” steels which require particularly careful inspection for pitting corrosion), and may be subject to flight time/cycle penalties to cover ground running in lieu of maintenance. Calendar lives between overhaul may therefore be required. Consultation with CAA may be necessary.
 - h. Propellers (if applicable): If the aircraft is propeller driven, propeller type must be specified (Make, type, material, number of blades, blade/hub numbers, pitch and diameter) and justified. Usually this justification is by reference to documentation showing that it is the type originally fitted on that engine/airframe combination. However, if the engine has changed or if any modifications are involved, this aspect may require significant investigation. Compliance with CAP 747 Generic Requirement 17 may be required.

- i. **Transmission Systems (If Applicable):** This section is intended to cover such items as gearboxes, drive shafts, standalone rotor brakes, free-wheel units, expansion couplings, oil coolers, cooling fans etc. This section will be applicable in the main to rotorcraft, but also to aeroplanes such as the Gannet that have contra-rotating propellers. For each transmission system component fitted, the report will identify last release to service, time between overhauls and time attained (whether in cycles or hours, units should be compatible for comparison). Permanent records will need to include a copy of the each transmission system component release to service and the last logbook page showing hours/cycles attained.
- j. **Rotor Heads and Blades (If Applicable - Rotorcraft):** For each rotor head fitted, the report will identify last release to service, time between overhauls and time attained (whether in cycles or hours, units should be compatible for comparison). Permanent company records will include a copy of each rotor head release to service and the last logbook page showing hours/cycles attained. For each rotor blade fitted, the report will identify last release to service, time between overhauls and time attained (whether in cycles or hours, units should be compatible for comparison). Permanent company records will include a copy of rotor blade release to service and the last logbook page showing hours/cycles attained. Some rotor blades may require special provisions. For example, early helicopters had rotor blades made of wood and were fabric covered. Special maintenance actions may be required in this case. For each drive train accessory fitted, the report will identify last release to service, time between overhauls and time attained (whether in cycles or hours, units should be compatible for comparison). Permanent company records will include a copy of the drive train accessory release to service and the last logbook page showing hours/cycles attained.
- k. **Radio/Avionics:** Only CAA approved radio/navigation equipment may be operational, although sometimes, old equipment remains fitted for reasons of authenticity (e.g. as have previously been accepted on some Spitfires). In some cases, there is an equivalent civil set and approval is straightforward. In other cases, the applicant must seek an appropriate declaration from the equipment manufacturer. See Chapter 5 Paragraph 5.58.

A-1.6 Assessment of Conformity to Type Standard

- a. In principle, the aircraft is accepted on the basis of an appropriate degree of conformity to a type with an acceptable safety record. Any departures from this standard must be justified more carefully, however, and it must be remembered that A8-25 Supplement 2 approval does not include the privilege to carry out design of modifications, only to make recommendations to CAA. Depending on the modification(s) proposed appropriate design organisation(s) might therefore be required to propose substantiations. Demonstrating conformity or otherwise is achieved via the aircraft standard/design status report providing evidence as to the original build standard and including a checklist against each manufacturer's modification required for airworthiness. For a UK-designed aircraft this means each modification classified b/2 or above in the AP Master Modifications List.
- b. While a comprehensive list is available for more modern machines (Vampires onwards), earlier machines suffer from lack of documentation and so the most comprehensive list should be compiled. For example, the best available AP Master Modifications List for many Spitfire types commences at number 736. For some types it may not be possible to obtain such documentation. In such cases the CAA will assess what might be acceptable.
- c. The design report will refer to subsidiary documentation including modification checklists, fatigue audit, etc. to show that the particular aircraft matches the design standard for which the safety record was generated. Simple types may not be submitted through an E4 approved organisation, but such checks will still be made. These checklists will form part of the permanent company records covering justification of the aircraft.
- d. The A8-25 Supplement 2 organisation will also compile checklists against other service instructions including for example RAF Special Technical Instructions (STIs), Service Instructions (SIs) etc. For US aircraft, service requirements such as Technical orders may be listed in an FAA TCDS for the aircraft. Note that although there might not be a TCDS for the specific variant, Technical Orders for other variants of the same type might be applicable, such as is the case where ones applicable to the P-40B are included in the TCDS for the P-40N. These will be captured in the AAN.
- e. Compliance with Mandatory Permit Directives promulgated by CAA for the type is also required.
- f. Deferred defects should be declared. These may be acceptable by appropriate actions included in the maintenance schedule.

g. Fatigue:

- i. An audit of the fatigue state helps to establish conformity to the military design standard. It must be established that the accumulated lives of all fatigue life limited components are within their published limits. The Design report should summarise:
 - The document specifying fatigue accounting procedures;
 - Each fatigue critical part/assembly, by name/part number and by serial number fitted at time of initial approval;
 - Life accumulated, life limit, and life remaining of each part as above.
- ii. Early types may have fatigue lives quoted in hours, with role factors applicable to different missions or regimes of flight. In this case, the roles presented will be military ones and it will be necessary to assign appropriate civil equivalents to ensure that life accumulated is accounted acceptably. Fatigue lives are usually quoted in Fatigue Index (FI) for modern types. In these cases a fatigue meter will be fitted, recording counts at various manoeuvring load factors. Current practice is to record readings on the fatigue meter as a datum. Where the fatigue meter is unserviceable, fatigue usage will be calculated in flying hours with a suitable factor applied.
- iii. Aircraft that have come from former Eastern Bloc countries are likely to have had a different philosophy applied to fatigue lives to that commonly used in the UK or USA for example. These aircraft typically have an overhaul life defined as well as an airframe life. The airframe life is analogous to the fatigue life and may be set at an initial value that is low when compared to comparable Western aircraft. The design authority may then extend the airframe life subject to given conditions being met. Overhaul and airframe lives are frequently defined in the aircraft log book. In such cases, both lives need to be established, preferably with the involvement/concurrence of the design authority, and the aircraft may have to be returned to the manufacturer to have its life extended.

Approval Procedures

- A-1.7 The AAN will state that the aircraft/modification approval has been carried out in accordance with the applicable requirements. For UK products, the aircraft approval will be carried out in accordance with BCAR Section A, Chapter A3-7.

Basis Of Approval

A-1.8 CAA Approval Basis For The Aircraft/Modification

The AAN will state the basis of approval. Where a military design code is known (e.g. AP 970) it will be quoted (BCAR A3-7 Paragraph 4.1d) although compliance with such a code will not be checked in detail. For Intermediate types approval will also be on the basis of an acceptable safety record and where this is accepted by precedent this is stated. For Complex types the manufacturers statements and exposition undertakings will also be quoted. For a modification approval, a suitable airworthiness code such as BCAR K or CS-23 may be applied.

A-1.9 CAA Design Requirements For Permit to Fly

The AAN will specify, or reference a document specifying, the following as applicable:

- a. CAA Specifications as applicable
- b. CAP 747 Generic Requirements as applicable
- c. Equipment requirements.

The AAN will include the following statement:

“Any installed equipment for which the Air Navigation Order requires approval must be approved by the CAA”.

A-1.10 Environmental Requirements

For an ex-military aircraft operating on a CAA Permit to Fly there are no applicable noise and emissions requirements and so a noise certificate is not required.

A-1.11 Design Requirements Associated With Operational Approvals

In general, for an ex-military aircraft operating on a CAA Permit to Fly there are no applicable specific design requirements relating to equipment required by operational rules. However, Schedules 5 and 6 of the ANO 2016 will be reviewed for additional equipment that might be required for the operation. This particularly applies for aircraft used for SSAC operations.

A-1.12 Compliance With The Basis Of Approval**A-1.13 Compliance With The Approval Basis for the Aircraft/Modification**

Two ex-military aircraft ostensibly of identical type may be of significantly differing design/build standards and fatigue states and for this reason the CAA does not consider that it is generally possible to accept one aircraft as series to another. Because of this each aircraft requires an individual investigation culminating in issue of an Airworthiness Approval Note (AAN) specific to it, for approval and initial issue of a Permit to Fly. However, cross referencing to previous AANs for the same type is acceptable in areas where the design/build standard is identical.

The AAN will make reference to the design report defining the build standard of the aircraft, conformity to the type design, manufacturers mods, applicant's mods, Service Technical Instructions, Service Instructions, Mandatory Permit Directives etc. where applicable, as evidence of compliance with the requirements of A-1.8 above.

If relevant, the foreign type certificate will be referenced and how this is applicable to the UK evaluation.

A-1.14 Compliance With Design Requirements For Permit to Fly

The AAN will show evidence (or references to evidence) of compliance with the requirements of A-1.9 above. This will commonly include:

- a. Equipment approval
- b. CAA Specifications

c. CAP 747 Requirements.

A-1.15 Compliance with Environmental Requirements

For an ex-military aircraft operating on a CAA Permit to Fly there are no applicable noise and emissions requirements and so no compliance is required to be demonstrated.

A-1.16 Compliance with Design Requirements Associated With Operational Approvals

For an ex-military aircraft operating on a CAA Permit to Fly there are no applicable specific design requirements relating to equipment required by operational rules.

A-1.17 Required (Amendments To) Manuals And Other Documents Including Mandatory Placards

The AAN will specify, or make reference to a document specifying, changes to the following, where applicable:

- a. Flight Manual or Pilot's Notes as applicable – References to documents, CAA approval of them, (and that supplements/change sheets must be included in the AFM)
- b. Placards - Actual text, or reference to drawings of placards
- c. Electrical Load Analysis - (CAP 747 Generic Requirements 4 and 6)
- d. Maintenance Manual
- e. Maintenance Schedule
- f. Weight and Balance Schedule

The AAN will include a section specifying maintenance manuals and schedule usually by reference to the section on Manuals mentioned above. CAA may agree to a "low utilisation" maintenance schedule. This is intended to catch calendar related aspects/overhauls correctly.

A-1.18 Conditions Affecting This Approval

The AAN will detail the Airworthiness Limitations for Permit to Fly as appropriate to the aircraft/modification. These might include that the aircraft must be operated in accordance with the limitations specified in the Flight Manual referenced in Section A-1.17 above, some of which are also defined below.

- a. Maximum Number of Occupants
- b. Aerobatic Limitations
 - i. Whether aerobatic manoeuvres are permitted and specific items that are not, as well as any applicable load factor limitations.
- c. Engine Limitations
- d. Air Speed Limitations

- e. Loading Limitations such as:
 - i. Maximum Take-Off Weight
 - ii. CG range limits
 - iii. CG datum point
- f. Other Limitations
 - i. The aircraft shall be flown by day in visual meteorological conditions only.
 - ii. Any conditions applicable to the specific aircraft e.g. due to modifications installed.

A-1.19 **Continued Airworthiness**

The influence of the modification on Airworthiness Directive, Service Bulletin eligibility and other data must be considered and the publications monitored accordingly. The maintenance schedule for the aircraft should include reference to this material additional to the original design.

The AAN will include anything specific such as reduced fatigue life, or any particular inspection/test for continued airworthiness including any additional maintenance or overhaul periodicity including calendar lives, and where the limitation or inspection is to be recorded (e.g. the Aircraft Log book).

A-1.20 **Survey**

The AAN will state whether a CAA survey is required; and if so, whether the in the particular areas examined during the survey the aircraft was found to conform with the standard recorded by the AAN. Alternatively, it will note that arising from the survey that specified changes are required to the aircraft and documentation.

A-1.21 **Issue of Permit to Fly**

Each aircraft is required to have a flight test at the end of its restoration. In general this will be conducted by a CAA contracted Test Pilot, or delegated to a suitably experienced pilot following a briefing on the required Flight Test Schedule. The CAA evaluation is of particular importance for a new type, or one with known marginal characteristics or unusual features. At the end of the test programme the applicant then submits their Flight Test Report to the CAA for assessment.

The AAN will detail the applicable actions that must be completed prior to initial issue of the Permit to Fly:

- a. All actions and ground test procedures specified by the aircraft manufacturer must be completed satisfactorily.
- b. Verification that the documents or amendments to documents, and the placards defined under Section A-1.17 above are as specified, including any changes specified under Section A-1.20 above.
- c. The need for CAA Flight Test

d. Anything else for the specific aircraft

A-1.22 **Approval**

The AAN includes an appropriate approval statement. This will specify that subject to the conditions of A-1.18 above, the aircraft is approved for the issue of a CAA Permit to Fly, provided that it is operated in accordance with the limitations specified/referenced and that it conforms with the contents of the AAN and provided it is maintained in accordance with the Maintenance Schedule as specified in Section 5.5 of the AAN. It also specifies whether the approval is applicable to this example only or may be used on other aircraft of the same type.

APPENDIX 2: Approving aircraft imported in partial of fully completed form

A-2.1 **General**

A-2.1.1 An individual or organisation may apply for a Permit to Fly for a partially or fully completed ex-military aircraft.

A-2.1.2 For a complete aircraft, the eligibility of the imported aircraft for consideration for issue of a Permit to Fly will be subject to:

- a. Acceptable documentary evidence submitted by the previous owner to the National Civil Aviation Authority of the country that originally approved the aircraft verifying that the aircraft was certificated/approved as an ex-military aircraft and that it meets the requirements of EU Regulation 216/2008 Appendix II paragraphs (a)(iii) or (d); and
- b. Acceptable documentary evidence from the National Civil Aviation Authority (or if applicable their Authorised Agents) of the country where the aircraft was originally completed verifying the acceptance of the build standard and quality of restoration 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 ex-military aircraft by its own National Civil Aviation Authority.

- 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/restoration 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 1; and
- g. Evidence being made available that shows that sufficient experience of safe operation has been demonstrated; and
- h. Declaration of the design and build standard of the aircraft; and
- i. The equipment standard being acceptable; and
- j. The flight manual/Pilots' Notes being acceptable; and
- k. The GAU Airworthiness Surveyor to agree a bridging inspection for new Permit to Fly based on past history and records; and
- l. The completed aircraft being shown fit to fly by means of documentary review, inspection and flight-test.

- A-2.1.3 Attempting to show satisfactory compliance with the conditions stated above can be notoriously difficult. If the evidence presented is inadequate then the processing of the application for a Permit to Fly will be delayed or unable to be completed. Some of the points above are discussed in more detail below.
- A-2.1.4 Depending on the type, it may be necessary for a BCAR A8-25 approved organisation to carry out a detailed review of the aircraft prior to it being accepted onto the UK register.
- A-2.2 Proof of Eligibility**
- A-2.2.1 Before an applicant completes the purchase of the aircraft it is essential that the documentation described in paragraphs A-2.1.2 a) to l) above, are obtained or ensures that these will be available on completion of the purchase. Also CAA strongly advises the applicant to obtain examples of the build records that will be accompanying the aircraft.
- A-2.2.2 When the applicant is in possession of the documents referred to in the above paragraph they should contact the CAA Applications and Approvals Department to make an application for a Permit to Fly. Alternatively, The General Aviation Unit Airworthiness team may be contacted in advance of an application to discuss the project and the likelihood of a Permit to Fly application succeeding.
- A-2.3 Maintenance and Repair History**
- A-2.3.1 The Applicant should be able to present to CAA a verified and comprehensive maintenance and repair history for the aircraft along with the maintenance schedule used.
- A-2.3.2 If adequate levels of maintenance and repair history cannot be demonstrated to CAA's satisfaction or the maintenance schedule is considered to be inadequate, then the Applicant 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.
- A-2.3.3 Before a Permit to Fly is issued to the aircraft, an appropriate maintenance schedule for it will have to be agreed between the Applicant and the CAA.
- A-2.4 Approval of the Design**
- A-2.4.1 The aircraft design will need to be approved or accepted by CAA. As ex-military aircraft are not generally built to a recognised civil standard, each aircraft is treated effectively as a unique case. However, if the aircraft is of the same or similar design to one that has already been previously approved then the process may be simplified and some credit may be given for the previous approval. Once the design has been approved and the build standard and flight test programme agreed the CAA will issue a working draft AAN.

A-2.4.2 It may transpire that as a result of the CAA design investigations that additional limitations may be imposed on the aircraft, particularly if the methods of substantiation used in the exporting/original country of approval cannot be verified by CAA. For example, an aeroplane previously flown for aerobatics may now be prohibited from performing such manoeuvres.

A-2.5 **Declaring the Build Standard**

A-2.5.1 As part of the documentary submission to CAA in support of the application for a Permit to Fly for the imported aircraft, the Applicant will have to declare the design and build standard. 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. The submission should also include the conformity of the aircraft to the declared design and build standard.

A-2.6 **Flight Test and the Flight Manual/Pilot's Operating Handbook**

A-2.6.1 If the aircraft being imported is a type the CAA has not previously approved then the applicant will have to arrange for a flight test to be conducted by a CAA contracted Test Pilot. If the aircraft is a type previously approved by CAA then the Flight Test may be delegated to a suitable pilot but who will still have to discuss the Flight Schedule with the CAA contracted Test Pilot or GAU Flight Specialist.

A-2.6.2 A Flight Manual or Pilot's Operating Handbook/Pilot's Notes will be required and its content agreed with the CAA's GAU Flight Specialist.

A-2.7 **Demonstrating that the Imported Aircraft is Fit to Fly**

A-2.7.1 In order to demonstrate that an imported aircraft is fit to fly the following will need to be satisfactorily accomplished and depending on the type; it may be necessary for a BCAR A8-25 approved organisation to carry out a detailed review of the aircraft to achieve this:

- a. Have had the Maintenance Organisation satisfactorily conduct the required inspections in order to prove an acceptable level of build quality; and
- b. If the aircraft was only partially completed on import, have completed restoration; 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; and
- d. Have had the design approved by CAA; and
- e. Completed a documentary review for the aircraft to CAA's satisfaction; and
- f. Satisfactorily completed an agreed flight test programme.

A-2.8 Aircraft Previously Restored Overseas

A-2.8.1 In each case it will be necessary for the applicant to demonstrate how the approval and system used by the overseas authority might be used as part of the evidence for the design report submission that allows CAA to compile an Airworthiness Approval Note and to progress the application. General points are noted below:

Q1. Can a warbird with a current and valid US Experimental CofA automatically get a UK Permit to fly with no further showing?

A1. No. Full credit will be given for the Experimental CofA, but the evidence used to get the CofA must be submitted to the CAA with the A8-25 Supplement 2 Design report in order to assist the CAA assessment and for the for issue of the AAN to be progressed.

Q2. Why does the CAA need to do this?

A.2 For an aircraft with an Experimental CofA, there is no Type Certificate Data Sheet or established civil design standard, therefore for a UK PtoF to be issued there needs to be a known standard to be issued against. The AAN fulfils this requirement and establishes the standard.

Q3. So the CAA is asking for re-justification of what the FAA has already approved?

A3. No. The submission to the FAA will be used to establish the baseline design and modification standard at the time of import. However, if the CAA is not content with any aspect – for example a material substitution that it believes may be below strength – then it may ask for a modification to be raised to justify or rectify that issue.

Q4. What else does the design report and AAN achieve?

A4. As it is established as a baseline standard, any modifications that are necessary to be made to maintain the aircraft's airworthiness whilst flying in the UK can be recorded as a "delta" from that baseline. This will allow complete records to be maintained both for continuing airworthiness oversight purposes and in the event of an onward sale for the subsequent owner to establish their own baseline standard.

Q5. CAA and other National Airworthiness Authorities such as the FAA in the USA have bilaterals to allow greater freedom of transfer between registers; why doesn't this apply here?

A5. Those bilaterals apply to aircraft with established Type Certificates and Manufacturers support. As these aircraft may have neither, the bilaterals do not cover these aircraft and so a standard needs to be established and recorded.

Q6. My aircraft is certificated in the Limited Category; is the situation different from the Experimental Category?

A6. Yes, this actually makes the approval process easier because there is an established standard – type basis plus technical orders – with which compliance must have been demonstrated to the FAA. This evidence of compliance must be provided to the CAA and the AAN will therefore reflect that LTC standard plus any deviations/modifications/repairs made from that standard.

Q7. What else might an applicant be required to submit?

A7. The applicant and maintenance organisation needs to be able to show how they have satisfied themselves that the aircraft meets the declared standard. The assigned CAA GAU Airworthiness Surveyor will also need to inspect and survey the aircraft before PtoF issue. The GAU Flight Specialist will need to be involved in the flight-test phase to approve the test pilot and flight-test schedule and CAA may itself require to fly the aircraft using a contract test-pilot.

A-2.8.2 Most of the aircraft restored overseas come from countries that CAA has close working relationships with. Their systems for approval have been reviewed and their similarities to the UK system identified. This allows CAA to have greater confidence in taking account of submissions made to those Authorities when the aircraft are imported into the UK, however as noted under Paragraph A-2.8 above this is not an automatic acceptance or rubber-stamping exercise. Instead, the similarities in the processes should ensure that the necessary supporting evidence for UK approval is already available as a result of the work undertaken to support the overseas approval. Relevant processes of specific countries are reviewed below:

A-2.8.2.1 **USA**

Ex-military aircraft that are not eligible for a full ICAO compliant Certificate of Airworthiness are instead certificated in either the Experimental category or Limited category.

On import into the UK, the Experimental or Limited Category Certificate of Airworthiness will be given full credit; however, on their own these certificates are not sufficient to allow the CAA to issue a UK Permit to Fly. An E4 submission will have to be made that shows the build standard of the aircraft at the time of import and this should reference the experimental or limited CofA and any applicable TCDS in order to assist the CAA review. The Permit to Fly will be issued against the resulting AAN once the CAA has been satisfied that the established design standard meets UK requirements and that the aircraft has been shown by survey and flight test to meet those requirements.

Relevant or useful FAA legislation and Policy include (but are not limited to) the following:

FAR 21 Certification Procedures for Products and Parts:

Para 33 – inspection and tests;

Para 21.189 – Issue of airworthiness certificate for limited category aircraft;

Para 21.191 – Experimental certificates;

Para 21.193 – Experimental certificates: general;

Order 8130.2J Airworthiness Certification of Aircraft and Related Products: Section 4 (Special Airworthiness Certification), Section 4 (Limited airworthiness Certification), Section 7 (General Experimental Airworthiness Certifications) and Section 10 (certification and operation of A/C under experimental purposes).

Note: Order 8130.2J specifically mentions the bilateral in the context of Type Certificated aircraft and repairs to Transport Category only. It does not apply to non-Type Certificated aircraft.

AC23-27 Parts and Material Substitution for Vintage Aircraft

A-2.8.2.2 **Canada**

Relevant legislation and Policy include the following:

CARS Part V Airworthiness

Standard 507 Appendix F Standards respecting ex-military aircraft.

Standard 509 Exports from Canada

CAR511 Approval of the Type Design of Aeronautical products

Reviewing these, it shows that the same documentation as required by the UKCAA has to be made available to Transport Canada. This documentation should be obtained as part of the submission to the CAA for the AAN and the PtoF application.

A-2.8.2.3 **New Zealand**

Relevant legislation and Policy include the following:

Part 21 Certification of Products and Parts:

Para 21.193 Special category – experimental certification requirements

AC 21.3 Product Certification – Airworthiness Certificates in the Special category. This gives useful information including requirements for submissions required to be submitted, such as general design basis plus mods etc. as well as conformity to acceptable type design including aircraft history, aircraft records and dataplates

This shows that all data required by UKCAA will have had to be furnished to NZCAA. A copy of the same and the NZCAA inspection record therefore could and should be supplied to UKCAA to support the application.

A-2.8.2.4 **Australia**

Relevant legislation and Policy include the following:

Civil Aviation Safety Regulations (CASRs) Part 21 Subpart H and Regulation 262AM of Civil Aviation Regulations Limited Category aircraft certification.

Civil Aviation Regulations 35/36 – approval of mods and repairs.

CASA AC 21.5(0) Limited category Aircraft – Certification

CASA AC 21.10 Experimental Certificates

In essence, CASA requires the same submissions and documents as CAA for the issue of a Limited CofA. Therefore, when purchasing an aircraft from Australia this documentation should be available to the purchaser and may be used along with a statement of any subsequent modifications as part of the application to the CAA for a PtoF against an AAN compiled on these submitted records.

A-2.9 **Aircraft Previously Exported Overseas from the UK**

A-2.9.1 Confusion has arisen where an aircraft has previously had a configuration approved under an AAN when the aircraft was originally on the UK register. The aircraft then leaves the UK for another register before returning. The original configuration may no longer be reflective of the aircraft's current condition. The receiving organisation, wishing to place the aircraft on the register, may wish to carry out modifications or re-embodiment modifications to re-establish compliance with the originally approved configuration.

A-2.9.2 Due to the uniqueness of the AAN and Permit to Fly system, unless the aircraft can be restored to its previous UK standard by the application of the same modification standard, using the same materials, components or equipment the original configuration approval cannot be applied. A further modification approval will be required to address the changes, even though they may appear insignificant. This is predominantly an issue for aircraft returning to UK registration. However, if the aircraft has not been altered then the original AAN should suffice.

APPENDIX 3: Standard/non-standard features for ex-military aircraft

- A-3.1 Ex-military aircraft often have features not generally seen on type certificated civil aircraft and so may not be catered for by existing civil design codes. The Applicant's design report should contain additional information to cater for this eventuality, in particular for features such as those below.
- A-3.2 **Reheat**
- A-3.2.1 Aircraft with reheat or afterburner systems will be considered for flight under the CAA Permit to Fly system. The only *intermediate* category aircraft thus far accepted for approval with such a system fitted is the Lim-7/MiG-17 as the reheat fitted is of basic design and also not required for normal operations. Most aircraft with reheat will fall into the *complex* category and therefore the reheat system becomes one part of the whole aircraft that has to meet the applicable requirements under this more exacting category. A good example of this is the SEPECAT Jaguar where the required use of throttleable reheat or the requirement for reheat on the remaining engine in the event of an engine failure renders the aircraft in the *Complex* category.
- A-3.3 **Ejection seats**
- A-3.3.1 Ex-military aircraft should conform as closely as possible to the standard for which the CAA accepted the service safety record. CAA recommends that ejection seats, canopy jettison systems and Mini Detonation Cords (MDCs) as appropriate should be maintained "live".
- A-3.3.2 For CAA to consider accepting that such charged systems as ejection seats, canopy jettison systems and MDCs be disarmed, the aircraft must first be shown to have a landing speed low enough (and with benign handling) that it is reasonable to expect the pilot to be able to make a forced landing in a field.
- A-3.3.3 Aeroplanes where disarmed ejection seats have been accepted are all aircraft with seats of low capability (not "zero-zero"), which would not work at the critical parts of the flight envelope – immediately after take-off and prior to landing.
- A-3.3.4 Disablement of ejection seats is a modification and as such must be defined (usually via a company procedure) and submitted to the CAA for approval as a Major modification.
- A-3.3.5 Examples where disarmed ejection seats have been accepted include the Jet Provost Mk 5, DH115 Vampire and Aero L-29.

A-3.4 **Drop/Jettisonable Fuel Tanks**

A-3.4.1 There are a number of ex-military aeroplanes currently on the UK aircraft register that have the capability to carry additional fuel in external jettisonable fuel tanks for the purpose of enhancing the aircraft's useful range and endurance. The ANO only permits the dropping of fuel or other articles in the event of an emergency. Hence, in principle, such jettisonable fuel tanks could be formally approved subject to investigation of the design of the system to establish that the inherent level of airworthiness was acceptable.

A-3.4.2 The Applicant's design report should address the following aspects:

- a. In the absence of known satisfactory in-service experience, the system configuration and the fuel tank latch/release mechanisms should be examined to determine if there are any single failure modes that could cause failure to release or inadvertent release of one or more fuel tanks. If any potential problem areas are identified, review should be made as to whether the probability could be minimised by initiating periodic maintenance checks or by introducing a simple design change. Where the probability of a single failure is assessed as significant, this could be grounds for declining the approval of a particular installation. In order to avoid a single failure causing undemanded jettison, it has been found to be acceptable for second switches to have been fitted in series to the jettison switch.
- b. The operating method in the cockpit must require a distinct and deliberate action to release the tanks and must be so located and (guarded where necessary) to minimise the possibility of inadvertent release by the pilot. There must be a placard installed identifying the control, its mode of operation and specifying "emergency use only" adjacent to each cockpit control.
- c. Fuel management procedures must be available and published. The original aircraft manufacturers or military operating procedures will normally provide such procedures, but alternate procedures may be approved subject to investigation.
- d. The limitations for use of the jettisonable fuel tanks must be established and published in the Permit to Fly. The following must be included together with any other relevant information:
 - Limitations pertaining to the permitted use (e.g. ferry only) if required.
 - Airspeed limitations
 - Load factor limits or limitations regarding permissible manoeuvres with the fuel tanks installed.
- e. The modifications in respect of weight and balance, payload etc. must be established and published by amendment to the disposable load section of the aircraft weight schedule.
- f. In the case of wing tip tanks or aircraft having more than one tank where they are located at some significant lateral distance from the longitudinal axis of the aeroplane, the implications of loss of one tank inadvertently or failure of one tank to release should be considered in terms of the ability to continue safe flight and landing.

- g. The maintenance schedule must include suitable periodic maintenance e.g. lubrication and functional checks, and maintenance to be carried out at installation or removal of the tanks to maintain confidence in the correct operation of what are strictly speaking "one-shot" devices. The one-shot devices are often explosive bolts with a fixed life.
- h. Instructions for removal and installation of the tanks should be available and published including the requirement if necessary to install blanks or covers.
- i. The implications of the additional tanks on refuelling procedures and fuel management must be established and the appropriate procedures published. Additional placards may be required in these respects.
- j. The Permit-to-Fly for aeroplanes having jettisonable fuel tanks must incorporate the following statement:

"In accordance with the Air Navigation Order, the operation of the fuel tank release is restricted to emergency use only".

A-3.4.3 Disabling of Jettison Systems: If the aircraft is to be allowed to fly with external tanks fitted but with the jettison system disabled, the cases to be addressed are performance/engine failure during take-off, ability to recover from spins (with aircraft cleared for aerobatics), and the ability to land with wheels up. These are addressed as follows:

- a. For a single engined aircraft, procedures at take-off (particularly at low altitude) usually involve ejection rather than jettison. For twin--engined aircraft this needs review specific to the type.
- b. If the aircraft is to be approved for aerobatics, spin recovery needs to be acceptable in all configurations. This is to be checked during flight test for initial Permit issue. Where the Pilot's Notes show that jettison is required for spin recovery, aerobatics will be prohibited if the tanks are to be fitted but not jettisonable (whether or not they are to be usable for fuel). This is to be recorded on the AAN and Permit.
- c. There have been many cases of wheels up landing on empty jettisonable tanks, where the tanks have acted as skids and saved the airframe from damage. In such circumstances, it appears preferable to have empty tanks fitted than a clean airframe.
- d. Such a modification is to be covered in a Supplement to the Pilots Notes, the jettison button is to be placarded "Inoperative" and the AAN and Permit to Fly are to record appropriately.

A-3.4.4 Summary: It is anticipated that use of the above guidelines will encourage a consistent approach to the approval of jettisonable fuel tanks on ex-military aeroplanes. In adopting these criteria, due credit should be given to data submitted which was originated by the aeroplane manufacturer but care should be taken to ensure it is directly applicable to the variant of aeroplane considered.

A-3.5 **Occupancy**

A-3.5.1 Following an accident in 1986 to a civil registered ex-military aircraft operating on a Permit to Fly, where eleven of the fourteen occupants were killed, the Air Accident Investigation Branch (AAIB) focused attention on the difficulties faced by the CAA in satisfying themselves as to the airworthiness of an ex-military aircraft which has not been civil type certificated and does not have the continued airworthiness support required by ICAO Annex 8 for civil certification. The AAIB recommendation stated that *"When an aircraft is to be operated on a Permit to Fly the Permit should specify the maximum number of seats authorised to be fitted to the aircraft."* The response from the CAA was to define an overall occupancy limit in each case and endorse the Permit to Fly accordingly.

A-3.5.2 Policy: For any ex-military aircraft granted a Permit to Fly in accordance with BCAR Chapter A3-7 Paragraph 4.1(d), which has actual or potential seating provisions for more than two occupants, the maximum number of occupants will be equal to the number of seats fitted or four persons, whichever is more restrictive.

A-3.5.3 Ex-military Transport Aircraft: Some ex-military machines were designed to have capacities of greater than 2 seats. In such cases additional occupants may be accepted subject to the following defined criteria being met:

- a. If the aircraft can be shown to be identical in all significant respects to a similar type which has had, or would have qualified for a Certificate of Airworthiness; and
- b. It will be maintained and operated to appropriate standards (equivalent to CofA)

NOTE: Confirmation required would need to be in the form of a compliance statement from the appropriate manufacturer and would have to consider not only the build standard, but also the service experience, maintenance history and component lives.

Currently this value has been capped at four passengers. The maximum total occupancy currently approved for an ex-military aircraft flying with a Permit to Fly is 6 – Boeing B-17, Max Holste Broussard and Avro C-19/Anson.

A-3.5.4 Potential for increased occupancy: For individual aircraft on a case-by-case basis it may be possible to increase the occupancy to Essential Crew plus a maximum of six passengers up to a total maximum permissible occupancy of nine. This brings ex-military aircraft into line with the precedents set for aircraft previously Type Certificated but now downgrading to a Permit to Fly such as the Bell UH-1H helicopter or the Max Holste Broussard.

The existing restriction has been driven by responses to AAIB reports and recognition of the differing standards between Permit to Fly and Certificate of Airworthiness aircraft. It is therefore essential that to increase the occupancy and still retain a Permit to Fly, mitigation or additional considerations have to be put in place over and above the existing Airworthiness Approval Note (for pre-approved aircraft) or as part of the AAN development for new applicants. Items might include:

- A Safety Review to include, but not be limited to, an analysis of whether hazards and risks have been identified and responded to through appropriate mitigating strategies.
- A plan to mitigate risks as they become known, or to correct an unsafe condition or practice. This includes, but is not limited to, risks in design, manufacturing, maintenance and operations.
- A detailed explanation of all supporting and historical safety-related data, such as: Maintenance history, airworthiness status, operational failure modes, ageing aircraft factors, and civilian and military accident rates.
- Operator history, including accidents and incidents, regulatory compliance and Authority surveillance history.
- Maintenance records, including modifications.
- The aircraft's operational history, including the operator's proposed mitigation of known risks.
- Operating limitations to enhance safety, clarify, and remediate differences in like aircraft.
- An assessment and, if necessary, required changes to passenger safety in terms of configuration (potentially including restricting seats to fore-and-aft), seats, crashworthiness, head impact criteria, fire detection and emergency egress, etc.
- Demonstration of the passenger's ability to egress each aircraft in the event of an emergency in which the crewmember(s) is unable to assist.

A-3.5.5 Ex-military aircraft shall have a placard in the cabin with the following warning to the occupants

“This aircraft has not been certificated to an International Requirement”

A-3.6 **Use of ex-military livery and serial numbers – Exemptions from the need to display Marks on UK Registered Aircraft**

A-3.6.1 Article 32 of The Air Navigation Order 2016 states that aircraft registered in the United Kingdom shall not fly unless they bear the nationality and registration marks allocated by the CAA.

A-3.6.2 In certain cases exemptions to Article 32 are granted for aircraft to fly without bearing UK nationality and registration marks. The CAA Aircraft Registration section policy is only to exempt aircraft which display historically accurate military liveries and marks. The exemption is usually issued for a period of three years and should be renewed on expiry if the aircraft is to remain in those markings

- A-3.6.3 If the aircraft is to bear military markings permission must be obtained from the Ministry of Defence or the appropriate foreign government and sent to the CAA, Aircraft Registration section. One exception to this is aircraft wearing United States military markings as the US Embassy have granted permission for UK registered aircraft to wear their authentic markings as long as the aircraft type is no longer in USAF use or in their service inventory. Permission of the UK MOD should be sought from the RAF Events Team at RAF College Cranwell. Other permissions should be sought from the Embassy of the relevant country concerned or direct from the relevant military air arm.

Note: The normal letter of permission issued by the UK MOD excludes flights in Northern Ireland and outside of UK airspace and gives permission to the applicant rather than the aircraft which may change ownership in the future. A new owner of an exempted aircraft should re-apply to the MOD for their permission to maintain these markings under new ownership. Once an exemption is issued by the CAA it should also be noted that this allows the flying of the aircraft in UK airspace only, if the aircraft is to be flown outside the UK then extra permission must be sought from the authorities of the countries visited or over flown.

- A-3.6.4 To apply for an exemption from the requirements to display nationality and registration marks application should be made to the Aircraft Registration section. The CAA Aircraft Registration section also requires the following information in support of an application for the exemption:
- i. A current colour photograph or photographs clearly showing the livery and marks carried by the aircraft concerned, or a colour diagram showing the intended livery and marks to be carried by the aircraft concerned.
 - ii. Literature (which includes diagrams or pictures) on the aircraft which would allow the Aircraft Registration Section to verify the authenticity of the livery carried by the aircraft; and

Once an exemption has been granted, any changes to the markings displayed on the aircraft must be notified immediately in writing to the Aircraft Registration section.

A-3.7 **Airworthiness Requirements for Aerobatic Smoke Systems**

- A-3.7.1 The following requirements apply to smoke systems fitted to ex-military permit to fly aircraft. They are equally applicable to civil aerobatic machines.
- a. Weight
The definition of empty weight for the aircraft shall include the weight of the smoke system but exclude that of the fluid. The aircraft must remain within the existing weight and centre of gravity limits.
 - b. Strength
The smoke system shall be stressed to withstand the same load cases to which the aircraft was designed, including the manoeuvre, gust and emergency alighting cases.

- Guidance Material: The stressing submission need only cover additionally installed parts associated with the smoke system. Conservative load factor stressing assumptions may be made which may obviate the need to establish specific load factors.
- c. Cockpit
- The cockpit controls shall be located such that the pilot, when seated, strapped in and in full flying kit, has full and unrestricted movement of each control. The cockpit shall have adequate ventilation.
- Guidance Material: A CAA pilot may carry out a cockpit assessment to assess qualitatively the air quality in the cockpit.
- d. Smoke Fluid Tank Design and Installation
- Each tank shall withstand without failure the vibration, inertia, fluid and structural loads that it may be subjected to in operation. Each conventional metal tank shall be pressure tested to 3.5 psi.
- The smoke fluid tank filler connection shall be electrically bonded to the aircraft structure. Any vent system shall be vented to the exterior of the aircraft.
- e. Lines fittings and components
- The lines, fittings and components shall conform to good engineering practice and be compatible with the fluids to be used.
- f. Smoke fluid
- The smoke fluid specifications are to be established for the system. The system shall be configured in such a way that the possibility of accidental filling with AVGAS or any other inappropriate fuel is unlikely.
- Guidance Material: The filler neck may be fitted with a restrictor to ensure that a normal AVGAS refuelling nozzle cannot be inserted. A suitable placard may be accepted in lieu of an undersized filler neck.
- g. Miscellaneous markings and placards
- The smoke tank filler connection shall be placarded with the approved smoke fluid specification and the usable capacity of the tank. System controls should be appropriately placarded, this placard also conveying any operating limitations.
- h. Fire Safety
- i. Particular attention must be given to the requirements of CS 23.1121(b) with respect to the smoke fluid line that introduces the smoke fluid into the exhaust system.
 - ii. In order to minimise the probability of an unsafe operation, it must be demonstrated that under the critical operating conditions, there is no risk of ignition of the injected smoke fluid either within or external to the exhaust system.
 - iii. Unless it can be shown that there is no possibility of a fire under normal or failure conditions, it must be shown that the flow of smoke fluid can be stopped to prevent further smoke fluid reaching the exhaust system.
- i) Flight Manual Supplement

The Applicant shall provide a Flight Manual Supplement, prepared in accordance with BCAR Section K Chapter K7-5, Appendix 5.

A-3.8 **Other Special Features – General**

A-3.8.1 There are many features which may be found on military aircraft, which are not usual in General Aviation civil aeroplanes. These often come to light during the review for potentially hazardous features referred in BCAR A3-7 Paragraph 3.1 (d). Assessment of new features calls upon the Surveyors experience and judgement. Although the CAA is not the design authority of such types and must not re-design them, there may be features which place third parties at unnecessary risk, and fundamental principle of proof against a single failure must be borne in mind. Some examples of special features previously addressed are detailed below.

A-3.9 **Armament**

A-3.9.1 Ex-military aircraft must not be armed. Guns may remain fitted for authenticity and to retain c.g. position, but they must be disabled.

A-3.9.2 Replica bombs will be considered for fitment on a case-by-case basis as they may need justification of the loading conditions. Handling and performance may also be affected and assessment of these will have to be made and reflected in the Pilot's Notes.

A-3.10 **UK Instruments**

A-3.10.1 Although metric instruments are not unusual in aircraft with overseas service history, for UK civil operation:

- a. Altimeters must be to UK standard (ft. and millibars)
- b. ASIs may be in any units but must be consistent with the Pilot's Notes employed (use of RAF Pilots Notes in lieu of may thus drive change in ASI)

A-3.11 **Simulated failure modes selectable from Rear Cockpit**

A-3.11.1 It should not be possible to select simulated failure modes such that the commanders (P1) level of control over the aircraft is reduced. In cases where this is possible in service, these have been identified and rendered safe. This method was employed in such as the Aero L-39 Albatros.

A-3.12 **Jettisonable Doors**

A-3.12.1 Jettisonable doors are not usual on aeroplanes although they may be an integral part of an ejection system (e.g. Canberra rear seat). On the P-63 Kingcobra the doors are designed to be jettisonable for emergency use, via withdrawal of the hinge pins at the leading edges. In this case in order to reduce the possibility of inadvertent jettison, the CAA required a frangible copper wire seals at the pin ends, as a "tell-tale". It therefore remains possible to jettison such doors.

A-3.12.2 Jettisonable doors are usual on military rotorcraft and no measures such as mentioned above have been taken.

A-3.13 **Bomb Bay Doors**

A-3.13.1 Aircraft such as the Canberra and Vulcan have a large bomb bay and the doors may be opened in flight. The deployment in flight of such doors is part of the normal operation of the aircraft and is generally accepted as such, within any limitations quoted in the Pilots Notes. However, a restriction may be placed on this due to some system location changes to allow for such as an experimental equipment fit that was removed prior to civil operation.

A-3.14 **Arrester Hooks and Catapult Launches**

A-3.14.1 Arrester hooks intended for use during ship-borne or ground based operations may be fitted for authenticity. The use of arrester hooks is not required for civil use and is not approved. A limitation will appear on the AAN and on the Permit in such cases. Similarly, although the necessary equipment to conduct catapult operations in military service may be fitted for authenticity, the use of such gear has not been approved for civil use as it may involve additional stresses on the airframe and difficult handling cases for the pilot.

A-3.15 **Brake Parachute**

A-3.15.1 If a brake parachute was fitted during military service, this is allowable provided it is adequately covered by Pilots Notes. It should not be streamed in flight (although CAA does not insist on a weight-on-wheels switch) and it is not to be relied on in order to plan a landing on a short runway.

A-3.16 **Operation from Grass/Unpaved Surfaces**

A-3.16.1 Most turbine-powered aircraft were designed to operate from prepared hard surfaces (runways or carrier decks). Operation from grass fields is prohibited for such aircraft unless the Pilots Notes/Aircrew Manual specifically allows it, as such operations may affect fatigue life. A Mandatory Permit Directive (MPD) was necessary to clarify this aspect for the Jet Provost. The L-39 may operate from grass provided the weight is within an acceptable limit.

A-3.17 **Electric Trim only, without back-up actuator**

A-3.17.1 On the L39 the elevator trim is electrical only, with no back-up actuator. Flight test assessment concluded that in the event of failure leading to runaway the control forces are light enough that the pilot could still be expected to land the aircraft.

A-3.18 **Automatic Deployment of Controls**

A-3.18.1 On the L-39 the airbrake automatically extends if both Mach meters read more than 0.78. That both have to detect such a condition provides some protection against inappropriate deployment due to a single failure. In this case flight test assessment of trim change due to deployment at low speed concluded that the pilot should be able to cope with un-demanded deployment in the circuit.

A-3.19 **Transmission Tunnel**

A-3.19.1 On the P-39 Airacobra and P-63 Kingcobra the engine is mounted behind the pilot, who sits astride a transmission tunnel, which houses the drive to the tractor propeller. Although at first sight this unusual design appears alarming, it is a feature that is accepted as part of the overall design without further investigation. However, as the engine is behind the pilot an engine fire warning system may be installed as an applicant's modification to give an additional level of safety.

A-3.20 **Coffman or AvPIN Starters**

A-3.20.1 Ex-military jets such as Hunter, or Canberra may employ cartridge-powered starters or iso-propyl nitrate powered starters. While these systems present an increased hazard for ground handling, they do not present an unacceptable level of in-flight hazard, and have been accepted as they are (with the appropriate life limits on the equipment concerned).

A-3.22.1 It should be noted that some aircraft – such as the Hunter – have been modified to have an electric starter to negate any issues with the previous type of starter.

A-3.21 **Flight in IMC**

A-3.21.1 The Permit to Fly generally restricts flight to day VMC only. On occasion, permission for limited flight in IMC has been granted on an individual basis for ex-military aeroplanes of a type that were approved for such flight in military service. For any formal approval to operate in IMC, the aircraft operating company will have to make a suitable justification for consideration by the CAA. This will have to demonstrate that the aircraft is equipped for the flight and that the safety record of such operation in service supports such operations. Consideration will be given on a case-by-case basis only and any approval will not be taken as a precedent for other types and/or other classes of permit to fly aircraft.

A-3.22 **Hazardous Materials**

A-3.22.1 Operators of ex-military aircraft used for flying displays must identify and where practicable (i.e. where this does not affect airworthiness) remove any hazardous materials. For example drop tanks might contain phenolic asbestos; in this instance, if operationally possible then the aircraft should be flown in the clean configuration.

APPENDIX 4: Applicant procedures for A8-25 supplement 2 organisations in support of ex-military aircraft permit to fly applications

A-4.1 Introduction

The purpose of this appendix is for guidance of a company's personnel, when engaged in the process of application for a Permit to Fly.

A-4.2 Procedures

The following sample procedures cover submission of an aircraft to the CAA for initial issue of a Permit to Fly.

A-4.2.1 Procedure for the Application to CAA for initial issue of a Permit to Fly and submission of Justification for this. The Chief Engineer is responsible for carrying out the company aspects of this procedure.

- a. Raise permanent company record file on the aircraft
- b. Application is made on Form CA3 together with a cheque for the deposit. This is sent to CAA's Applications and Approvals Section at Aviation House, Gatwick. If the CAA has not previously accepted an example of the type, the A8-25 Supplement 2 Signatory will propose a complexity category at the time of application, and include sufficient information on the design features of the type (technical descriptions and Pilots Notes) to justify the recommendation with his letter.

If the aircraft is of a type previously accepted by the CAA:

- c. Obtain copies of previous AANs to ensure that all aspects are covered in the design report. Then proceed to Paragraph (g) for complex aircraft or Paragraph (i) otherwise

If the aircraft is of a type which has not previously been accepted by the CAA:

- d. If the aircraft complexity categorisation is marginal, or if it incorporates features not previously accepted by the CAA, further meetings may be required at Aviation House in order to determine acceptability. The Chief Engineer will arrange such meetings and compile appropriate presentation material.
- e. Submit safety record (BCAR A3-7/B3-7 Appendix 1 paragraph 2.1) and any proposed ameliorative measures for civil operation to CAA Design Surveyor for discussion and agreement.
- f. Obtain formal written acceptance of the type complexity category and safety record (with ameliorative provisos) from the CAA.

Once the safety record and complexity category have been agreed by the CAA:

If the aircraft is classified as *Complex*:

- g. Obtain the Type Design Organisations formal agreement to remain involved in the continued oversight of the project. Propose amended Exposition to cover procedures for the necessary interface with the manufacturers providing support for the aircraft and of its critical equipment, and/or an acceptable Military Authority.
- h. Obtain CAA approval of such procedures and Exposition amendment.

Otherwise:

- i. Establish conformity to type design standard for which the safety record was demonstrated, via checklists against modifications required for airworthiness. Compile a design report (referring to subsidiary documentation including modification check lists, fatigue audit, etc) to show that the particular aircraft matches the design standard for which the safety record was generated. This must also identify and propose technical justification for any departures from this standard (see procedure 6.2 for more detail).

The bulk of the permanent company records covering justification will be completed at this time.

- j. Send design report to CAA GAU Design and Certification Surveyor at Aviation House, Gatwick, together with other supporting information as necessary (copy of each applicant's modification, copy of Pilots Notes, FRCs, etc).
- k. Provide responses to the GAU Surveyor's questions relating to the aircraft/submission.
- l. Propose flight test schedule and test pilot and obtain CAA agreement to each of these. Ascertain whether the CAA requires to fly the aircraft. CAA Flight Specialist assessment will always be required for a new type.

A-4.2.2 **Procedure for Compilation of a Design Report**

The company design report should employ a similar layout to the AAN issued by the CAA as per Appendix 1. The A8-25 Supplement 2 Signatory should compile a report and ensure that permanent company records are compiled concurrently. Copies of supporting documents such as Aircrew and W&B manuals, AP extracts etc. should be included.

A-4.2.3 **Modifications not shown on the Manufacturers Master List including those made by the A8-25 Organisation**

The Supplement 2 approval granted under BCAR A8-25 approval does not confer approval of any activity to design or seek approval for Major Modifications on this class of aircraft.

While the aircraft should conform as closely as possible to the Type Design Standard in respect of which the safety record has been accepted, the CAA recognise that the operating organisation may wish to embody modifications in order to simplify operation of the aircraft (such as replacement of non-standard oxygen supply connectors with NATO standard connectors).

In general, the normal CAA procedure as detailed in BCAR A2-5/B2-5 will apply in such cases. Significant changes to the aircraft in terms of powerplant changes, propeller type, alternative material specifications or equipment changes (to ensure that the aircraft is equipped to a standard acceptable to the CAA for the intended purpose) may be the subject of major modification action. Such modifications are to be adequately defined on modification sheets to include drawings, circuit diagrams and changes to Pilots Notes showing effect on limitations and operation, and justification.

The design report will list modifications but procedure for justification of each will be subject to individual agreement with the CAA Design and Certification Surveyor. Use of appropriate approved design organisations is normally required for particular modifications such as those affecting primary structure.

Minor modifications to aircraft or components are required to be submitted either to the GAU Airworthiness Team, along with technical justification, to substantiate such change or alternatively be submitted via a suitably CAA approved design organisation.

APPENDIX 5: Changes to the original design

A-5.1 Introduction

The purpose of this appendix is for guidance regarding changes to the original design standard of an aircraft.

A-5.1.1 A modification is a change made to an aircraft or its engine, propeller, radio apparatus, accessories, instruments, equipment, and their installations. The changes may be made during restoration of an aircraft (either in the UK or prior to transfer to the UK) or during in-service maintenance. These changes may include:

- a. Substitution of one type for another when applied to components, engines, propellers, radio installations, accessories, instruments and equipment.
- b. Material substitution, changes of processes or treatments during the manufacture of replacement parts.
- c. Addition, removal or alteration of components.
- d. Any repairs not made in accordance with a manufacturer's repair manuals or other approved repair schemes.
- e. Changes to the aircraft that affect the flight manual or maintenance manual.

A-5.1.2 It is recommended that operators ensure that all modifications and repairs made to the aircraft are included in the aircraft records and where necessary to have the necessary modification approvals in place. It is clear that not all changes need formal modification approval (for example tertiary items or equipment). However, where modification action is not taken in support of a change, it is suggested that a record of this is included to show that consideration has been given but modification action has not been taken. It is also recommended that operators establish that all parts used in support of these activities have been manufactured in accordance with appropriate design data.

A-5.1.3 If it is not possible to establish the applicable approval for a modification or repair, operators should contact the General Aviation Unit Airworthiness Team for further assistance and guidance.

A-5.2 Guidance

A-5.2.1 Standard Modifications

Generic guidance to applicants who do not hold CAA BCAR A-8 or EASA Part 21 Design Organisation approvals, for the preparation of the data required to support applications for the approval of minor modifications to UK registered non-EASA aircraft has been developed and published as CAP 1419. This reflects also the guidance given by EASA within CS-STAN.

<http://publicapps.caa.co.uk/docs/33/CAP%201419%20MAR17.pdf>

A-5.2.2 Standard Repairs

Generic guidance regarding standard repairs is being developed as part of the GA Programme, specifically as item GAC-057. At the conclusion of this item, the relevant information will be included here.

A-5.2.3 Material Substitution

Generic guidance regarding materials substitutions is being developed as part of the GA Programme, specifically as item GAC-134. At the conclusion of this item, the relevant information will be included here.

A-5.2.4 Manufacture of Spare Parts and Assemblies

With the introduction of BCAR A8-23 (specifically Paragraph 9.3) and A8-24 (specifically Paragraph 5.1), the ability for suitably approved organisations to manufacture or fabricate components and assemblies has been introduced. A capability list and procedures for this should be included in the company exposition for agreement and approval by the assigned GAU Airworthiness Surveyor. Guidance and Advisory Material will be developed in relation to this and included within this CAP when available.

APPENDIX 6: Ageing aircraft campaigns

A-6.1 Introduction

Chapter 5 recognises that in some cases there is a shortage of information on ageing aircraft systems and wiring, particularly in ex-military aircraft. Where extensive restoration has taken place, the original components will have been refurbished and perhaps wiring replaced. However, there are many instances where little has been done to the aircraft and its original build standard. Guidance will be therefore established for ageing aircraft, system and wiring and included within this Appendix.

A-6.2 Guidance

A-6.2.1 Engine Overhaul Lives

Guidance will be provided here on engine overhaul lives in a future revision to this CAP.

A-6.2.2 Corrosion

Corrosion can result in a significant decrease in the thickness of original load bearing material that can lead to a loss of structural integrity and potentially to catastrophic failure. In the case of more highly stressed parts, finding and rectifying corrosion damage can help to prevent the early initiation of fatigue cracking from corrosion pits that can also lead to premature structural and catastrophic failures. This has been observed in aluminium alloy forgings and light aircraft landing gear components, where a mixture of exfoliation and pitting corrosion on the flash line initiated stress corrosion cracking that then lead to corrosion fatigue, normal fatigue and exfoliation.

To aid in dealing with this, general guidance is provided in CAP 1570 on the design, assembly and inspection of various parts of an aircraft structure. Those areas that because of their remoteness, complexity or boxed-in nature and are not readily accessible during routine maintenance or require attention in the light of operational experience are highlighted.

http://publicapps.caa.co.uk/docs/33/CAP1570_Corrosion.pdf

A-6.2.3 Wiring

Guidance on the condition of wire and wiring materials found in British ex-military aircraft flying with a Permit to Fly will be provided here in a future revision to this CAP.

A-6.2.4 Component Lives

Guidance on the condition of components, such as seals etc. and ancillaries such as fuel and air system components where the continuation of an hourly-based inspection/replacement regime does not account for a potential degradation of the seal material due to system inactivity or the resulting calendar period will be provided here in a future revision to this CAP.

A-6.2.5 Seat Harness Condition Monitoring

EASA has published a Research Study into seat belt degradation:

https://www.easa.europa.eu/system/files/dfu/SEBED%20Report_Final_5-2010.pdf

Further guidance on the condition of seat harness components will be provided here in a future revision to this CAP.