Part 11 Airworthiness Information

Leaflet 11-1 Chipmunk Spinning and Aerobatics

(Previously issued as AIL/0046)

PURPOSE: The purpose of this Leaflet is to acquaint pilots with a background of information on:

a) the long chord rudder;

b) anti-spin strakes on the rear fuselage;

c) behaviour of the aircraft when spinning and attempting to spin;

d) the necessary spin recovery action; and to acquaint the pilots with the contents of the Flight Manual.

REFERENCES: Various, as quoted in Leaflet.

1 Introduction

Considerable numbers of de Havilland Chipmunks have come onto the civil register from the Royal Air Force. Unfortunately, because accidents have occurred, the aeroplane has become the subject of ill-informed rumours about its spinning characteristics.

2 Long Chord Rudder (de Havilland Modification H 104)

The long chord rudder was introduced at the request of the Royal Air Force to improve handling during aerobatics. Specifically, the modified rudder enables the pilot to hold the nose up during slow rolls, and improves control when sideslipping and during a cross-wind take-off or landing.

The modified rudder can be identified on sight by the markedly curved trailing edge and the presence of small bite at the trailing edge where it joins the root rib (to give up-elevator clearance when full rudder is applied).

The long chord rudder was not introduced to improve spin recovery – nor has it been proved during extensive tests to have the slightest effect upon recovery from a spin. It does, however, improve spin entry because the pilot can achieve greater yaw, making a spin more likely than the spiral dive, which has often been confused with a spin.

3 Anti-spin Strakes (de Havilland Modification H 231)

The anti-spin strakes consist of extensions forward of the tailplane roots, some 3 feet in length, faired into the fuselage sides. Their purpose is to increase the aerodynamic drag of the tail, thus tending to damp rotation in yaw, and steepening the spin.

The strakes improve spin recovery, by reducing the number of turns taken before rotation ceases after corrective control movements have been applied.

Considerable experience has produced no evidence that the improved spin recovery of a Chipmunk fitted with strakes is affected in any way by the fitting of either a standard or a long chord rudder.

4 Condition of the Aircraft

Everything that follows presupposes that:

a) control surface rigging is maintained within limits;

b) control cable tension is maintained within limits;

c) the leading edges of wing and tail surfaces are not significantly damaged or dented;

d) the weight and centre of gravity are within limits;

e) the engine idling rpm is within limits.

NOTE: It is important that no pilot embarks upon an aerobatic or spinning sortie without first checking the loading of his aeroplane.

5 Aerobatics

Aerobatic and spinning manoeuvres are not permitted unless the aeroplane is fitted with anti-spin strakes (de Havilland Modification H 231).

When aerobatic manoeuvres are permitted such manoeuvres shall be performed with:

a) cockpit canopy SHUT and LOCKED;

b) wheel brakes OFF to ensure full rudder travel;

c) flaps UP;

additionally:

d) elevator trim NEUTRAL;

e) harness TIGHT and LOCKED;

f) direction indicator CAGED;

g) mixture RICH;

h) carburettor air AS REQUIRED;

i) oil temperature and pressure WITHIN LIMITS;

j) fuel SUFFICIENT.

6 Spinning Manoeuvres

The aeroplane is hard to spin properly at almost all centre-of-gravity positions. The characteristics of one aircraft may differ from another: where one will spin, another will only enter a semi-stalled spiral dive, and one aeroplane may do either. The difference in behaviour depends upon such variables as weight and position of centre of gravity, the intended spin direction, and aileron deflection into or out of the direction of spin.

As the spiral and the spin can be confused, it is essential to differentiate between them. The characteristics of the spiral dive and the spin are as follows:

The Semi-Stalled Spiral Dive

The spiral resembles a spin, and is more likely to occur in conditions of forward centre of gravity.

The following points indicate that the spiral is in fact a semi-stalled spiral dive without auto-rotation (the characteristic of the true spin):

a) the attitude is steep;

b) the airspeed will increase from 40 knots IAS at the start to 80-90 knots IAS after two turns with the stick fully back and full rudder to maintain the manoeuvre;

c) the controls retain the forces of normal manoeuvres, but there is some buffeting of the tail;

d) there is usually noticeable noise and rattle resulting from buffeting at increasing IAS;

e) upon releasing the controls the aeroplane will recover by itself, or with some opposite rudder, after rotating through one quarter to one half a turn.

The Spin

The spin has the following characteristics:

a) the attitude is steep initially but after two or three turns the spin may become less steep with the nose generally 30° to 50° below the horizon, while appearing to be less so;

b) the airspeed remains steady, between 30 knots and 50 knots IAS;

c) the rudder force is light;

d) the stick force is light when aft of neutral; a relatively heavy push force is needed to move the stick fully forward, and this may be accompanied by some buffeting.

7 Spin Procedure

The spin should be started at 50 knots by applying full rudder in the required direction, and moving the stick fully back. If the stick is not moved fully back until the spin has been entered, a semi-stalled spiral dive may be encountered. In addition to the normal pro-spin control movements, it is often necessary to force a reluctant aeroplane to enter a spin by use of aileron against the intended direction of spin. If aileron is so used it should be centralised when entry is achieved.

When finally spinning the nose of the aircraft gradually rises, and the flatter attitudes may cause longer recoveries than for many other types of aircraft. It is important for a pilot to appreciate that:

a) full and decisive control movements are needed to recover, particularly nosedown elevator, which may require a considerable push force;

b) the rate of spin rotation may increase momentarily when anti-spin controls are applied; this is to be taken as an indication that the correct actions have been followed;

c) standard recovery action is effective as long as one has the required altitude, and a conscious effort is made to apply and maintain full opposite rudder and full forward stick;

d) normal recovery action takes place in one to two turns, which may involve a height loss of 1,000 feet to straight and level flight. Exceptionally, the recovery may take up to four and one half turns involving a total height loss around 2,000 feet.

Drills

Spin Entry should not be attempted below 4,000 feet above ground level. Before starting the spin, check:

a) cockpit canopy SHUT and LOCKED;

b) wheel brakes OFF to ensure full rudder travel;

c) flaps UP;

additionally:

d) elevator trim NEUTRAL;

e) harness TIGHT and LOCKED;

f) direction indicator CAGED;

g) mixture RICH;

h) carburettor air AS REQUIRED;

i) oil temperature and pressure WITHIN LIMITS;

j) fuel SUFFICIENT.

The aeroplane should be spun with 1) throttle CLOSED, 2) full rudder and 3) stick fully back.

NOTE: If aileron is applied against the direction of the spin, it must be centralised when entry is achieved.

Spin Recovery must be started at least 3,500 feet above ground level, in order to retain level flight by 1,500 feet, consistent with a height loss during recovery of up to 2,000 feet.

a) check throttle CLOSED;

b) check ailerons CENTRAL;

c) apply full OPPOSITE RUDDER;

d) PAUSE;

e) move the stick firmly FORWARD against the increasing stick force and stick buffet, IF NECESSARY TO THE FRONT STOP and hold it there until rotation ceases;

f) when rotation ceases CENTRALISE the rudder control and ease out of the ensuing dive.

8 Placards

All civil Chipmunks cleared for aerobatics (i.e. fitted with anti-spin strakes) display the following placard in full view of each pilot, in the prescribed position (HSA Modification H324).

SPIN RECOVERY
MAY NEED
FULL FORWARD STICK
UNTIL ROTATION STOPS
(also see Flight Manual)

Aircraft not cleared for spins and aerobatics must display the following placard, in full view of each pilot, in the prescribed position (HSA Modification H323).

AEROBATICS
AND SPINS
PROHIBITED

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Leaflet 11-2 Carbon Monoxide Contamination in Aircraft

(Previously issued as AN 40)

1 Introduction

All concerned are warned of the possibility of dangerous carbon monoxide concentrations in aircraft. All aircraft types may be affected, but this Leaflet relates mainly to light aircraft.

NOTE: Carbon monoxide (CO), a poisonous gas, is a product of incomplete combustion and is found in varying degrees in all smoke and fumes from burning carbonaceous substances. It is colourless, odourless and tasteless.

2 Main Sources

The two main sources of contamination are:

2.1 Modifications, such as those involving the introduction of additional openings in the fuselage or the removal of windows and doors, e.g. for camera installations or parachutists: in future, before approval can be given for such modifications, aircraft must be tested to ensure that the cockpit/cabin is free from unacceptable concentrations. Aircraft modified in accordance with an approved scheme must also be subjected to a similar test.

2.2 Defective heating systems of the type which utilise an exhaust heat exchange: physical inspections of such systems should be carried out according to the manufacturer's instructions at the intervals specified and whenever carbon monoxide contamination is suspected.

3 Other Sources

Other possible sources of contamination are:

3.1 Apertures in fire walls of single-engined aircraft, ineffective seals at fuselage strut attachments, defective exhaust manifold slip joints, exhaust system cracks or holes, discharge at engine breathers, defective gaskets in exhaust system joints and faulty silencers: aircraft should be carefully examined for defects of this nature during routine inspections, which should occur at sufficiently regular intervals.

3.2 Exhaust from other aircraft during ground holding and taxiing: the obvious precaution in this case is that ground holding and taxiing should be carried out clear of the exhaust area of preceding aircraft.

4 Testing for Carbon Monoxide

The CAA's nearest Regional Office (see Airworthiness Notice No. 29, Appendix 2) should be contacted in cases where the presence of carbon monoxide is suspected and a test for concentration is considered desirable.

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Leaflet 11-4 UK Certification of Aircraft which are Eligible for the Issue of a Certificate of Airworthiness

1 Introduction

1.1 The purpose of this Leaflet is to provide guidance to applicants regarding CAA requirements that have to be satisfied for the Issue of a Certificate of Airworthiness; it includes procedures covering how to make an application and the subsequent processes.

Whilst covering all aircraft types irrespective of weight, the processes detailed in this Leaflet should not be considered as being definitive. Not all references quoted will apply to every aircraft type.

Reference to BCAR Section A/B Chapter A/B2-2 and A/B3-2 is advised prior to contract/purchase of an aircraft.

2 References

a) (CAP 388, 391, 398, 399, 400 and 408) Log Books - Airframe, Engine, Propellers.

b) (CAP 393) Air Navigation: The Order and the Regulations (including CAA Scheme of Charges).

c) (CAP 411) Light Aircraft Maintenance Schedules (Aeroplanes).

d) (CAP 412) Light Aircraft Maintenance Schedules (Helicopters).

e) (CAP 455) Airworthiness Notices.

f) (CAP 473) Foreign Airworthiness Directives Volumes I and II.

g) (CAP 474) Foreign Airworthiness Directives Volume III.

h) (CAP 476) Mandatory Aircraft Modifications and Inspection Summary.

i) (CAP 480) UK Additional Requirements and Special Conditions.

j) (CAP 520) Light Aircraft Maintenance.

k) (CAP 553) BCAR Section A.

l) (CAP 554) BCAR Section B.

m) (CAP 731) Approval, Operational Serviceability and Readout of Flight Data Recorder Systems (scheduled for publication 28 May 2004).

n) Civil Aviation Authority web site – www.caa.co.uk.

o) Type Certificate Data Sheets – available for download from www.caa.co.uk, under the headings 'Airworthiness' and 'Certification'.

p) CAA Specifications.

q) JAR-OPS 1 and 3.

r) JAA Joint Technical Standards Orders.

s) Additional National Design Requirements (JAA Administration and Guidance Material).

t) (CAP 747) Mandatory Requirements for Airworthiness.

3 Applications

This Leaflet is applicable to both new and used aircraft where an application is being made for a UK Certificate of Airworthiness.

3.1 Certificate of Registration

The application Form CA1 has to be completed in full and sent together with the appropriate fee to:

Civil Aviation Authority
Aircraft Registration Section
CAA House
45-59 Kingsway
London WC2B 6TE

Tel: +44 (0) 20 7453 6666
Fax: +44 (0) 20 7453 6670
E-mail: aircraft.reg@srg.caa.co.uk

Whilst a UK registration can be allocated following application, evidence of de-registration, or confirmation that the aircraft has never been entered on the civil register of the exporting country is required before it can be issued. The Registration Section will require written confirmation from the previous State of Registry/ Exporting Country.

The registered owner should give careful consideration to the timing of the removal of the aircraft from a foreign register. Where an Export Certificate of Airworthiness is required, such a certificate may need to be issued by the exporting State of Registry prior to the aircraft being de-registered.

3.2 Certificate of Airworthiness

Application for the Issue of a Certificate of Airworthiness (C of A) is made on Form CA3. Particular care must be taken in the completion of all sections of the form to ensure that all the details required are provided, to minimise the processing time taken by the CAA.

Send the completed Form CA3, together with a copy of the Export Certificate of Airworthiness and the correct fee to:

Civil Aviation Authority
Safety Regulation Group
Applications and Approvals Department
Aviation House
Gatwick Airport South
West Sussex RH6 0YR

Tel: +44 (0) 1293 768374
Fax: +44 (0) 1293 573860
E-mail: aanda@srg.caa.co.uk

Upon receipt of Form CA3, the Applications and Approvals Department will carry out an initial technical assessment to determine whether the aircraft is eligible for a UK Certificate of Airworthiness. If the applicant has any doubt on the eligibility of an aircraft for a UK Certificate of Airworthiness, Applications and Approvals Department should be contacted at the earliest opportunity.

Where an Export Certificate of Airworthiness is required, it should not be more than 60 days from the date of issue when received by the CAA. Some regulatory authorities do not issue an Export Certificate of Airworthiness; in such cases the CAA may accept as an alternative:

a) a valid domestic Certificate of Airworthiness issued within the last 60 days; or

b) a valid Certificate of Airworthiness together with a written statement signed by the regulatory authority of the exporting state within the last 60 days confirming that the aircraft is in accordance with the TCDS and is in an airworthy condition. Derogations or waivers to requirements issued by the exporting country must be agreed with the CAA in advance.

Delivery flights to the UK may be completed whilst the aircraft is on the foreign register. Aircraft on the UK Register requiring to be flown to a destination in order that it may qualify for the issue of a UK Certificate of Airworthiness may be issued with ferry documentation at the discretion of the CAA. Surveyor involvement will normally be required to issue the ferry documentation and if this involves travelling abroad, the additional costs incurred will be charged to the applicant (refer CAA Scheme of Charges).

For new aircraft, classified as Series, delivered directly from the manufacturer, the CAA may at their discretion issue ferry documentation to the foreign regulatory authority to validate on behalf of the UK CAA. The full C of A issue process will then be completed in the UK at an appropriate facility. Request for ferry documentation must be made on Form CA3 at the time of the application for the C of A.

3.3 Noise Certification

The Form CA3 is also the application for the Noise Certificate. The CAA will establish whether the aircraft qualifies for the issue of a Noise Certificate, which will normally be issued by the Surveyor at the time of C of A issue. If the applicant has any doubt on the eligibility of an aircraft for a UK Noise Certificate, Applications and Approvals Department should be contacted at the earliest opportunity.

3.4 Flight Manual Approval

When completing the Form CA3 the applicant provides the Flight Manual (FM) reference number in the appropriate box. Additional information regarding FM approval following the adoption of Regulation (EC) 1702/2003 will be provided at the next revision to this Leaflet.

If there are any queries regarding the approval status of the FM and associated supplements, Applications and Approvals Department should be contacted.

3.5 Radio Licence and Installation Approval

All radio equipment installed has to be of an approved type. Approved radio equipment is listed on the Aircraft Equipment Approval Record System (AEARS) database, which is part of the CAA website. All radio installations must be approved. The approval of radio installations is referenced on the Radio Station Licence.

An application for a Radio Licence should be made to:

WT Radio Licensing
Surveillance and Spectrum Management
Directorate of Airspace Policy
K6 Gate 6
CAA House
45-49 Kingsway
London WC2B 6TE

Tel:(0207) 453 6529
Fax:(0207) 453 6546

4 Type Certification

For aircraft subject to EU regulation, the type certification standard is that declared by the European Aviation Safety Agency (EASA).

Additional information on type certification standards will be provided at the next revision to this Leaflet.

If there are any questions regarding the acceptability of the type certification standard, Applications and Approvals Department should be contacted.

5 Issue of the Certificate of Airworthiness

5.1 An appropriately approved organisation is required to supervise presentation of the aircraft at the time of survey for the issue of the Certificate of Airworthiness. (Subject to CAA agreement, a Licensed Aircraft Maintenance Engineer may supervise aircraft less than 13610 kg/30000 lb MTWA.)

The documentation should be presented to the Surveyor at an early stage, in order that compliance with the airworthiness and certification standard of the aircraft can be determined.

It is essential that suitable notice is given and adequate time is allocated for the Regional Office Surveyor to survey the aircraft and associated records. Appropriate hangar and office facilities must be available. To support the assessment of the aircraft maintenance records, the latest revision of the applicable manufacturers and regulatory publications should also be readily available for reference purposes.

5.2 Type Certification Basis

The aircraft should be assessed to establish that it is in compliance with the appropriate type certification requirements, typically as specified in the applicable Type Certificate Data Sheet (TCDS). This will include the technical characteristics and certification basis.

5.3 Design Submission for Used/Imported Aircraft[1]

The accepted organisation, LAE, or, for aircraft above 15000 kgs, the BCAR E3 design organisation, will be expected to have completed an assessment of the previous records and raised appropriate reports prior to the survey.

1. Items marker with an * will require a report, form or documentary evidence supplied to the Surveyor.

5.4 UK Registration

Certificate of Registration must be issued before a Certificate of Airworthiness issue can take place.

NOTE: Aircraft must be UK registered even for flights under "A" Conditions.

5.5 Flight Test*

Perform Airworthiness Flight Test and if applicable a radio test to the correct schedule, using a pilot accepted by the CAA unless alternative arrangements have been agreed by the CAA. Upon completion and when satisfied, the pilot should sign the Flight Test Certificate.

5.6 Aircraft Weighing*

The following items must be valid:

a) Weighing Record (record of the weighing and the calculations involved).

b) Weight and Centre of Gravity Schedule (enables the totally loaded weight and C of G to be calculated).

c) Weight and Balance Report/manual required for aircraft above 5700 kg. (Record of loading data essential to enable the particular aircraft to be correctly loaded).

CAA will normally expect aircraft to be re-weighed prior to the issue of the Certificate of Airworthiness and a weight and centre of gravity schedule to be prepared from that weighing record. If there is technical justification for not weighing the aircraft, there may be discretion to accept the previous weighing record, however this should be agreed with the CAA Surveyor.

5.7 Flight Manual, Pilots Operating Handbook or Owners Manual[1]

See paragraph 3.4.

5.8 Export Certificate of Airworthiness from Exporting Country*

Where an Export Certificate of Airworthiness has been issued, the original should be available at the time of survey.

5.9 Airworthiness Notices

The aircraft and records should be reviewed to ensure compliance and certification of all applicable Airworthiness Notices and a compliance statement prepared. This includes engines, propellers and equipment.

5.10 Airworthiness Directives*

The aircraft and records should be reviewed to establish evidence of compliance and certification of all applicable Airworthiness Directives. An Airworthiness Directive compliance statement should be prepared for the aircraft, engines, propellers and equipment.

Compliance should be shown with:

a) All applicable Airworthiness Directives issued by the State of Design.

b) All applicable Airworthiness Directives issued by EASA.

Plus

c) Any CAA Additional Airworthiness Directives.

1. Items marker with an * will require a report, form or documentary evidence supplied to the Surveyor.

5.11 UK Additional Requirements for Import (ARI) – (As applicable)*

The aircraft and records should be reviewed to ensure evidence of compliance with all applicable ARI's and JAA Additional National Certification Requirements.

5.12 Maintenance Requirements

All maintenance requirements must have been carried out and certified in the applicable aircraft records and a Certificate of Release to Service issued. This may include Scheduled Inspections, Corrosion Prevention and Control Programme and Supplementary Structural Inspection Document tasks.

Where a used aircraft is being placed on a maintenance schedule or programme an alignment (bridging) maintenance check may be required. The content of the alignment check, including consideration of previous maintenance standards, previous maintenance programme and any escalations, must be agreed with the CAA Surveyor. For used aircraft below 2730 kg being placed on the Light Aircraft Maintenance Schedule (LAMS), an Annual Inspection will normally be required.

5.13 Certification Maintenance Requirements[1]

Where the type certification process has identified Certification Maintenance Requirements, the aircraft and records should be reviewed to ensure evidence of compliance and certification, at the prescribed intervals and a compliance statement prepared.

5.14 Airworthiness Life Limitations (Service Life Limits)*

The aircraft and records should be reviewed to ensure the CAA, State of Design, and Type Certificate Holders recommended life limits have been incorporated into the maintenance programme/schedule. Evidence that the existing life limits have not been exceeded must be established. This also includes the engines, propellers and appliances.

5.15 Airframe, Engine, APU, VP Propeller Logbooks

The aircraft, engine, propeller and appliance historical records must be available to confirm the aircrafts provenance and current status.

Logbooks to meet the ANO requirements must be available and up-to-date.

Owners/operators who wish to retain records by a means other than log books will require written approval from the CAA.

5.16 Modification Records

A modification Record Book should be kept for aircraft above 2730 kgs to record all aircraft modifications and repairs.

Modification relating to Engines and Propellers/APU should be recorded in the applicable logbooks.

5.17 Previously Applied Repairs

The aircraft, engine, propeller and appliance records should be reviewed to identify all previous repairs and ensure they comply with recognised approved data.

5.18 Cabin Configuration

Check the current configuration conforms to a recognised approved modification.

- Equipment location and placards

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1. Items marker with an * will require a report, form or documentary evidence supplied to the Surveyor.

- Seat pitch/aisle width
- Over wing type III and IV exits
- Galleys
- Toilets

5.19 **CAA Specifications**

The aircraft and records should be reviewed to ensure compliance as applicable. This includes the engines, propellers and appliances.

5.20 **Avionic Issues***

The avionic and electrical equipment installation should be reviewed and the certification and continued airworthiness issues established i.e. electrical load analysis report and software criticality list, maintenance requirements, etc.

6 Operation of the Aircraft

The following items are not directly related to the issue of the Certificate of Airworthiness. They must however be addressed prior to flight, according to the Certificate of Airworthiness category and usage of the aircraft.

6.1 **Approved Maintenance Programme/Schedule[1]**

The owner/operator of the aircraft is responsible for the continued airworthiness of the aircraft, which includes maintaining the aircraft to the approved maintenance schedule/programme.

NOTE: If the aircraft type is new to the operator it will normally be expected that the maintenance schedule/programme (task/check frequencies) will be based upon the Maintenance Review Board Report (MRBR), Maintenance Planning Document (MPD) or equivalent documents. Movement away from the scheduled tasks and intervals will only be considered when the operators in service experience/reliability monitoring data is available to support the change.

Ensure the maintenance programme/schedule has been approved and is applicable for the particular aircraft, or that an amendment has been raised to add the aircraft into an existing maintenance programme/schedule.

Avionics and operating approvals equipment should be adequately addressed, i.e. maintenance instructions (or equipment) systems installed under STC or other modification approval. Such instructions will not always reside in the MPD; it is advised that the certification basis for the equipment be reviewed to identify the continued airworthiness instructions.

6.2 **Certificate of Maintenance Review**

Required by the ANO and applicable to aircraft with a C of A in force in the Transport and Aerial Work categories not operated on a JAR-OPS AOC.

6.3 **Technical Log**

Required for aircraft with a Transport or Aerial Work Category Certificate of Airworthiness. Technical Log should be to an appropriate standard for the aircraft type.

1. Items marker with an * will require a report, form or documentary evidence supplied to the Surveyor.

6.4 Equipment*

The aircraft and records should be reviewed to ensure compliance with the ANO or JAR-OPS standard for operational equipment. It is the owner/operators responsibility to ensure that all equipment fitted to the aircraft is approved by CAA. This responsibility extends to establishing that any limitations or restrictions mentioned within the CAA Approval or TSO are understood and complied with.

6.5 Operational Approvals

The aircraft and records should be reviewed to ensure compliance with operational approvals as appropriate:

- Reduced Vertical Separation Minima (RVSM).
- Extended Twin-engine Operations (ETOPS) / Long Range Operations (LROPS).
- All Weather Operations (AWOPS) / Auto land Category.
- Minimum Navigation Performance Specification (MNPS).
- Required Navigation Performance Specification (RNP).

6.6 FDR and CVR Calibration/Readout[1]

FDR

The operator/applicant should provide a compliance statement that demonstrates the following:

- A Data Frame Layout Document (DFL) is available for the FDR system.
- Conversion Data (to enable translation of FDR data to engineering units) is available for the FDR system.
- Procedures are in place to provide the DFL and Conversion Data to the appropriate readout facility.
- The Aircraft Approved Maintenance Schedule includes a list of tasks specified by the TC/STC holder to ensure the continued serviceability of the FDR system.
- The FDR Readout from a representative flight, conducted immediately prior to C of A issue, has been evaluated to ensure that the FDR system is functioning correctly.

NOTES: 1 Where an operator experiences a delay such that the results of the read out are not available for analysis at the time of C of A issue the responsible CAA Regional Office should be contacted to agree a specified time scale for its completion.

2 Irrespective of the originating source of the aircraft, the FDR system is required to meet the UK operational rules.

CVR

The operator will need to arrange for a recording from the CVR to be evaluated for acceptable performance. In addition, periodic maintenance checks and evaluation of recordings will need to be included in the approved maintenance schedule/ programme.

1. Items marker with an * will require a report, form or documentary evidence supplied to the Surveyor.

7 Typical Survey Items

The aircraft survey is intended to establish the condition and conformity of the particular aircraft and will sample various structures/systems and installations together with the associated technical records. When deciding what aspects (areas/ zones/systems) to survey on a second-hand/imported aircraft, the previous operating history will be a prime consideration. The following are examples of items, which may be sampled by the Surveyor during the survey.

7.1 Structures and Systems including Engines, Propellers and Appliances

- Condition and conformity
- Repainting
- Repairs

7.2 Flight Manual

A confidence check of the flight manual content against the FMAS report, if applicable, and revision status of manufacturers additional supplements.

7.3 Cabin Configuration

- Compliance with approved drawing.
- Minimum space for seated passengers.
- Access to exits and emergency exits.
- In Flight Entertainment (IFE) installations.
- Galley and Lavatory compartments.

7.4 Manufacturer's Data Plates

Check details on data plates are correct.

7.5 Nationality and Registration Marks

Fire proof plate/Aircraft exterior.

7.6 Compass Correction

Cards installed and valid.

7.7 Exit and Break-in Markings

- Applicable exit and "break-in" markings.
- Door surround markings.

7.8 Internal and External Placards and Markings

- Cabin placards.
- Cockpit placards and instrument markings.
- External placards.

7.9 Mandatory Requirements

- Flight Manual.
- Air Navigation Order.
- Modifications.
- Airworthiness Directives.
- Type Certificate Data Sheets/AAN.
- CAA Specifications.

- Airworthiness Notices.
- Certification Maintenance Requirements.

7.10 **Aircraft Records**

- All log books.
- Work packages.
- Technical Log.
- Life Item Records / Component Log Cards.

7.11 **Emergency Equipment**

Equipment compliance checked to approved drawing.

7.12 **Operational Requirements**

- JAR-OPS.
- CAP 360.
- ANO.

Leaflet 11-10 Electrical Generation Systems – Bus-Bar Low Voltage Warning Single-Engined Aircraft With A UK Certificate of Airworthiness

(Previously issued as AIL/0130)

1 Introduction

This Leaflet provides guidance material to achieve compliance with CAP 747 GR No. 6, and provides a list of acceptable low voltage units currently available.

It was originally written to give guidance for compliance with CAA Airworthiness Notice (AN) No. 88. This AN has been notified to European Aviation Safety Agency (EASA) under Article 10.1 of Regulation (EC) 1592/2002, and therefore the content is still appropriate. AN No. 88 has been transferred to CAP 747, Mandatory Requirements for Airworthiness, Appendix 1, Generic Requirement (GR) No. 6. These GRs are pending EASA review and concurrence. The resulting EASA Policy will supersede the validity of this Leaflet.

NOTE: CAA ANs that are notified to EASA have been transferred to CAP 747, Mandatory Requirements for Airworthiness, Appendix 1 as Generic Requirements. CAP 747 provides a single point of reference for all mandatory information for continuing airworthiness, including Airworthiness Directives, as applicable to civil aircraft registered in the UK.

The technical content and the paragraph numbering of GR No. 6 is identical to that of AN No. 88 Issue 3 dated 29 October 2001. Therefore, the guidance given in this Leaflet is also valid for GR No. 6. This Leaflet has been updated to reflect the changes in requirement references.

2 References

CAP 747 Mandatory Requirements for Airworthiness, Appendix 1, Generic Requirements, GR No. 6 dated 28 September 2004.

3 Low Voltage Units

3.1 GR No. 6 requires a single-engined aircraft equipped with an engine driven electrical generating system to be provided with a clear and unmistakable warning to the pilot that the alternator or DC generator output voltage has fallen to a level where the battery is supplying power to the electrical loads. However, the requirement is waived where an aircraft is equipped only to operate under day VMC conditions and where the loss of generated power could not prejudice continued safe flight and landing.

3.2 Service experience has shown that the following alternator/generator failure warnings will NOT be acceptable for compliance with GR No. 6:

a) Warnings sensed within the generator/alternator windings because they will not detect failures between the output terminals and distribution bus. This method of failure detection is known to be used on many models of Piper single-engined aircraft, and

b) Warnings which rely upon wide voltage differentials because they will only operate when the output voltage is well below that of the battery, thus when the warning illuminates the battery may have lost a significant proportion of its capacity.

NOTE: Aircraft currently equipped with such systems should be modified to comply with GR No. 6.

4 Equipment

4.1 An acceptable means of compliance would be to provide a red bus bar low volts warning, similar to the 12 volt or 24 volt units, which were designed and manufactured for installation in multi-engined aircraft, for compliance with the requirements of CAP 747 GR No. 4. The following units have been found acceptable for satisfying the requirements of GR No. 6.

NOTE: The original CAA frozen E Number Type Approval is quoted below each device.

Avionics Mobile units: E13746	AM–LV14–00/AM–LV28–00
LRE units: E13823	L403–450–12/L403–450–24
Rogers Aviation units: E13887	RLV/14/28
CSE units: E13889	BVM14 and BVM28
Bradford units – from McAlpines: E13845	3025–12/3025–14 (flashing) 3026–12/3026–24 (flashing, light dims when cancelled) 3027–12/3027–24 (steady, non dimming, non cancellable)

Advice may be sought from the Avionic and Electrical Systems Section of the CAA Safety Regulation Group, Aviation House, Gatwick, on the suitability of other devices which may be available. (See paragraph 10).

4.2 It is recognised that other manufacturers or individuals may wish to produce similar devices and for this reason the following specification is issued as general guidance on a standard which would be acceptable to the CAA in the first instance:

Specification

Indication:	Red warning light – steady or flashing.
Flash Rate: (Optional)	50 to 100 cycles per minute.
Dimming:	Not acceptable unless automatic reset is provided.
Trigger Voltage:	The warning lamp should illuminate decreasing voltage at: (i) 25.0 to 25.5 volts for 24 volt DC systems. (ii) 12.5 to 13.0 volts for 12 volt DC systems.
Resetting:	The warning should reset automatically to extinguish the lamp on a rising voltage 0.5 volts above these settings.

Voltage Ranges:	33.0 to 18 volts DC or 16.5 to 9 volts DC.
Environmental Conditions:	Generally, in accordance with British Standards BS3G100 or EUROCAE ED-14 (RTCA DO-160), for example as follows:
Operating Temperature Range:	–10°C to 40°C
Mechanical Loads:	Units should be capable of withstanding typical shock and vibration loads found in service.
Moisture:	The unit should either be encapsulated or shown to be capable of withstanding ingress of moisture. A simple water spray test would be sufficient to show compliance.
Fire and Smoke Hazard:	Unit should not be capable of producing toxic fumes or smoke under fault conditions, neither should it be capable of supporting combustion.
Radio Interference:	The unit should not create interference on radio communication or navigation equipment.
Compass Interference:	The safe compass distance should be specified.
Identification:	The unit should carry an identification of the manufacturer, its part number and serial number.
Testing:	The unit should be subjected to an endurance test of not less than 2 hours under normal conditions (i.e. warning not lit) and 1 hour with the warning operating.
Acceptance:	The specification, drawings and test evidence should be submitted to the CAA in the first instance for acceptance before the unit is fitted to any aircraft (see also paragraph 8).

5 Installation

The following general guidelines should be used:

5.1 The warning lamp should be mounted where it will be readily seen by the pilot. Steady lights will normally need to be mounted in the vicinity of the primary flight instruments whereas those which flash may be acceptable in a less central location.

5.2 The low bus voltage warning detector must be connected to the bus system through its own individual fuse or circuit breaker or to one of a suitable rating already fitted to the aircraft for a non-essential service such as a cigar lighter or cabin lighting, etc.

5.3 This Leaflet has concentrated on low bus volts monitoring because it is considered the simplest and most effective method, but other means of providing an acceptable alternative could be engineered and these will have to be assessed on an individual basis.

6 Pilot's Instructions

Instructions should be provided in the appropriate manual, such as the Pilot's Notes on the operation of the system and the pilot actions to be taken should the warning operate. A suggested format is attached as an Appendix to this Leaflet. It is recommended that the minimum battery endurance available is specified following the warning and for practical purposes it should be not less than 30 minutes (see Paragraph 7 below).

7 Battery Duration

7.1 Battery endurance can be estimated from either a practical test which involves applying typical aircraft loads for a period of time or by calculation. In either case, only 75% of the name plate capacity should be considered available because of loss of battery efficiency during service. The recommended statement is only intended to give the pilot an estimate of the battery endurance and conditions under which it can be achieved. Furthermore, because it is a relatively broad band estimate it should only be necessary to amend it if a refit with extra electrical loads is carried out.

7.2 An example of how to calculate the duration is given below:

a) Check the nameplate capacity of the battery and assume 75% is available,
e.g. 12 amp-hour = 720 amp-mins.
Thus 75% = 540 amp-mins.

b) Estimate the normal or pre-load shed cruise consumption,
e.g. 15 amps (15 amps x 5 mins = 75 amp-mins).
Assuming 5 minutes for pilot to shed essential loads following the low voltage warning.

c) Estimate the minimum cruise load needed to maintain flight after the generator/ alternator has failed,
e.g. 10 amps.

d) Estimate the consumption required during the landing approach,
e.g. 20 amps for 5 minutes (100 amp-mins).

The **cruise** duration is therefore:

$$\frac{\text{Battery capacity a) -[pre-load shed load b) + landing load d)]}}{\text{cruise load c)}}$$

$$\frac{540 - (75 + 100)}{10} = \frac{365}{10} = 36.5 \text{ mins}$$

Total duration = pre-load shed cruise time + cruise duration + landing time
= 5 + 36.5 + 5
= 46.5 mins

8 Modification Status

8.1 Installations can normally be approved in accordance with MINOR changes procedures (see EASA Part 21.495). Any natural and legal person may apply for approval of the change. The application for change classification and approval and the

relevant technical documentation should be forwarded to EASA (via the CAA) for review.

8.2 Should any company or individual wish to produce a suitable low bus voltage warning detection unit for general use in compliance with GR No. 6, it will be necessary for all documentation to be submitted in the first instance to the CAA Safety Regulation Group, Aviation House, Gatwick, for acceptance of the unit. Individuals who install their own 'one-off ' unit must retain the documentation with the aircraft records.

9 Applicability

9.1 The requirements will be applicable to aircraft equipped with an engine driven electrical generating system.

9.2 GR No. 6 is not applicable to aircraft operating on a Permit to Fly.

10 Further Information

Further information and advice on the contents of this Leaflet may be obtained by contacting the CAA at the following address:

Avionic and Electrical Systems Section
Engineering Department
Safety Regulation Group
Aviation House
Gatwick Airport South
West Sussex, RH6 0YR

Telephone: +44 (0)1293 567171 (Switchboard)
Fax: +44 (0)1293 573999

APPENDIX

<ORGANISATION IDENTIFICATION>

Flight Manual/Pilot's Operating Handbook Reference: <xxxxxxxxxxx>

Supplement No. <xxxxx> **Issue:** <xx>

Aircraft Type: <xxxxxxxxx>

Registration Mark: <xxxxxx> **Aircraft Serial No:** <xxxxxxx>

ADDITIONAL LIMITATIONS AND INFORMATION FOR CERTIFICATION

The limitations and information contained herein either supplement or, in the case of conflict, override those in the flight manual.

LOW BUS VOLTS WARNING

A steady/flashing warning light is installed which will illuminate if the generator/ alternator output reduces to a level where the battery supplies power to the bus-bar.

Before engine start

Check low volts warning – ON

After engine start

Check low volts warning – OFF

If warning illuminates during flight

Reduce electrical load

Battery duration approx. ..... mins

Land as soon as possible.

NOTE: Warning may illuminate with low engine rpm. Check it goes out when rpm increased.

Approved as part of minor modification no. <xxxxxxx>

EASA Approval no. <xxxxxxxxx>

Date:

Leaflet 11-11 Steep Approaches

(Previously issued as AIL/0155)

1 Introduction

The purpose of this Leaflet is to provide guidance material to explain the Airworthiness and Operational Requirements for Steep Approach Operations conducted by aeroplanes for which the certification and approval remains the responsibility of the CAA. For all other aeroplanes, guidance concerning the applicable requirements should be obtained from EASA.

1.1 Few aerodromes in the UK require a steep approach capability, hence there has not been a need for a comprehensive statement of the CAA's requirements for this type of operation. However, one such aerodrome, London City Airport, does require a steep approach and can only accept those aeroplanes that are approved for such operations. The glideslope angle at the aerodrome was originally 7½°, but has been reduced to 5½°. Together with an increase in runway length to 1199 metres (3934 ft), this represents a greater operating flexibility than before and it is recognised that a number of operators may accordingly wish to investigate the feasibility of operating their aeroplanes at this aerodrome.

1.2 This Leaflet is therefore intended to indicate areas of concern, and to provide guidance on how an application for steep approach approval should be undertaken. It is not specific to London City Airport, but applies to any circumstance where steep approaches are required.

2 Definition of Steep Approaches

The vast majority of approaches are flown at a glideslope angle of 3°. Angles up to 3½° are occasionally found but are nevertheless considered to be routine and within the capabilities of any certificated aeroplane. Approach angles greater than 3½° but less than 4½° are unlikely to produce significant problems in normal operations, but operators which encounter such procedures should consult with the aeroplane manufacturer to satisfy themselves that the performance and handling characteristics are satisfactory at this angle. It is generally accepted internationally that approach paths of 4½° or greater constitute steep approaches for which specific airworthiness and operational approval is required.

3 Promulgation of Approval

3.1 For UK registered aeroplanes, airworthiness approval to make steep approaches will appear in the Flight Manual. This will specify a maximum approach angle permitting the use of steep approach procedures up to that angle. If no such approval is contained in the Flight Manual, then it must be assumed that the aeroplane is not approved to make steep approaches.

3.2 Clearance of a particular type of aeroplane will not automatically permit all individual examples to operate to the approved angle, because such an authorisation might require the modification of existing equipment, such as Terrain Awareness Warning System (TAWS), autopilot and flight director computers. It will be the operator's responsibility to determine the eligibility of a particular aeroplane to operate to the

approved standard. The type approval issued by the CAA will be considered proprietary to the manufacturer. This will ensure that the ongoing airworthiness responsibilities remain with the appropriate organisation. Foreign-registered aeroplanes will also be expected to have the appropriate clearance, the responsibility for which lies with the Regulatory Authority of the State of Registration.

NOTE: UK operators will also be required to obtain operational approval from the CAA Flight Operations Inspectorate Department before services are permitted to begin.

3.3 All steep approaches will require approach path guidance of a type which must be acceptable to the CAA. For visual approaches, weather minima of 500 ft or 1000 ft cloud base for propeller-powered and turbojet-powered aeroplanes respectively, and 2 nautical miles visibility will be required. This will allow adequate preparation time at the minimum height between visually locating the runway and intercepting the glideslope.

4 Application for Steep Approach Approval

Applications for steep approach approval should ideally be made by the manufacturer and addressed to the Aircraft Certification Department of the Airworthiness Division. Operators wishing to obtain steep approach approval for their aeroplanes may apply directly, but should first seek the support of the manufacturer, since CAA flight test evaluations are normally constrained to the various flight envelope parameters that have already been explored and cleared. In any case, the CAA would generally seek the manufacturer's agreement before undertaking an evaluation.

5 Additional Considerations Associated with Steep Approach Approval

5.1 Speed and flight path control become more demanding with increasing approach angle. The ability to track a steep approach path, and especially to regain the glideslope from above, depends upon the aeroplane possessing adequate residual throttle movement to make the necessary flight path corrections, and will receive close attention during certification.

5.2 Applications for steep approach approval should specify the configurations required to be evaluated, i.e. all-engines-operating or one-engine-inoperative, with or without flight director and autopilot. Any approval which utilises existing equipment such as autopilot or flight director will require a re-evaluation of those systems to ensure compatibility in the new operating environment. For example, TAWS boundaries would need to be checked and in some cases may require modification.

5.3 An aeroplane type may optionally be cleared for a one-engine-inoperative steep approach and landing. Nevertheless in all cases consideration must be given to the procedures to be adopted in the event of an engine failure after the commencement of the approach. This should include assessment of the go-around capability in the landing configuration.

5.4 A common misunderstanding is that a steep approach automatically allows a reduced scheduled landing distance. This has never been the case. Short field landing performance is a separate certification issue, irrespective of the type of approach. If it is required CAA performance specialists will need to be consulted, and additional work (which may include flight measurement) carried out in order to produce the necessary Flight Manual charts.

6 Structural Considerations

6.1 The effects of the probability of occurrence of increased rates of descent and thus normal acceleration values during landing from steep approaches must be taken into account.

7 Evaluation for Approval

The CAA will require to evaluate the aeroplane to address those items discussed in paragraph 5 above. It is not possible to specify a flight test schedule that would be applicable to all certifications as it would vary with each individual type and extent of approval that was sought, but in all cases flight tests at the limiting values of weight and centre of gravity position will be required. To facilitate this evaluation, these flights will need visual approach path guidance set up at the nominated glideslope angle, and additionally at a steeper angle not less than 2° greater than the nominal angle. Flight testing at this steeper angle is intended to evaluate the ability to regain the glideslope following an inadvertent deviation, and to simulate the effects of an approach with a tailwind. If flight director or autopilot approval is sought, then an ILS calibrated at the nominated angle will also be required.

8 Further Information

8.1 Enquiries regarding steep approaches should be addressed to:

Civil Aviation Authority
Safety Regulation Group
Aviation House
Gatwick Airport South
West Sussex RH6 0YR.
Telephone: +44 (0) 1293 567171 (Switchboard).

8.2 Specific questions on making applications for Steep Approach approval should be addressed to the Aircraft Certification Department. Technical queries on performance and handling aspects should be directed to the Flight Department. Operational approval queries should be address to the Flight Operations Inspectorate Department.

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Leaflet 11-12 Installation of High Intensity Strobe Lights (HISL) on Helicopters

(Previously issued as AIL/0168)

1 Introduction

The purpose of this Leaflet is to provide information and guidance on the requirements for approval of HISL installations. This information does not represent official European Aviation Safety Agency (EASA) policy. However, the information presented in this Leaflet has been used by the UK CAA and is considered to be useful guidance material for the evaluation of HISLs on helicopters.

2 References:

JAR OPS 3 Commercial Air Transport (Helicopters)

Commission regulation No (EC) 1702/2003 Annex Part 21 – Certification of aircraft and related products, parts and appliances, and of design and production organisations

CS-27 – Certification Specification for Small Rotorcraft

CS-29 – Certification Specification for Large Rotorcraft

CS-VLR – Certification Specification for Very Light Rotorcraft

BCAR Section G6-7

AC 27-1B, Chg 1 Certification of Normal Category Rotorcraft

AC 29-2C, Chg 1 Certification of Transport Category Rotorcraft

CAP 393 Air Navigation: The Order and The Regulations

CAA Letter Captain J G Mimpriss dated 2 July 1991

3 Background

3.1 The UK Air Navigation Order Rules of the Air 1996 (Rules 9 and 10) require the mandatory fitment of an anti-collision light on certain classes of helicopters. They are helicopters having a maximum total weight authorised (MTWA) of more than 5700 kg and those having a MTWA of 5700 kg or less which conform to a type first issued with a type certificate on or after 1 April 1988. The Joint Aviation Requirements JAR-OPS 3, Commercial Air Transport (Helicopters), also requires that a helicopter operated in day VFR conditions shall be equipped with an anti-collision light system. Anti-collision lights may be fitted on other helicopters as an option.

3.2 The EASA Certification Specifications for aircraft are used to demonstrate compliance with the Basic Regulation (Regulation 1592/2002) and its implementing rules (Regulation 1702/2003). These include airworthiness codes, which are standard technical interpretations of the airworthiness essential requirements contained in Annex 1 to the Basic Regulation; and acceptable means of compliance, which are non-exclusive means of demonstrating compliance with airworthiness codes or implementing rules.

3.3 The Certification Specifications for small rotorcraft and large rotorcraft (CS-27 and CS-29) include paragraph 1401, which requires that an anti-collision light system be installed if the rotorcraft is to be operated at night. CS-VLR requires that if an anti-collision light system is fitted, it complies with CS-27.1401.

3.4 The Advisory material for paragraph 1401 states that certification for a night operation requires an approved aviation red anti-collision light. Determination of the location and how many anti-collision lights are required to satisfy the regulations are functions of aircraft shape and the ability to obtain the required area coverage and light intensity.

3.5 In addition, the Advisory material states that the anti-collision light(s) should be located to obtain the required coverage and to prevent cockpit reflections that would affect the crew's vision. The anti-collision lights are required to be red to reduce cockpit reflections and objectionable effect of rotor blade strobe effects.

3.6 The UK Air Navigation Order Rules of the Air define 'anti-collision light' as meaning, in relation to a helicopter, a flashing red light. They also require that an anti-collision light, when fitted, must be switched on in flight. In order to improve conspicuity however, the CAA has been requested to approve HISL units with a dual colour (red/white) capability. For daytime use the unit could be switched to flashing white and for use at night, flashing red. As the Rules of the Air require helicopters to display a flashing red light by night and day, the UK CAA issued a general exemption to Rule 9 (1) (b) in relation to these units for daylight use.

3.7 In response to concern expressed over the number of near collisions between low flying military aircraft and helicopters engaged on pipe or powerline survey, the CAA is to require the fitment of HISLs on these helicopters since 30 June 1992. CAA letter entitled 'High Intensity Strobe Lights for AOC Helicopters Engaged in Power and Pipe Line Survey Operations' dated 2 July 1991 refers.

3.8 This Leaflet summarises the requirements applicable to the fitment of flashing white or white/red HISLs on helicopters when fitted to improve daytime conspicuity.

4 General

4.1 The fitment of a HISL to a helicopter, whether in compliance with CAA requirements or not, will be classified as a major design change in accordance with EC Reg. 1702/2003 Annex Part 21A.97. It could normally be expected that this be introduced using Part 21 Subpart E, STC process, although Part 21 Subpart D for the TC process would be equally appropriate. The major design change application may only be submitted by the holder of the type certificate, for changes under Part 21 Subpart D; or by a person or organisation holding a design organisation approval in accordance with Part 21 Subpart J or equivalent agreed by the EASA. Part 21 paragraphs 21A.92, 21A.97, 21A.112, 21A.112B refer.

The major change will include the approval of the equipment; the responsibility for the equipment design would therefore be vested in the design organisation making the design change application.

4.2 For the purpose of improving the conspicuity of helicopters in daylight conditions, the minimum intensity of a white strobe light for it to be effective is considered to be 2000 candela. Anything less powerful will not provide an effective and easily discernible contrast against ambient sunlight and light coloured backgrounds. Therefore in the context of helicopters undertaking pipe and powerline survey operations, HISLs are considered to be those of 2000 candela or more. The intensity of other HISLs, fitted as optional equipment for other types of operations, may be chosen at the discretion of the applicant.

5 Effective Flash Frequency

5.1 The effective flash frequency is the frequency at which the HISL or HISLs are observed from a distance. The frequency applies to all sectors of light including the overlaps which might exist when the system consists of more than one light source.

5.2 The effective flash frequency of the light shall be not less than 40 and not more than 100 flashes per minute. In an overlap, flash frequencies of up to 180 flashes per minute will be permitted.

6 Coverage

When performing the functions of an anti-collision light, as required by the UK Air Navigation Order Rules of the Air, the HISL shall be visible in all directions within 30° above and 30° below the horizon. When fitted as an additional light in order to enhance conspicuity, the field of coverage should be as great as is practically possible when taking into account the limitations of installation weight, centre of gravity and structure. It is not expected that two HISL (upper and lower) need to be fitted to meet the UK CAA requirements relating to power and pipeline survey operations.

7 Design Considerations

7.1 Strobe light units normally operate by charging a capacitor to a high voltage and then discharging through the flash tube. Extra care is therefore necessary to ensure that there is no hazard to personnel from the high voltage, particularly if the capacitor is remote from the light fitting. Also the helicopter should be checked to ensure that the discharge of the tube causes no interference to any equipment and systems required for type certification or by the operating rules, or whose improper functioning would reduce safety. Special consideration should be given to cases where the unit is mounted close to an existing aerial. Care should be taken in the location of the discharge unit and in the routing of high voltage cables to ensure that they are not in close proximity to, or liable to be a source of ignition to, flammable fluids or vapours. All fittings should be adequately bonded. Fittings and wiring should be installed to ensure they can withstand the effects of lightning discharge.

7.2 The HISL, if fitted in addition to a standard red anti-collision light, must have a separate control switch which is independent from the red anti-collision light control.

7.3 The HISL must be positioned so as not to be a source of any interference to the pilot i.e. no distracting glare or reflection. This will primarily be achieved by careful positioning of the HISL but may involve the treatment of any reflecting surfaces.

7.4 Unless operation of the HISL has been evaluated and found not to be a source of distraction in these particular circumstances a cockpit warning placard shall be situated on the pilot's instrument panel stating:

WARNING – Turn off the white strobe light when in the vicinity of other aircraft or persons when on the ground, during flight in cloud, fog or haze and during night operations.

8 Flight Manual

As part of the major change, a Flight Manual Supplement shall be raised which states operating limitations and normal operating procedures associated with the HISL installation. A specimen Flight Manual Supplement is shown as Annex A.

9 Electrical Load Analysis

The electrical load analysis shall be amended, as appropriate.

10 Approval Procedures

The major change shall be approved in accordance with European Commission Regulation (EC) No. 1702/2003 Annex Part 21 Subparts D or E.

Annex A

Issue 1

SPECIMEN – FLIGHT MANUAL SUPPLEMENT

[Company ABC] Flight Manual Supplement No [X]

[Aircraft Type] Manufacturer's Serial No: Registration Mark:

The information contained herein supplements or supersedes the basic manual only in those areas listed in this supplement. For limitations, procedures, and performance information not contained in this supplement, consult the basic manual.

Introduction

[Company ABC] Modification No [XYZ] introduces a HISL installed at the [aircraft position]. The HISL emits a flashing white light at an intensity of [at least 2000 candela]. Pilot operation of the HISL is through a switch located [cockpit position].

Limitations

A cockpit warning placard is situated on the instrument panel stating:

WARNING

Turn off the white strobe light when in the vicinity of other aircraft or persons on the ground, during flight in cloud, fog or haze and during night operations.

Emergency Procedures – No Change

Normal Procedures

After Take-off

When clear of persons on the ground: HISL switch – ON

Before Landing

HISL switch – OFF

Performance – No Change

To be inserted at the back of the manual and the CAA revision record sheet amended accordingly.

[Company ABC] Supplement No [X] CAA Approved

[Date]

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Leaflet 11-16 Computer Control – Records and Programmes

(Previously issued as AD/IL/0134/1–4)

1 Introduction and Purpose

Increasingly, the CAA are being asked by approved organisations if the CAA accepts the computerisation of aircraft records, maintenance programmes, stock control records etc., as an alternative to the traditional 'hard copy' documents. The purpose of this Leaflet is to provide guidelines and general information to assist in responding to these questions.

2 References:

Air Navigation Order 2005 (as amended)

3 Legal Requirements

It has been established that the CAA may accept computerised records where it has satisfied itself that the computerised record will provide storage, preservation and retrieval to the same level as would have been achieved by hard copy records. The CAA acceptance of computerised recording does not normally exempt the operator or company from complying with the conditions of Articles 86, 87, 88, 89, 90 and 91 of the Air Navigation Order 2005 (as amended).

4 Scope of Computer Function and CAA Assessment

The scope of the computer function will determine the extent to which the CAA will be involved in establishing satisfaction with the proposal. Total maintenance control programmes will obviously need more involvement than simple stock control record systems used by (say) material distributors. The assessment guidelines in paragraph 4 of this Leaflet are addressed to the more complex proposals, as indicators of the type of questions that should be considered.

5 Assessment Guidelines

5.1 Identify the type of computer and try to ascertain the degree of confidence that the company personnel place on the system from practical experience. Identify the extent of the intended use for both CAA and non-CAA functions. It is common for organisations to introduce computerisation for simple tasks, using only a fraction of the computer capability. As experience is gained and the potential is realised, the user tends to incorporate additional functions. These functions can extend beyond the initial proposals for CAA purposes and encroach on areas not originally assessed. Therefore, impress upon the Company that any programme extension of CAA functions must be discussed with the CAA before they are incorporated.

5.2 Power supply and memory preservation. Current computer technology usually includes a system to detect voltage variations and to automatically transfer to a back-up power system when necessary. Earlier, and cheaper, computers can suffer memory loss due to power interruptions. Ensure that memory and function will be

preserved in the event of power interruption. Check if there is a standby tape system which can be used to recover corrupted information.

5.3 Dumping function. Some computer systems include a 'dumping' function. This is a procedure whereby a tape, or disc, which can be used for more than one programme, has the information relating to one specific programme 'dumped' (consolidated) onto another tape or disc for storage purposes. Where a dumping function is incorporated, ensure that the procedure is described in the operation manual (paragraph 5.1 refers), and that it is appreciated by the operator that incorrect procedures can result in compromised programmes.

5.4 Computer access and security. Some computer networks will have multi-terminal sites. Whilst the computer information may be readily available to all users, it is important to ensure that only authorised persons have the access which will enable alterations and deletions to be made to the programme. In some systems this is accomplished by the authorised person keying in a personal identification code. Other systems respond to the insertion of an identification card. Try to beat the system and gain access as an unauthorised operative.

5.5 Record of amendments to stored information. Some systems retain for recall the total history of all inputs. Thus, if a component was programmed to be 'called off' at 10,000 hours and was changed because of defect at 8,000 hours, the complete history including the instruction to delete the 10,000 hour entry would be retained in the data bank. Other systems will only retain the last information fed and erase the back history. As a further example, consider a Service Bulletin. Initially perhaps only the repetitive inspection part of the bulletin needs to be accomplished. Subsequently if the terminating modification part of the SB is accomplished, deleting the necessity for repetitive inspection, will this terminating action delete all reference to previous inspections? This type of information needs to be considered when evaluating a computerised maintenance programme.

5.6 When evaluating a system which will be used by, say, a Material Distributor, consider if the computer will also be used to produce the Approved Certificate. If this is the case, then recognition must be made of the requirement for consecutive serialised numbers to be controlled and allocated to each certificate.

6 Bringing the System on Line

6.1 Before bringing a system on line, it is essential to ensure that operations manuals are available to the proposed operatives.

6.2 The computer manufacturer's operations manual should be supplemented by a Company Manual which describes:

a) The main functions of the proposed system. Under this heading would be such subjects as Aircraft Maintenance files, Removal and Installation of Components, Records of Inspections and Flying hours, Component purchase orders or despatch for overhaul, Stock records etc.

b) The company procedures for interrogation and enquiry. This part should also identify the persons authorised to make changes to the programme, and a brief description of the security control which ensures that unauthorised inputs will not be accepted.

c) A flow chart of the various functions. Check who within the Company, does what with selected parts of the programme.

d) Training arrangements for operatives and authorised personnel.

6.3 The normal testing period for a computer control system has been established by the CAA as six months. During this period the traditional hard copy documentation is run in parallel with the computer system. This enables checks to be made of the validity of the programmed information.

6.4 During the testing period the CAA requires a 'Problem Log' to be maintained. This should be a register (not loose-leaf), in which all problems, subsequent action and solutions are entered. This procedure tests the validity of the Company Manual (Paragraph 5.2 refers).

6.5 In the case of an Approved Organisation, the Company Manual information should be incorporated into the Company Exposition.

7 Conclusions

This Leaflet is not a training document, neither does it attempt to define the common terms used in the computer industry. Computer abilities and computer deficiencies can vary considerably between makes and models, and these can be exacerbated by the human abilities and deficiencies of the operator. The material contained in this Leaflet should enable staff to identify potential problems, and also to ask the right questions. These questions will test the verity of any claim by the applicant 'that the computer system will maintain a level of confidence at least equal to that provided by the traditional hard copy records'. If the Surveyor can satisfy himself that this criteria can be met, the system is probably acceptable. If doubts exist then reference should be made to the Survey Department of the Safety Regulation Group for further guidance.

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Leaflet 11-17 Helicopter Mixed Passenger/Cargo and all Cargo Cabin

(Previously issued as AIL/0166)

1 Introduction

The purpose of this Leaflet is to provide guidance on the certification of helicopter cabin configurations when the carriage of passengers and cargo in the cabin is to be undertaken simultaneously, or cargo only is to be carried.

1.1 **References:**

- BCAR Section G Chapters G3-8, G4-3 & Chapter G6-1 Paragraph 3.3.2
- Blue Paper G786, Blue Paper G805
- BCAR 29 Paragraphs 29.571, 770, 783 – 787, 803, 807, 809, 811 – 831, 851, 853, 855, 863.
- CS 27.571, 783 –787, 807, 831, 853, 855, 863.
- CS 29.571, 783 –787, 803, 807, 809, 811 – 831, 851, 853, 855, 863.
- JAR-OPS 3.270, 790.
- ANO 2005 (as amended) Article 54
- CAP 747 Mandatory Requirements for Airworthiness Generic Requirement (GR) No. 21.

2 Background

2.1 Particularly for the larger helicopters employed in support of the off-shore resources industry, commercial requirements dictate that cargo only, or a mix of passengers and cargo simultaneously, be carried in the cabin. The passenger cargo mix is hereinafter referred to as the mixed configuration. The cargo required to be carried is varied in nature, size and weight and often the operator is given very short notice of a customer's intention that a cargo or mixed configuration is required to be flown. The following text provides guidance and interpretation on the airworthiness certification criteria that should be met, if cargo only or mixed configuration operations are to be undertaken.

2.2 The objective of the airworthiness certification criteria is to ensure that the safety standard for passengers in a mixed configuration is the same as for a public transport all passenger cabin configuration, with a full passenger complement. Also in the event of an emergency, including capsize following ditching, the crew and passengers will not be hampered when making good their escape from the helicopter.

2.3 The majority of cases requiring mixed configuration passenger cabins are considered to be for operations in support of the off-shore resources industry. Nevertheless the content of this Leaflet is equally applicable to all helicopters engaged on all types of public transport operations requiring the use of mixed configuration passenger cabins.

3 Principles and Procedures

3.1 For the purpose of this Leaflet, cargo is defined as any inanimate or nonhuman object with a weight greater than 5 kg and/or the sum of its main dimensions exceeding 115 cm. Nevertheless all such objects should be secured in such a manner that the intent of this Leaflet is met. Refer also to the ANO 2005 (as amended), Article 54(6)(b).

3.2 Cargo only or mixed configuration cabin layouts are to be treated as a Level 2 Major Modification and will be approved in the normal manner by EASA, or for Annex 2 aircraft by the CAA. Irrespective of which organisation will be approving the modification, prospective applicants are advised in the first instance to contact the CAA's Aircraft Certification Department, at Aviation House Gatwick, in order to be advised of the appropriate certification route, requirements and process for the approval of the modification.

3.3 The helicopter should have designated cargo areas within the passenger compartments. The designated cargo areas and passenger areas should comply with the helicopter certification requirements applicable to the type in question.

3.4 The practice of loading cargo onto seats may be permitted provided an appropriate load size, weight and restraint criteria has been developed, and adequate loading instructions have been published (see paragraph 3.18). For example this could be satisfied by soft baggage with a maximum weight of 15 kg, minimum length 0·6 m, maximum length 1·0 m, minimum diameter 0·5 m and secured by the lap strap being passed through the carrying handles.

3.5 Cargo loaded in the passenger compartment should normally not be loaded above the window-sill height and be adequately distanced from seated passengers so as to preclude the risk of head or body strike hazards. Loading to a higher level is permitted provided that sufficient emergency exits are available to the passengers. Any exit blocked or partially blocked by cargo should be completely disidentified and disabled, i.e. EXIS lights (if fitted), release mechanisms, decals etc. made inoperative and hidden from view.

3.6 When a seat is not in its normal position, (i.e. lowered and available for use), then it is subject to all the criteria applicable for the carriage of cargo.

3.7 Mixed and/or cargo cabin configurations should be defined.

3.8 For helicopters certificated to BCAR Section G attention should be paid to the requirements of Blue Paper G786.

3.9 Fire fighting equipment to the following scale, which is relevant to helicopters in the 8 to 10 tonne MTWA category, should be provided and should be easily accessible to the crew:

2 x 1·5 kg Halon 1211 extinguishers
1 x 1½ lb Water Glycol extinguisher
1 set of CAA approved Protective Breathing Apparatus.

Cargo should be loaded such that, where appropriate, the crew have access to all areas for the purpose of extinguishing any fires.

NOTES: 1 The CAA recognises the impracticality of applying all of the above guidelines to certain smaller helicopter types. Equally, larger helicopters may require additional fire fighting aids.

2 The scales of fire extinguishers quoted above are not additional to those required by the requirements referenced in paragraph 1.1 above. They are minimum recommended absolute values for the passenger compartment when the helicopter is operated in the mixed or all cargo configuration. At all times the conditions of the stated requirements must be satisfied.

3.10 Standard methods for securing cargo in all areas should be declared. The provisions of BCAR G3-8 as amended by Blue Paper 805, or the provisions of BCAR 29.561, or CS 27.561 or CS 29.561 apply as appropriate. The correct requirement to use will be determined by the original basis of certification for the helicopter in question. Additionally attention is to be paid to the roll-over and inverted case.

3.11 Cargo should be secured and covered in such a manner that the overall surface does not present any additional hazard in terms of snags or trips irrespective of helicopter attitudes, when in flight or at rest.

3.12 In all cargo configurations the requirement of paragraph 3.11 in terms of securing and covering only applies to cargo adjacent to escape passages and exits. Also adequate access to/from emergency and ditching exits should be provided.

3.13 For all configurations, location of and passage to emergency and ditching exits should be specified. Operation of said exits should not be impeded. In all cases the minimum laid down standards for the Provision of Emergency Exits should be met within the passenger seating areas.

3.14 Location and type of safety equipment should be specified for each configuration.

3.15 The CAA may require evacuation demonstrations to take place.

3.16 Pre-take-off safety briefings should reflect the configurations being operated and should highlight any differences from the safety on board notices.

3.17 Consideration to the containerisation of cargo within the passenger compartment may be given as an alleviation to paragraph 3.3 providing all other relevant requirements of this Leaflet are met along with the current certification requirements for helicopter passenger compartments. Where a cargo container is used attention is drawn to the requirements of CAP 747 GR No. 21.

3.18 Operations Manual information should be prepared, which details the various approved interior layouts, cargo securing methods, levels and locations of fire fighting equipment required, location of usable ditching and emergency exits, levels and locations of accessible survival equipment, weight and balance calculation and recording methods. The operations manual should also include details of the training requirements for staff under the control of the helicopter operator, responsible for the supervision of the loading and securing of cargo.

3.19 Applicants should ensure that only adequately trained personnel are involved in the securing of, or the supervision of the securing of cargo.

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Leaflet 11-18 Helicopter Emergency Escape Facilities

(Previously issued as AIL/0124)

PURPOSE: To provide guidance on interpretation of the requirements and recommended standards for emergency escape facilities for use should the helicopter capsize after a ditching.

REFERENCES: BCAR Chapter G4-3
BCAR Blue Paper G779 paragraph G4-3, 5.2.7
CAA Direction to Offshore Helicopter Operators dated 18 October 1985
Air Navigation Order 2005 (as amended) Article 54(6)(b)
JAR OPS 3. 837(a)(4) and (6)

1 Introduction

As long as the probability of a helicopter sinking or capsizing subsequent to ditching remains at a significant level, it is considered that it is necessary to improve the chances of escape from a submerged or partially submerged cabin in this situation. Following consultation with industry, it has been agreed that some aspects of the survival systems of the current helicopter fleet can be improved, and as a result the appropriate regulations and requirements have been amended.

This Leaflet addresses three of these aspects, namely improved emergency exit illumination, provision of additional escape routes, and security of loose articles, and gives guidance on interpretation and acceptable means of compliance.

2 Emergency Lighting

All helicopters being used in support of offshore energy exploitation have been required to comply with BCAR Chapter G4-3, 5.2.7 as amended by Blue Paper G779, or JAR OPS 3.837 (a)(4) which requires emergency exit illumination to be adequate for its purpose even when the aircraft is capsized and the cabin partially or completely submerged. Additionally, some cabin windows are of a suitable size to provide an additional escape route and, as required by the CAA Direction, or JAR OPS 3.837 (a)(6) must be made openable. (See 3 below). Although not a requirement, lighting for these 'escape windows' can be installed provided it does not reduce the effectivity of the emergency exit illumination.

2.1 Emergency Exit Lighting

Lighting systems should incorporate the following features and characteristics:

a) **Activation**

In principle at least two separate means of activation should be provided:

i) by flight crew action, to switch all exit light systems simultaneously; and

ii) automatically, when the cabin becomes more than half submerged in water, each emergency exit being provided with its own automatic switch.

NOTE 1: Where it is impracticable to provide for remote activation of an individual exit lighting, for example where the emergency exit is inset into a door, a self-contained automatic activation alone will be acceptable.

NOTE 2: Flight crew compartment emergency exit lights should only be activated automatically, unless it can be shown that reflections or dazzle will not be a hazard to the flight crew.

b) **Lighting System Characteristics**

iii) Lights should operate at their full brightness level for a minimum of 10 minutes after activation.

NOTE: Battery capacity should take account of the need for routine testing of the light system.

iv) The system should remain fully operational when submerged to a depth of at least 50 feet.

v) Power supplies must comply with the existing requirements for emergency lighting power supplies.

vi) The system should be designed so that any single transverse vertical separation of the fuselage will not result in the loss of exit lights not directly damaged by the separation.

c) **Format**

vii) Generally, all sides of each emergency exit should be equally illuminated, except that, where one side of the exit is at floor level, this side need not be illuminated.

viii) For passenger compartment emergency exits, there must be sufficient light to locate the means of release of the exit. This will normally entail the provision of a discrete locator light adjacent to the exit release means.

ix) Brightness should be such that the exit can be identified as such from a distance of at least 20 feet in clear water, without any additional light from other sources.

2.2 Escape Window Lighting

It is recommended that these lighting systems incorporate the following features and characteristics:

a) **Activation**. This should be in a similar manner to emergency exit lighting activation, except that no manual control need be provided, and each window lighting system should be completely independent wherever possible.

b) **System Characteristics**. These should be similar to the emergency exit lighting system, except that escape windows are only intended for use by occupants in their immediate vicinity. Illumination therefore need only be adequate to allow occupants of the immediately adjacent seats to identify the opening and its means of release.

c) **Format**

i) There should be no possibility of confusion between an emergency exit and an escape window.

ii) The arrangement of the lighting elements should direct an occupant to the center of the aperture, and should avoid confusion with any spaces between apertures or exits.

3 Escape Windows

3.1 Underwater escape through a rectangular aperture of 17" x 14" (432mm x 355mm) has been satisfactorily demonstrated by persons of a size believed to cover 95% of male persons wearing representative survival clothing and uninflated lifejackets. All suitable openings in the passenger compartment which are of this approximate size or larger need to be considered for designation as an additional escape route in the event of a capsize, and made openable. The means of opening should be rapid and obvious. Passenger safety briefing material should include instructions on the use of such escape facilities.

3.2 For windows smaller than approximately 19" x 17" (483mm x 432mm), down to the minimum acceptable size of 17" x 14", placarding and passenger briefing will be necessary to ensure that larger persons do not occupy the adjacent seats. It is recommended that placards should be of the pictorial 'fat man/thin man' type.

4 Security Baggage

4.1 Article 54(6)(b) of the Air Navigation Order 2005 (as amended) requires the commander of an aircraft '....by reason of....any emergency occurring during the flight....to take all reasonable steps to ensure that those items of baggage in the passenger compartment which he reasonably considers ought by virtue of their size, weight or nature to be properly secured are properly secured.....'.

4.1.1 In the case of helicopters operated for offshore energy exploitation support, this regulation should be interpreted as referring to all items of baggage which, if unsecured, might obstruct the occupants escape from the aircraft in the event of a capsize or flooded cabin following a ditching. For this reason no baggage or other loose articles of significant size or weight should be carried in the passenger compartment unless secured so that they cannot move from their secured location in an emergency, even if the aircraft becomes inverted and/or the cabin fills with water.

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Leaflet 11-19 Aircraft Plywood - Thin Plywood Sheet

(Previously issued as AIL/0152)

1 Introduction

The purpose of this Leaflet is to advise of manufacturing defects which have been discovered in a small number of thin plywood sheets manufactured by British Plywood Manufacturers Ltd.

2 Background

2.1 Thin plywood sheet in the range 1/16 to 5/32 inches thick manufactured by British Plywood Manufacturers Ltd between June 1990 and 31 October 1991, may be suffering from delamination arising from difficulties encountered in the manufacturing process.

2.2 British Plywood Manufacturers Ltd have taken measures to ensure that the problems encountered have been obviated and the CAA has no reason to believe that these problems will recur. Plywood in use or storage at present may however, be affected. The company has made efforts to contact the persons known to have purchased affected plywood but due to the wider dispersion which may have taken place subsequently the CAA is issuing this Information Leaflet in order to provide a wider circulation.

3 Inspection

3.1 In the isolated cases where delamination has been observed, it has mostly been confined to the centre area of manufactured board. The delamination may vary in extent and does not exist in every board. Where structural components have been manufactured from the material in question without the visual inspection or tap test described below being carried out, a tap test of the built up structure should be undertaken.

3.2 Delamination may be detected visually be examination of the glue lines on the cut edges or by the surface, ballooning or bulging.

3.3 Tap testing is a good way to detect delaminations or disbonds in a laminated board or structure. Surface tapping with the edge of a coin or similar object reveals a distinctive sound on good material but a noticeable change to the sound occurs when tapping disbonded material. Such taps should be repeated at approximately 2 inch intervals across the surface to be examined.

4 Implication

4.1 Delamination in plywood used for structural purposes will have a weakening effect on the structural strength and stiffness. The nature and extent of this weakening will be dependant upon the particular application.

4.2 Delaminated material should not be built into stressed aircraft structure. Where any doubt exists about the integrity of an existing structure, an appropriate Design Organisation should be consulted.

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Leaflet 11-20 UK Certificate of Airworthiness Issue for Series Aircraft at the Manufacturer's Premises in the USA

(Previously issued as AIL/0163)

1 Introduction

This Leaflet is issued to provide guidance material to assist applicants in meeting the requirements for the issue of a Certificate of Airworthiness for a Series Aircraft being certificated at the manufacturer's premises in the USA.

1.1 **References:**

BCAR Section B Chapter B3–3.

1.2 This Leaflet supersedes and cancels Leaflet AD/IL/0142/1-7 dated 21 May 1990, which should be destroyed.

2 This Leaflet is issued to assist applicants in meeting the requirements for the issue of a Certificate of Airworthiness for a Series Aircraft being certificated at the manufacturer's premises. It also satisfies industry's request for a more definitive standard of documentation for the CAA Surveyor, to relieve the aircraft manufacturer of difficulties when dealing with requests from individual Surveyors. These difficulties only seem to arise in the USA, European Manufacturers already supply a comprehensive certification package.

3 The Certificate of Airworthiness issue process is not a rigid procedure and Surveyors will be free to call for more detailed assessment and scrutiny of the production and flight test documents associated with the Certificate of Airworthiness issue, should they have reason to believe there is a need.

4 In addition to the checks carried out by the Surveyor, the Applicant/Owner/Operator's own monitoring of the manufacturer's controls and standards in the production of the particular aircraft is important and will have a significant impact on the depth of investigation and overall confidence level established by the Surveyor.

5 Where the Applicant/Owner/Operator does not have resident engineers at the manufacturers, or support from another airline's resident engineering staff, the Surveyor will inevitably become more involved with the manufacturer and the extent of the investigation of the build standard will be more protracted than had the Applicant's own assessors been involved.

6 In order that the Applicant/Owner/Operator is aware of what is required from the manufacturer for the issue of a (Certificate of Airworthiness), the Check List shown in Appendix No. 1 has been prepared. It is essential that a single specific point of contact is established at the manufacturer's facility for liaison purposes.

7 The Check List primarily addresses Boeing products and uses Boeing terminology (see Appendix No. 2). It is, however, generic to other US manufacturers' products and may be used with these manufacturers subject to adjustments being made to the certification document terminology used.

7.1 However, the Surveyor must be satisfied that the aircraft is wholly in compliance with the relevant CAA certification requirements which are prescribed in FAA Advisory Circular AC 21-2( ) entitled 'Export Airworthiness Approval Procedures' prior to issuing the UK Certificate of Airworthiness.

NOTE: Should the need arise, the requirements and principles referred to in this Information Leaflet may be applied to European Manufacturer's Products.

Appendix 1

CAA CERTIFICATE OF AIRWORTHINESS ISSUE CHECK SHEET – SERIES AIRCRAFT

The following items are required **from the operator** by the Surveyor for Certification:

1 Tab No. .... Customer No. .... Serial No. .... UK Registration ....

2 FAA Export Certificate of Airworthiness. (DC)

3 Letter from Manufacturer stating compliance with: (DC)

a) FAA ADs.

b) CAA Additional Directives.

c) CAA Mandatory Modifications and Inspections (Reference UK Manufactured Equipment installed).

d) Manufacturer's Statement of Compliance with CAA Special Conditions.

e) Manufacturer's Statement of Compliance with CAA Airworthiness Notices.

4 Confirmation of Item 3 (a)–(e) relating to Engines (DC) and APU. (AW)

5 Log Books for Airframe, Engines and APU. (DC)

6 FAA Approved Flight Manual for CAA Approval. (DC)

7 Weight and Balance Manual. (DC)

8 Copy of Interior Certification Drawing as provided to FAA showing a pictorial presentation of the aeroplane cabin interior as approved for compliance with FAR Part 25. (DC)

9 Flight Test Defect Reports and Rectification Action. (DC)

10 Confirmation that the aircraft is no longer registered in the USA. (AW)

The following documents are to be obtained by the operator prior to certification and made available to the Surveyor:

1 Statement of Build Standard.

a) Detailed Specification Document. (CE)

b) Master Change Listing. (CE)

c) PRR Listing (at time of delivery) or update since last CAA aircraft. (CE)

d) Service Bulletin applicability standard. (AW)

2 Electrical Load Analysis. (Differences only between delivered aircraft and first aircraft certificated) (could be received within one month). (AW)

3 Compass Check Certificate. (DC)

4 Radio Equipment List. (AW)

5 Software Criticality Listing showing affected Part Numbers. (AW) or (CE)

NOTE: Where aircraft are required to meet the requirements of Schedule 4, scales P or S, of the Air Navigation Order in respect of Flight Data Recorders, the Applicant/Owner/Operator should ensure on acceptance of the aircraft, that they are in possession of all the appropriate information pertaining to the conversion data necessary for obtaining an accurate and comprehensive read out from the FDR.

The Applicant/Owner/Operator should also ensure that the FDR system is fully functional and capable of producing a comprehensive read out at the time of the Certificate of Airworthiness issue.

( ) See Appendix 2

Appendix 2

BOEING AIRCRAFT

Build Standard – Boeing 'build standard' at delivery is determined by a number of different types of customer defined configuration items and Boeing defined items. The individual aircraft Detailed Specification is comprised of the following items:

Standard Options (SO) – These are options available to the customer as part of the 'standard aeroplane'. Example – Graviner or Systron-Donner fire detection.

Standard Changes (CH) – These are not an 'A' or 'B' selection, rather a change to the equipment that is Boeing standard. Example – Esso/Exxon 2380 oil in lieu of Mobil Jet II oil.

Change Request (CR) – A change request is requested by the customer when a desired configuration is not available from the standard options and changes. Examples of this might be a new interior arrangement or selection of equipment not previously certified for use on the particular aircraft.

Committed Changes – Once the detailed specification has been closed, the only way to revise the configuration of the aircraft is by committed change. All changes must have the approval of the Chief Engineer. The changes are committed on a Change Board that has representatives from all affected organisations. Once a change has been committed, the commitment cannot change without the full consent of all members of the Change Board. Any of these changes can supersede another.

Master Changes (MC) – Customer requested changes that occur after the detailed specification has been closed.

Production Revision Record (PRR) – Boeing initiated changes. Product improvements, new suppliers, design errors, etc. The PRR listing is in two types: Type I is given to the customer, Type II will be made available on request to the certifying regulating Authority.

Rapid Revision (RR) – Rapid Revisions are the only type of change document that is a drawing. They are generally used for last-minute changes, usually customer initiated.

Please be advised that the PRR listing that is supplied is to be used as a tool to evaluate an aeroplane's configuration. If the listing compares two aircraft and the change is on both, it will not appear. The database is not guaranteed to be 100% accurate. Drawings are the only method to define what is to be installed on any aircraft.

Boeing Certification Documents are supplied from three centres:

The Delivery Centre (DC)	– Renton (NB) Everett (WB)
The Airworthiness Office (AW)	– Renton (NB) Everett (WB)
Customer Engineering (CE)	– Renton (NB) Everett (WB)

(NB) Narrow Bodied Aircraft
(WB) Wide Bodied Aircraft

Aircraft Flight Manuals, Engine Log Books and the Readiness Log are held by the Delivery Centre Records Offices. These documents will be released to the customer on releasing day. They are however available for scrutiny.

NOTES: 1) Liaison with Customer Engineering as a prime source of assistance is advised.

2) Local variations in procedures between the Renton and Everett facilities may be encountered.

Leaflet 11-21 Safety Critical Maintenance Tasks

(Previously issued as AN 72)

1 A factor in a serious incident involving an oil leakage on a large twin engined commercial air transport aircraft was the failure to re-install the drive cover plate on both engines following maintenance. The CAA wishes to highlight the potential safety benefit where companies choose to apply aspects of Extended Range Twin Operations (ETOPS) maintenance philosophy to multi-system aircraft in order to avoid the possibility of simultaneous incorrect maintenance on two or more safety critical systems. In this context, such systems are those which have a fundamental influence upon the safe operation of the aircraft, engines and their systems being a case in point.

2 Operators and maintenance organisations should consider the following paragraphs when planning, and accomplishing scheduled and non-scheduled maintenance tasks on multi-system aircraft.

a) Arrangements should be made to stagger scheduled maintenance tasks on essential or primary systems such that the accomplishment of similar critical tasks on two or more systems are segregated. Consideration should be given to introducing procedures that will ensure that such tasks are separated by at least one flight cycle. Where it is not practical to introduce staggered maintenance, inspections and functional checks should be performed independently to ensure system serviceability.

b) Where it is not practical to introduce staggered maintenance at Base Maintenance inputs or during rectification of Line or Base defects, the use of separate work teams together with the accomplishment of appropriate functional checks to verify system serviceability should ensure a similar level of system integrity.

c) Procedures should be established to provide maintenance and planning personnel with guidance on the identification and accomplishment of safety critical tasks conducted during scheduled and non-scheduled maintenance activities. Routine task documentation should identify those tasks which may have a critical effect on safety and should clearly identify the individual stages of such tasks. Maintenance Programme or Maintenance Schedule basic rules should provide the necessary standards to ensure the identification of critical scheduled maintenance tasks.

3 Maintenance personnel's initial and continuation training should highlight the critical nature of conducting maintenance tasks on essential or primary systems. The instruction given should provide personnel with the necessary information to identify and satisfactorily accomplish such tasks. Training programmes should focus on safety critical tasks and the possible consequences of failure to follow the associated maintenance procedures. The development of these training programmes should use feedback from maintenance experience, to enhance the programme and maintenance procedures.

4 The CAA considers that the intent of this Leaflet provides a basis for organisations to adopt good maintenance practices for multi-system aircraft.

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Leaflet 11-22 Experience from Incidents

1 Introduction

1.1 From time to time incidents occur, usually in aircraft operations, which in the opinion of the CAA reflect the need for a general awareness of possible hazards resulting from maintenance or design practices and which may have a general application.

1.2 Such information is initially published as an appendix to Airworthiness Notice No. 12. In order to maintain the effectiveness of Airworthiness Notice No. 12 and its associated appendices, its contents will in future be limited to information arising from the most recent incidents. For example, at the time of going to initial print of this Leaflet 11– 22, Airworthiness Notice No. 12 contained nine appendices which were not sorted into any standard chronology.

1.3 This Leaflet includes the text from Airworthiness Notice No. 12 appendices presented in a manner consistent with other aviation publications, which have been sorted, where possible, into Air Transport Association of America Specification 100 (ATA100) chapters. Where an appendix will not align with ATA100 chapter numbers, the CAA has allocated an unused chapter number indicated by an * for the purpose of this Leaflet 11–22. A subsequent amendment to Airworthiness Notice 12 will delete appendices which have been included in this Leaflet.

1.4 The purpose of this Leaflet is to inform organisations and individuals (such as LAEs) of these incidents and to advise future actions to minimise the probability of recurrence in order to enhance flight safety.

1.5 The applicability of information in each Leaflet will usually be self evident from the text. In most cases the applicability is to maintenance activities but some have implications for design organisations.

1.6 The CAA wishes these Leaflets to be used as advice on 'good maintenance practices' in the context of JAR 145.65(a).

1.7 The ATA 100 chapters used in this Leaflet are shown in the following table.

Chapter No	Description	Appendix No	Appendix Title
1	Operations Information	1-1	Damage to Packages of Dangerous Goods Caused by Inadequate Securing of Hold Floors
		1-2	The Consignment By Air Of Aircraft Spares As Cargo Which meet The criteria of ‘Dangerous Goods’
4*	Maintenance Information	4-1	Ambiguous Information
		4-2	The Use and Interpretation of Unfamiliar Units
		4-3	Responsibilities of Engineers who carry out and certify Maintenance on Aircraft

		4-4	CAA Approval and Continued Airworthiness of the L-3 Communications Model F-800 Digital Flight Data Recorder
		4-5	Control of the use of Pitot Head and Static Vent Blanking Covers
5	Time Limits/ Maintenance Checks	5-1	Aged Components – Permit to Fly Aircraft
		5-2	Planning and Recording of Non-Scheduled Maintenance Tasks
9	Towing and Taxiing	9-1	Ground Handling of Transport Aircraft
	Parking, Mooring, Storage and Return to Service	10-1	Control of the use of Pitot Head and Static Vent Blanking Covers
11	Placards	11-1	Aircraft Marking and Placards
12	Servicing	12-1	Fluids used in Aircraft
		12-2	Security of Re-fuelling Point Caps
		12-3	Helicopter Gearbox Oil Level Sightglasses
		12-4	Ice Falls from Aircraft
20	Standard Practices	20-1	Soft Metal Shims
		20-2	Crowded Ball Races
		20-3	Unauthorised Alteration of Parts
		20-4	Maintenance and Re-installation of Pipes and Cable Looms
		20-5	Hazards of Damage Caused by Arc Burns
		20-6	Hydraulic Fluid Contamination
22	Auto Flight	22-1	Auto-Pilots on Light Aircraft
23	Communications	23-1	David Clark Isocom Intercommunication Amplifiers
24	Electrical Power	24-1	Electrical Power Supplies - Light Aircraft Care and Maintenance
		24-2	Silver Tantalum Capacitors
		24-3	Electrical Cable Failure
		24-4	Thermal Circuit Breakers
		24-5	Battery Terminal Failure - GA Aircraft
		24-6	Lithium Batteries
25	Equipment and Furnishings	25-1	Single Lock Airframe Seat and Furnishing Attachments
		25-2	Stowage and Accessibility of Lifejackets

		25-3	Protection of Lifejackets and Flotation Bags from Damage after Deployment, by Sharp Projections of an Airframe
		25-4	Adjustable Seat Locking Mechanisms
		25-5	Seat Belts in Light Aircraft - Orientation of Stitched Joints
26	Fire Protection	26-1	Fire Hazards
27	Flight Controls	27-1	Flutter of Flying Control Surfaces
		27-2	Flap Systems on General Aviation Aircraft
		27-3	Control and Use of Rigging Pins
		27-4	Control Cable End Fittings
31	Instruments	31-1	Altimeters in Aircraft
		31-2	Vertical Speed Indicators on Imported Aircraft
32	Landing Gear	32-1	Brake and Anti-Skid Systems
		32-2	Tyre Maintenance and Reliability
33	Lights	33-1	Bonding of Strobe Lights
34	Navigation Equipment	34-1	Maintenance of Radio Navigation Equipment Course and Alarm Signal Current Lamps
35	Oxygen	35-1	Oxygen Fire Risk
		35-2	Passenger and Crew Oxygen Systems
51	Standard Practices	51-1	Inspection in Relation to Spillage or Collection of Fluid
		51-2	Primary Structural Fasteners made in H-11 Steel
		51-3	Corrosion Inhibiting (Temporary Protective) Compounds
		51-4	Lock-Bolt Failures
		51-5	Control of Precision Cutting Tools
		51-6	Self-locking Fasteners
		51-7	Foreign Objects and Loose Articles – Danger of Jamming
56	Windows	56-1	Aircraft Windshields and Transparencies
60	Standard Practices Propeller/Rotor	60-1	Inspection of Critical Parts of Helicopters Gearboxes
70	Standard Practices - Engines	70-1	Molybdenum Disulphide Lubricants - Effect on Turbine Engines
		70-2	Allison 250 Series Gas Turbine Engines
		70-3	Effects of Chloride Based Materials on Stainless Steel and Titanium

72	Engine (Turbine/ Turboprop)	72-1	Air intake Filters
76	Engine Controls	76-1	Single Path Control Systems

APPENDIX 1-1 Damage to Packages of Dangerous Goods Caused by Inadequate Securing of Hold Floors

1 Introduction

This appendix supersedes Airworthiness Notice No. 12 Appendix 56 Issue 1 dated 7 November 1997.

2 Background

Dangerous goods are regularly and routinely carried as cargo in aircraft. A comprehensive set of rules produced by ICAO, the 'Technical Instructions for the Safe Transport of Dangerous Goods by Air' ensures that this is a perfectly safe practice. Packaging must meet specific design criteria and be subjected to a stringent test regime before it may be used to contain dangerous goods for air transport. However, a number of incidents have occurred involving damage to metal drums, both in the United Kingdom and world-wide, resulting in leakage of dangerous goods in cargo holds. The damage observed was of a very specific type and occurred to the bases of drums. The vast majority of incidents were experienced after carriage on narrow body aircraft.

3 Airworthiness and Operational Considerations

3.1 Certain types of dangerous goods may be consigned in metal drums, the capacity of which can be up to 60 litres when transported on passenger aircraft. The attendant weight of such drums makes it physically impossible for loading staff to lift them in the confined space of the holds of narrow body aircraft. Consequently, drums tend to be dragged to their intended loading position. As part of the investigation into the instances of drum leakage, the floors of 20 cargo holds of narrow body aircraft were inspected. All but one of the floors had securing screws which were protruding to various degrees above the surface of the floor. Some screws had been worn to produce a very sharp edge and loading staff suggested they may also be the cause of injury.

3.1.1 Subsequent tests using a simulated hold floor, including screws of the exact type seen during the hold inspection, resulted in drum damage identical to that experienced in incidents. Protrusion of between 0.25mm and 0.5mm was sufficient to cause the damage.

3.2 CAAIP Leaflet 11-22 Appendix No. 51-1 advises of the potential dangers associated with spillage or collection of *any* fluid in aircraft; leakage of dangerous goods may present an even greater risk. The attention of operators and maintenance organisations is drawn to the importance of the correct fitting of cargo hold floors, including the need to ensure (where appropriate) screws are secured such that they do not protrude above the surface of the floor panel. Furthermore, particular attention must be paid to the handling of metal drums during their preparation for transport, the type of aircraft on which they are to be carried and the method required to load that aircraft, so that accidental damage is not caused through dragging or other mishandling of the packages. Repetitive findings of damage should result in a review of the maintenance schedule and operating (loading) procedures for effectiveness.

APPENDIX 1-2 The Consignment by Air of Aircraft Spares as Cargo which meet the Criteria Of 'Dangerous Goods'

1 Introduction

This appendix supersedes Airworthiness Notice No. 12 Appendix 59 Issue 1 dated 23 October 1998. This Appendix highlights the dangers associated with the improper air transport of aircraft spares and replacement items, meeting the criteria of 'Dangerous Goods'.

2 Background

Dangerous Goods are defined as articles or substances which are capable of posing a risk to health, safety, property or the environment when transported by air and which are classified according to the ICAO's Technical Instructions for the Safe Transport of Dangerous Goods by Air. Personnel may be more familiar with the field document produced by IATA, the Dangerous Goods Regulations. These reflect the Technical Instructions and as such are a comprehensive set of rules to ensure the perfectly safe practice of transporting dangerous goods.

3 Airworthiness and Operational Considerations

3.1 Aircraft components are installed in accordance with prescribed airworthiness specifications such that they do not present a hazard to the aircraft or its occupants. However, this safeguard may not apply to such items if they are removed and shipped as cargo. This was graphically demonstrated by an accident in 1996 in which 110 passengers and crew were killed. This accident occurred following an intense in-flight cargo hold fire caused by the improper carriage as cargo of a number of chemical oxygen generators. These generators had previously been safely installed in aircraft passenger service units (PSUs) but had been removed and shipped in a manner such that they presented an extreme danger when transported as cargo. As a result of this accident, chemical oxygen generators are now forbidden for carriage on passenger aircraft as cargo and may only be carried on a cargo aircraft subject to, amongst other things, very stringent packing requirements which are specified in the Technical Instructions.

3.2 With the extensive publicity surrounding this accident and the subsequent remedial actions, the dangers associated with chemical oxygen generators are now relatively well known, although incidents involving these items continue to be reported. However, apart from chemical oxygen generators, which are also found in Personal Breathing Equipment (PBE), it is essential to be alert to the possibility that dangerous goods can also be found in various other types of aircraft spares e.g. compressed gases (fire extinguishers, oxygen cylinders, life saving appliances), explosives (engine fire extinguishers, flares), flammable liquids (fuel line components, paint), etc., all of which, when sent as spares, may only be transported as cargo in accordance with the provisions of the Technical Instructions.

3.3 Anyone consigning dangerous goods for carriage by air has a responsibility under the Air Navigation (Dangerous Goods) Regulations, to ensure that any dangerous goods are prepared for carriage in accordance with the Technical Instructions. It is also a requirement of the Technical Instructions that all staff with duties associated with dangerous goods receive training commensurate with their responsibilities. Any failure to comply with the requirements of the Air Navigation (Dangerous Goods)

Regulations is a criminal offence, the penalty for which reflects the potentially very serious consequence of any breach.

3.4 In summary, aircraft spares and replacement items (i.e. components and equipment) meeting the criteria of dangerous goods, may only be transported by air as cargo in accordance with the ICAO Technical Instructions (or IATA Dangerous Goods Regulations). It is imperative that all personnel with responsibilities either directly or indirectly associated with the transport of these items are aware of this fact. It is also essential that measures are put in place to ensure that dangerous goods can never be offered for air transport when not fully meeting the requirements.

APPENDIX 4–1 Ambiguous Information

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 25 Issue 1 dated 22 January 1979 which was originally issued as a result of ambiguities in maintenance documents.

2 Background

2.1 During an investigation into an accident, it became apparent that some information contained in the maintenance documents for the aircraft was in fact ambiguous and had led to confusion in the minds of the staff concerned.

2.2 Whilst care is taken by all concerned, it is not always possible to avoid error or ambiguity, and in consequence, instructions may occasionally be found to be inaccurate or not clear as to their meaning.

3 Airworthiness Considerations

Any person who finds seeming ambiguities or errors in approved documents of any sort (Maintenance Schedules, Flight Manuals, etc.) is asked to inform the organisation responsible for the publication of the source data so that any uncertainties which could affect airworthiness can be corrected.

APPENDIX 4–2 The Use and Interpretation of Unfamiliar Units

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 28 Issue 1 dated 2 October 1981.

2 Background

CAA publications have for some years included units from the SI system alongside the previous Imperial Units.

3 Airworthiness Considerations

3.1 The use of SI Units (Système International) within the United Kingdom is dealt with in a publication 'Changing to the Metric System' issued by the National Physical Laboratory and obtainable from The Stationery Office, and in BSI 5775, obtainable from the British Standards Institute.

3.2 The names of the various units, the symbols used for them, and the methods to be used for presentation of those symbols in technical documents, are dealt with in both documents.

3.3 The correct understanding of technical information and instructions can depend upon the symbols used and their method of presentation. Hence, it is important that where safety may depend on the correct interpretation of symbols, product support departments and others involved in the dissemination of safety documents should consider whether any doubt could exist. Where this is the case, potentially ambiguous notation should be explained and illustrated by examples, where appropriate.

3.4 Where the users of such documents are in any doubt, they should make a careful check using reference documents such as those mentioned in paragraph 2.

3.5 In one case, a degree of uncertainty evidently arose when an area was expressed using the symbol 'mm^2' to express the concept of a square millimetre. This usage is similar to that, in Imperial Units, of 'in^2' to represent square inches (or 'sq in').

3.6 Figure 1 illustrates the unit of area of one square inch, or 1 in^2 (cross-hatched). An area of two square inches is shown, occupying twice the area. A two inch square, i.e. a square of sides 2 inches, clearly occupies four times the area or 4 in^2.

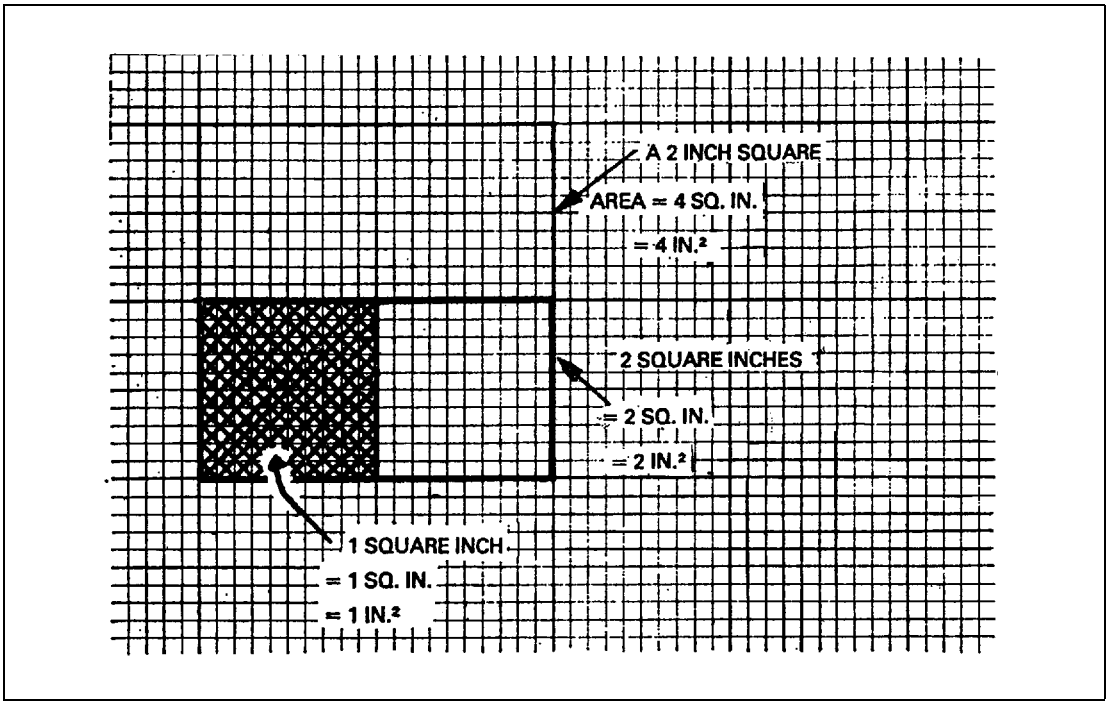


Figure 1

3.7 Figure 2 similarly illustrates the unit of area of one square millimetre, or 1 mm^2, and as an example, an area of 50 square millimetres (i.e. 50 mm^2, in that case a rectangle 5 mm by 10 mm). Once again this is quite different from the area of a 50 mm square, which is 50 times greater.

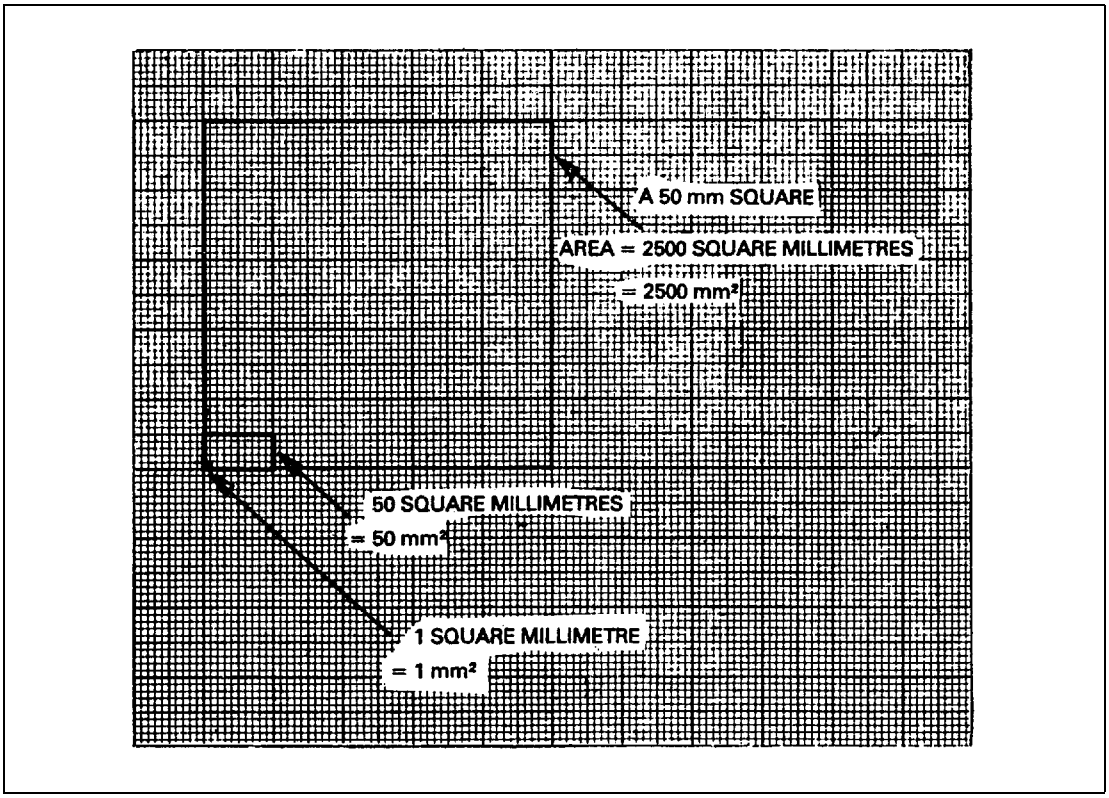


Figure 2

3.8 This Appendix is issued for information and action by all concerned. Reference should also be made to CAAIP Leaflet 11–22, Appendix 4–1 Ambiguous Information.

APPENDIX 4-3 Responsibilities of Engineers who carry out and Certify Maintenance on Aircraft

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix 52 Issue 1 dated 19 July 1996 which was issued as a result of an enquiry into a serious incident which occurred to an aircraft on the first flight following maintenance being carried out.

2 Background

The CAA wishes to remind Licensed Aircraft Maintenance Engineers and Authorised Certifying Staff employed by JAR-145 Approved Maintenance Organisations of their responsibilities when issuing Certificates of Release to Service after maintenance.

3 Certification Responsibilities

CAA Airworthiness Notice No. 3 specifies the certification responsibilities for Type Rated Licensed Aircraft Maintenance Engineers in relation to Articles 14 and 16 of the Air Navigation Order 2005 (as amended). Paragraph 1.7 includes the following information relative to the certification of maintenance:

'A Certificate of Release to Service shall only be issued for a particular overhaul, repair, replacement, modification, mandatory inspection or scheduled maintenance inspection when the signatory is (signatories are) satisfied that the work has been properly carried out and accurately recorded, having due regard to the use of:

a) up-to-date instructions including manuals, drawings, specifications, CAA mandatory modifications/inspections and company procedures,

b) recommended tooling and test equipment which is currently calibrated where applicable, and

c) a working environment appropriate to the work being carried out.'

4 JAR-145 requirements apply to Authorised Certifying Staff employed by JAR-145 Approved Maintenance Organisations who should be fully conversant with their content, particularly the following extracts from the requirements which are pertinent when carrying out and certifying maintenance:

4.1 **JAR 145.40 Equipment, tools and material**

(See AMC 145.40)

a) The JAR-145 approved maintenance organisation must have the necessary equipment, tools and material to perform the approved scope of work.

NOTE: The associated AMC 145.40 (a) states 'Where the manufacturer specifies a particular tool or equipment, then that tool or equipment should be used unless otherwise agreed in a particular case by the quality department,.....'

4.2 **JAR 145.45 Airworthiness data**

(See AMC & IEM 145.45)

a) The JAR-145 approved maintenance organisation must be in receipt of all necessary JAR airworthiness data from the CAA, the aircraft/aircraft component design organization and any other approved design organisation, as appropriate to support the work performed.

NOTE: AMC 145.30(c) Personnel Requirements. Paragraph 2 states 'To assist in the assessment of competence, job descriptions are recommended for each job role in the organisation. Basically, the assessment should establish that -. d. Supervisors are able to ensure that all required maintenance tasks are carried out and where not done or where it is evident that a particular maintenance task cannot be carried out to the approved data then such problems will be reported to and agreed by the quality organisation.'

4.3 **JAR 145.50 Certification of maintenance**

(See AMC 145.50)

a) A certificate of release to service must be issued by appropriately authorised staff on behalf of the JAR-145 approved maintenance organisation when satisfied that all required maintenance has been properly carried out by the JAR-145 approved

maintenance organisation in accordance with the procedures specified in the JAR 145.70 maintenance organisation exposition

4.4 **JAR 145.65 Maintenance procedures and quality system (See AMC & IEM 145.65)**

a) The JAR-145 approved maintenance organisation must establish procedures acceptable to the CAA to ensure good maintenance practices and compliance with all relevant requirements in this JAR-145 such that aircraft and aircraft components may be released to service in accordance with JAR 145.50. IEM 145.65(a) 1 states 'The maintenance procedures should cover all aspects of carrying out the maintenance activity and in reality lay down the standards to which the JAR maintenance organization intends to work. The aircraft/aircraft component design organisation standards and aircraft operator standards must be taken into account.'

5 The CAA consider that:

a) the responsibilities defined in both CAA Airworthiness Notice No. 3 and JAR-145 are fundamentally equivalent and require work to be carried out to specified maintenance instructions using recommended tooling and, when working in approved maintenance organisations, in accordance with established procedures.

b) it is important to adhere to publications which provide instructions for continued airworthiness together with company procedures which lay down the standards for work carried out by Licensed Aircraft Maintenance Engineers, Authorised Certifying Staff and Approved Maintenance Organisations. The privileges of Licensed Aircraft Maintenance Engineers and Authorised Certifying Staff do not include authority to deviate from such instructions or procedures.

APPENDIX 4-4 CAA Approval and Continued Airworthiness of the L-3 Communications Model F-800 Digital Flight Data Recorder

(Previously issued as AN 12, Appendix 63)

1 The CAA has been made aware that the Federal Aviation Administration (FAA) has cancelled the Technical Standard Order (TSO) Authorisation for the L-3 Communications (Formerly known as LORAL Data Systems and Fairchild Aviation Recorders, Sarasota, Florida 34232 USA) Digital Flight Data Recorder Model F-800. This followed reports of several performance problems related to this type of magnetic tape recorder. Some of these problems have caused difficulties for air accident investigators when replays are conducted. The CAA has conducted its own review of the service experience of the Model F-800 and has drawn similar conclusions to those of the FAA.

2 As a result, the CAA declared the BCAR Equipment Approval Number AR 515 obsolescent. This means that the L-3 Communications Model F-800 Digital Flight Data Recorder may not be newly installed on any UK registered aircraft for the purposes of compliance with any mandatory carriage requirement. (Mandatory carriage requirements are specified in the UK Air Navigation Order 2005 (as amended), or the Joint Aviation Requirements JAR-OPS, as appropriate.) However, where already installed in a UK registered aircraft, the Model F-800 may continue to be used, serviced and repaired, as necessary, until such time as the aircraft operator chooses to replace it with another model of flight data recorder. In such cases the Model F-800 installation will still be accepted as being compliant with the mandatory carriage requirements.

3 Following the FAA TSO approval cancellation, L-3 Communications no longer manufacture the Model F-800 but they are still providing continued airworthiness support and are continuing to manufacture spares. However, in their Field Service Bulletin No. F800 DFR FSB033, dated 1 April 2000, L-3 Communications have announced that the magnetic tape supply used to manufacture the F800 DFR reel and tape assemblies is being depleted. There is a finite and very limited supply of the DFR tape.

4 The CAA recommends that aircraft operators and maintenance organisations take these, and any other relevant obsolescence issues into account when reviewing their flight recorder maintenance schedules. Maintainers should ensure that approved replacement parts are acquired to meet future demand.

5 In addition, it should be noted that solid state Flight Data Recorder (FDR) technology meeting EUROCAE ED-55, FAA and JAA TSO-C124a has become widely available. One of the advantages of this technology is that solid state equipment can be designed to be operated under an on-condition maintenance regime.

APPENDIX 5–1 Aged Components – Permit To Fly Aircraft

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 34 Issue 2 dated 10 December 1986 which was issued following the investigation involving two fatal accidents.

2 Background

A split diaphragm in the fuel pump of a Hercules engine and a corroded capsule of a Gipsy Queen engine resulted in over-rich operation, both of which led to fatal accidents. Power loss in another Hercules engine was probably caused by failure of the insulation in a magneto. In each case extended calendar time between overhauls and low utilisation may have been factors contributing to the deterioration.

3 Airworthiness Considerations

These are just three examples of malfunctions associated with the deterioration of aged components in aircraft which are not maintained to an approved Maintenance Schedule.

3.1 It is recommended, therefore, that components including materials where deterioration due to age may occur, be inspected periodically. If signs of ageing, hardening, or deterioration of rubber components, insulation materials, or corrosion of metallic components are found, such components should be assessed and renewed as necessary.

3.2 Original servicing schedules and procedures should be used wherever available with due regard to the low utilisation of the aircraft. Operators are advised to consider additional periodic inspections for all components and equipment which may be affected by calendar time deterioration.

APPENDIX 5-2 Planning and Recording of non-scheduled Maintenance Tasks

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 53 Issue 2 dated 30 September 1996 which was issued as a result of an enquiry into a serious incident where incorrect and incomplete documentation was cited as a contributory factor.

2 Background

The CAA wishes to remind all Operators, Certifying Engineers and JAR-145 Approved Maintenance Organisations of the need to prepare complete documentation prior to the work being accomplished which clearly and accurately defines the non-scheduled maintenance task(s) to be undertaken.

3 Airworthiness Considerations

Non-scheduled maintenance tasks can arise from scheduled maintenance inspections or from defects recorded on operational aircraft. Non-scheduled maintenance tasks require a certificate of release to service be issued when all maintenance relating to the task(s) has been completed.

4 JAR 145.50(b), Certification of maintenance, specifies 'A certificate of release to service must contain basic details of the maintenance carried out.....' It therefore follows that the documents recording a non-scheduled maintenance task must contain sufficient detail to enable the Certifying Engineer to determine that it has been carried out to the standard which will enable him to issue a certificate of release to service.

5 Maintenance tasks on aircraft vary in complexity and task cards raised for scheduled maintenance reflect the level of complexity of the specific task. Control of these complex tasks by maintenance personnel at shop floor level is normally simplified by breaking each task down into a number of discrete steps with the provision for appropriately authorised staff to sign/stamp when each step is completed. It is equally important that non-scheduled maintenance tasks are similarly broken down into steps to provide a detailed record of maintenance which is to be carried out and certified on completion of each step or group of steps as they occur. Engineers are reminded of the need for a full and comprehensive hand-over of work outstanding at shift changes.

NOTE: The CAA endorses the use of stage sheets which is good maintenance practice as it enables personnel to record work to be carried out and provide a record of the accomplishment of that work. Human factors studies in engineering repeatedly show that the use of properly prepared stage sheets when carrying out tasks considerably reduces the opportunity for maintenance errors occurring.

APPENDIX 9–1 Ground Handling of Transport Aircraft

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 18 Issue 1 dated 25 March 1977 which was originally issued to alert operators to the possibility of a nose undercarriage failure in older types of aircraft during towing or push-back.

2 Background

There have been a number of occurrences involving nose undercarriage failure in the older types of transport aircraft. These failures can be attributed, at least in part, to loads induced during towing or push-back. Such loads have, in a number of cases, resulted in the initiation of fatigue cracking, leading to subsequent failure under operational loads.

3 Operating Considerations

3.1 Aircraft manufacturers specify suitable ground handling equipment, compatible with the aircraft type, designed to avoid overloading, e.g. employing shear pins, which fail at predetermined loads. However, it is possible to induce overloading by rapid acceleration or braking, especially when employing large, powerful tractors to move the smaller types of aircraft. Furthermore, certain manoeuvres now commonly employed, such as 'push-back' were not anticipated in the design of some older aircraft.

3.2 Operators, especially those of the older types of aircraft, should ensure that the correct ground handling equipment is always employed, that it is regularly and adequately maintained, and that particular care is taken when using large powerful tractors. Operators should also check with the manufacturer that their ground handling procedures are compatible with the aircraft design.

APPENDIX 10-1 Control of the Use of Pitot Head and Static Vent Blanking Covers

(Previously issued as AN 12, Appendix 57)

1 A serious incident involving a large commercial air transport aircraft occurred due to the loss of half the primary reference flight instruments readings during take-off. The reason for the loss was that pitot head blanking covers had not been removed before flight.

2 The aircraft had been subjected to an overnight stop during which time all four of the pitot head blanking covers were installed.

3 The engineering and flight crew pre-departure check resulted in two of the four pitot head covers being removed. The remaining two were missed, and not removed.

4 The pre-departure check was carried out at night and in rain, thus weather and darkness contributed to the incident.

5 Good maintenance practices dictate that the installation of blanks or covers requires a clear, unambiguous entry in the Technical Log that the aircraft is no longer airworthy as a result of that installation. This practice would assist line maintenance personnel in ensuring the removal of such items before aircraft acceptance by the flight crew.

6 Hence procedures should be instituted by operators and maintenance organisations to control the installation and removal of blanking covers for pitot and static probes.

6.1 Open entries should be made, at the time of installation of such blanking cover(s), in the Technical Log, identifying which blanking cover(s) have been installed.

6.2 Upon removal of the blanking cover(s) the open entry in the Technical Log should be appropriately annotated and certified.

6.3 Emphasising the use of 'temporary' blanking covers, such as masking tape on operational aircraft is not acceptable as it can also result in the type of incident described herein.

7 The reliance of warning or attention getting 'flags' attached to blanks or covers is not, in itself, sufficient to insure their identification and removal before flight. This is especially true when completing aircraft pre-departure checks in darkness or adverse weather conditions.

NOTE: Operators should consider application of similar practises in respect of other commonly used blanking or locking devices such as landing gear locking pins, intake blanks, external control locks etc.

APPENDIX 11–1 Aircraft Markings and Placards

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 45 Issue 1 dated 12 November 1990 which was originally issued to highlight the importance of the legibility and position of markings and placards.

2 Background

Resulting from an enquiry into an accident, the CAA wishes to draw attention to the importance of the correct positioning and legibility of aircraft markings and placards, especially those relating to emergency situations.

3 Maintenance Considerations

3.1 Operators and maintenance organisations are reminded that all placards, markings, operating instructions, especially those which pertain to emergency equipment and exits, should be inspected periodically to ensure legibility, complement and location.

3.2 The Light Aircraft Maintenance Schedule (LAMS) requires the inspection of placards in Section 7 at Check A, 50 hour, 150 hour and Annual check periods. Where other maintenance schedules do not refer to this subject, action should be taken to revise the schedule as appropriate.

APPENDIX 12–1 Fluids Used in Aircraft

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 5 Issue 2 dated 1 April 1985 which was originally issued to warn of the possibility of accidents occurring as a result of incorrect fluids being used.

2 Background

Aircraft are replenished with many fluids during their operation. Accidents and incidents continue to draw attention to the need to avoid the use of incorrect fluids.

3 Airworthiness Considerations

3.1 In addition to the obvious risks associated with damage to systems and failure to function if they are filled with the incorrect fluids, there is a risk that the damage may not become apparent until the aircraft is in flight with possible catastrophic results. Use of incorrect fluids may result from:

a) Incorrectly establishing the fluid required.

b) Incorrect identification of the fluid available.

3.2 Identifying fluids

3.2.1 To avoid incorrectly establishing the fluid required, the following should be observed:

a) Filling points are required to be clearly marked to indicate the fluid to be used and these markings should be maintained in a legible condition.

b) Where it is critical that the fluid to be used is to a particular specification(s), the marking may either indicate the specification(s) or provide sufficient information to permit servicing staff to determine which specification is applicable. Where neither is indicated, operators should ensure that the servicing staff, whether their own or an agent's, follow a procedure that will ensure that the required specification is correctly established.

3.2.2 To avoid incorrect identification of the fluid available, the following should be observed:

a) Containers and dispensing apparatus should be clearly marked with the identity of the fluid.

b) If a 'used' container has to be re-used to contain a fluid other than that corresponding to the original identification, then the identification should be removed or permanently obscured and the identification of the new fluid should be clearly marked on the container.

c) Fluids should only be obtained from sources whose integrity in respect of the contents of a container is beyond doubt.

3.3 Additional hazards apply when servicing fluids are carried on board aircraft and used to replenish systems when transiting overseas stations. Where foreign handling agents are used, language problems may compound potential problems. Operators should ensure that:

a) Ideally all fluids are in sealed manufacturer's cans.

b) Purpose-designed stowages are provided for each fluid type, arranged where possible, to give physical separation between different types.

c) The stowages are clearly identified as to the contents and that these markings correspond to those on the aircraft filler points.

d) Procedures on use and replacement are contained in an appropriate Company manual.

e) Scheduled checks are made to check the identity and stowage of on-board fluids.

APPENDIX 12–2 Security of Re-fuelling Point Caps

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 14 Issue 1 dated 30 May 1975 which was originally issued following an incident in which overwing fuel leakage occurred in flight.

2 Background

2.1 An incident occurred in which overwing fuel leakage occurred during flight and an adjacent engine was shut down to minimise fire risk.

2.2 A subsequent investigation showed that on completion of re-fuelling, the overwing refuelling point cap had been fitted with the retention chain trapped between the cap and the refuelling point sealing ring, thereby creating a gap through which fuel was drawn by airflow over the wing during flight.

2.3 Unless care is taken to ensure that the chain is not trapped when refitting re-fuelling point caps, the caps can be installed in the apparently secure and locked position, and yet be potentially hazardous.

3 Servicing Considerations

3.1 It is essential that persons engaged on, and responsible for refuelling of aircraft should ensure that re-fuelling point caps are correctly fitted.

3.2 Persons responsible for authorising others to refit re-fuelling point caps must ensure that such persons are aware of the correct procedure, and will avoid the hazards resulting from noncompliance.

APPENDIX 12–3 Helicopter Gear Boxes Oil Level Sightglasses

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 43 Issue 1 dated 16 March 1990 which was originally issued following incidents caused by the misreading of oil levels in gearboxes.

2 Background

Several incidents and an accident have occurred after stained oil level sightglasses gave the impression that transmission gearboxes were full, when they were in fact empty. This problem is particularly prevalent when synthetic oil is used.

3 Maintenance Considerations

Operators are reminded that sightglasses should be closely inspected for staining, regularly, and if readability is impaired they should be cleaned.

APPENDIX 12-4 Ice Falls From Aircraft

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix 66, Issue 1, dated 23 October 2003 which was issued to highlight the problems which arose from leaking aircraft potable water and toilet systems.

2 Background

2.1 In recent years, the CAA has received numerous reports regarding damage to property caused by blue or clear ice falling from aircraft. During the six year period 1997 – 2002, over 200 ice fall reports within the UK were received by the CAA and whilst in the majority of cases it was not possible to identify the offending aircraft it is known that the ice in most of these cases emanated from toilet system servicing points on the aircraft.

2.2 On several occasions, where an accurate incident time and location have been provided, ATC radar replays have been able to identify a specific aircraft responsible for the ice fall and follow up investigations have been able to identify an aircraft defect responsible for the ice build-up. Reports received by the CAA show that ice falls from aircraft occur throughout the year, mainly during descent and in the majority of cases affect properties located under approach paths into the UK's major airports. On those days when higher ambient temperatures exist at lower levels the ice may well melt, reaching the ground as slush or fluid.

2.3 The majority of ice accumulations recovered following such incidents are reported as being blue or clear in colour – the blue ice emanating from leaking toilet system servicing points, whereas the clear ice in the majority of cases is believed to come from leaking water system servicing or overflow points. In one incident where significant damage was caused to the roof of a house it was found that the responsible aircraft's water tank overflow valve was stuck open.

2.4 Damage to property has ranged from significant damage to house roofs, conservatories, greenhouses, garages and other buildings to cracked car windscreens. Reported sizes of ice range from "pellet" or "melon" size up to the size of a "bag of cement". Whilst there are reports of people on the ground having been struck by falling ice and suffering minor injury, to date there have been no known fatalities.

2.5 Quite apart from the potential for falling ice to damage property and cause a hazard to people, ice detaching from an aircraft can present a serious airworthiness threat.

There are several cases on record of extensive damage being caused to mainplanes, stabilizers and engines by ice detaching from leaking toilet system servicing points.

2.6 Several aircraft have over the years suffered engine detachment during flight due to being struck by ice accumulating at leaking toilet system servicing points. In one case, a large commercial air transport aircraft had a long history of the forward toilet not flushing due to the toilet system repeatedly losing its fluid charge. Eventually, the No. 3 engine detached during cruise at 35,000 ft after being hit by a large piece of ice that became detached from the forward toilet system servicing panel. Damage to engine intakes and compressor sections is not uncommon.

2.7 Toilet system fluid readily promotes corrosion and if allowed to leak past toilet system servicing panel sealing arrangements can be forced by the airflow into difficult to access structures (e.g. lap joints) and may well eventually result in the need for expensive repairs to pressure hull boundary structures.

2.8 Aircraft operators should be aware that during ramp audits of aircraft by the CAA and indeed by overseas regulatory authorities, any evidence of leakage/staining at toilet and water system servicing points may well result in the aircraft being delayed whilst investigations are carried out. Cases are on record where aircraft with no leaks but with previous staining not removed have been delayed for investigation during such audits.

2.9 It should be noted that what might appear to be a small seep/leak on the ground past toilet system servicing point seals will be significantly greater when the aircraft is pressurised.

REMEMBER
THE ONLY ACCEPTABLE LEAK IS NO LEAK!!

3 OPERATOR, MAINTENANCE AND GROUND HANDLING ORGANISATION RESPONSIBILITIES

3.1 Whilst toilet and water system details vary between aircraft types, the operating concepts and philosophies are of course similar and operators, maintenance and ground handling organisations should bear the following points in mind.

- Operators must ensure that personnel employed by contracted ground handling companies who provide toilet and water system servicing to the aircraft are fully aware of the reasons for and potential hazards associated with blue/clear ice. Ground handling personnel should be provided with instruction in Aircraft Maintenance Manual procedures for toilet and water system servicing. Continuation training programmes should ensure that these aspects are revisited as and when required. Ground handling personnel should be advised of the need to report leakage, damage or any servicing difficulties to maintenance personnel for corrective action.
- Reports of inoperative toilet flush and water systems especially where the fluid charge is being lost should be investigated and rectified without delay.
- Galley and toilet sinks that refuse to drain in flight are often an indication of a failed drain mast heater and therefore another possible source of ice accumulation.
- Operators should ensure that the aircraft maintenance programme contains all the manufacturer's recommendations for the maintenance of such systems.

- Operator and maintenance organisation quality departments should include inspection of toilet and water system servicing points for evidence of leakage and satisfactory condition of sealing arrangements in aircraft audit programmes.
- Where leaks are found prior to flight and cannot be rectified, the system should be drained and the toilet placarded INOPERATIVE – reference should be made to the aircraft's MEL.
- Where dents/damage to engine intake lips, compressor blades, stabilizer leading edges etc. are seen with no readily apparent reason for such damage, consideration should be given to the damage having been caused by the detachment of ice from toilet or water system servicing points forward of the damaged area.
- Where blue streaking/staining from toilet servicing panels is evident with nil apparent leaks, consideration should be given to the possibility of inadequate servicing procedures having been used.
- Whilst obviously all Airworthiness Directives applicable to such systems must be complied with all non mandatory service bulletins and modifications should be carefully assessed for application to such systems.
- Toilet and water system servicing point sealing arrangements must be maintained serviceable at all times and should receive the same level of attention as afforded to any other aircraft system.
- Leakage from otherwise fully serviceable toilet systems has on occasions been caused by items such as soap dispensers and disposable nappies being placed in toilets and becoming lodged under the toilet dump valve assembly. Placards located adjacent to the toilet showing prohibited items should be maintained legible at all times.
- Toilet systems servicing panel areas should be kept clean and free of staining to assist in the early detection of leaks. Following any leak rectification, maintenance personnel should ensure that any staining/contamination is removed otherwise any future leaks may well go undetected. Operators should consider the implementation of a cleaning programme for toilet servicing panel areas to assist the prompt detection of leaks.

REMEMBER
THE ONLY ACCEPTABLE LEAK IS NO LEAK!

APPENDIX 20–1 Soft Metal Shims

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 1 Issue 1 dated 1 March 1973 which was originally issued to warn operators of the possible failure of a power control bracket fitting to the elevator.

2 Background

An investigation into the failure of a power control bracket fitting to an elevator revealed that soft metal shims were embodied between the bracket and the elevator, apparently for assembly alignment and adjustment. Small diameter special tapered

bolts were embodied in shear and set bolts in tension, but the effect of these was quickly lost after tightening due to setting or extrusion of the soft metal shims.

3 Airworthiness Considerations

In this type of assembly it is important that the initial torque loading at manufacture should be maintained throughout the life of the assembly. This object was defeated by the use of soft metal shims and thus a design feature which had been proved by experience to be undesirable, was repeated and created a serious hazard.

APPENDIX 20–2 Crowded Ball Races

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 2 Issue 1 dated 1 March 1973 which was originally issued to warn of the possibility of a control shaft becoming completely jammed.

2 Airworthiness Considerations

2.1 Crowded ball races have no cage, and the balls are placed in position by forcing them through assembly slots in the inner and outer races. Only a small amount of interference between the ball and the slot is possible during assembly, with the result that excessive wear (which can be caused by rusting or faulty manufacture) can leave the balls free to re-enter the assembly slot. The inner race can then become locked to the outer race and, in addition, loose balls may drop out and possibly create a further hazard.

2.2 Cases have arisen with such bearings in which the clearances became sufficiently large for a ball to move from its proper track into the assembly slot and yet not escape completely because of the configuration of the bearing on the shaft. In this position, the ball completely jammed the control shaft on which it was used.

2.3 Among many ways of preventing this kind of hazard is the use of shaped washers alongside the bearing to prevent the balls moving sideways far enough to re-enter the slot.

APPENDIX 20–3 Unauthorised Alteration of Parts

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 11 Issue 1 dated 7 November 1973 which was originally issued to alert operators of accidents occurring as a result of unauthorised alterations to parts.

2 Background

Fatal accidents to UK registered civil aircraft have occurred after, and at least in one instance, as a result of, the unauthorised alteration of parts in such a way as to enable their incorrect assembly and functioning.

3 Airworthiness Considerations

3.1 No part which could affect the safety of an aircraft may be altered other than in accordance with drawings or instructions from the manufacturer or an appropriately approved organisation.

3.2 In the assembly of all parts, but particularly when any change which could affect interchangeability has been made, care must be taken to ensure that the correct part for the particular purpose is fitted, that it is fitted correctly, the right way round, and if a working part, that it and the system of which it is part, works in the correct sense and throughout the correct range.

3.3 No alteration may be made to nullify a feature provided to prevent wrong assembly.

APPENDIX 20–4 Maintenance and Re-installation of Pipes and Cable Looms

For the purpose of this Appendix, the term pipe is intended to cover small bore flexible or rigid pipes carrying fluid at either positive or negative pressure relevant to ambient and typically supported by 'P' clips or 'B' nuts.

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 42 Issue 1 dated 16 March 1990 which was issued following a number of incidents which occurred due to poor or incorrect routing of pipes and cable looms.

2 Background

2.1 A number of incidents have been reported in which the failure of pipes and cable looms has occurred due to poor or incorrect routing, incorrect or absent structural attachments and in the case of rigid pipes, corrosion and chafing at 'P' clips and 'B' nut locations.

2.2 Manufacturers' recommended maintenance requirements and standard practices have always stressed the need to conduct adequate inspections of pipes and cable looms in areas of poor and limited access during scheduled maintenance inspections and non-scheduled maintenance. However, it is felt appropriate to re-emphasise the need to conduct satisfactory inspections and re-installations of pipes and cable looms following maintenance activities.

3 Airworthiness Considerations

3.1 Maintenance organisations and maintenance personnel must be alert to the need to ensure the satisfactory condition of all pipes and cable looms with regard to chafing, correct routing and adequate structural attachment, following scheduled maintenance inspections, non-scheduled maintenance and the installation of

approved modifications. Attention should also be paid to the re-installation of pipes and cable looms in accordance with the manufacturer's original installation.

3.2 When inspecting pipes, care should also be taken to ensure that no corrosion exists under 'P' clips and 'B' nuts. Particular attention should be paid to pipes located in areas of adverse environmental exposure such as wheel bays, wing trailing edges and undercarriages.

3.3 For additional information related to cable looms see CAAIP Leaflet 11-22 Appendix 24–3 and for Stainless Steel pipes see CAAIP Leaflet 11-22 Appendix 70–3.

APPENDIX 20–5 Hazards of Damage Caused by Arc Burns

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 29 Issue 1 dated 1 April 1983 which was originally issued following a fatigue failure of a titanium alloy fan blade initiated by damage remaining from an arc burn.

2 Background

2.1 An engine's titanium alloy fan blade failed in fatigue that had emanated from an area of local blending on the blade leading edge. The failed airfoil may have been contained initially by the fan containment casing but the imposed impact and rotor unbalance loads caused damage such that together with aerodynamic loads, there were consecutive separations in-flight of the nose-cowl assembly and of the fan containment casing which then damaged the airframe and another engine.

2.2 The blending is believed to have met the acceptable standards for removing visible damage, but had been applied to remove a burned area which had been caused by a high energy electrical arc contacting the blade's leading edge. Subsequent laboratory examination of the failed blade's microstructure indicated that the blending operation had not removed all of the arc burn's heat affected area, one remaining portion of which became the origin of a fatigue crack.

2.3 There have been other cases of fan blade failure from arc burns. In addition, a failure of a helicopter rotor blade has been attributed to an arc burn which had occurred during an anodising process in manufacture.

2.4 The accidental occurrence of electrical arcs produces localised melting and rapid subsequent cooling of materials, thereby causing a local degradation of material properties, which may then lead to cracking (cracks for evaluation of fatigue crack growth in test specimens are often 'started' by means of low voltage short duration electrical arcs used to introduce a flaw in the material).

2.5 An arc burn may be evidenced by a small circular or semi-circular heat-affected area on the surface which may contain shallow pitting, re-melting or cracking. Usually a dark blue oxide discoloration is associated with the heat-affected area (paint protected materials are not immune, and paint burns could be indicative of arc burn damage in the component).

2.6 Most manufacturers provide detailed instructions for the rectification of the large scale arc burn damage caused by lightning strikes, but they may not all adequately cover the possibility and hazards of arc burns from electrical equipment used during maintenance and overhaul.

3 Airworthiness Considerations

3.1 Minimise the possibility of arc burns by proper maintenance of all electrical equipment used in the vicinity of aircraft/engine components.

3.2 If any electrical equipment, including its leads, is found to be faulty or has blown a fuse, inspect carefully for evidence of arc burns on any item which the equipment has been near.

3.3 Do not regard arc burns as 'normal' damage in determining the actions to remove the damaged area – in the absence of any published specific instructions regarding removal of arc burn damage, obtain advice from the manufacturer or reject the part.

APPENDIX 20–6 Hydraulic Fluid Contamination

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 33 Issue 2 dated 10 December 1986 which was originally issued to warn helicopter operators of the effects of chlorine contamination of hydraulic fluid.

2 Background

2.1 A shut off valve, integral with a flying control actuator, jammed due to internal corrosion and could not function correctly causing an accident to a large helicopter. The corrosion had been induced by chlorine contamination of the hydraulic fluid.

2.2 Whilst manufacturers' publications and accepted maintenance practices have always stressed the need for scrupulous cleanliness when dealing with hydraulic components, there has been little emphasis on the potential hazards which may result from the vulnerability of both phosphate ester and mineral based hydraulic fluids to contamination by cleaning solvents or water.

3 Airworthiness Considerations

3.1 Cleaning fluids in general contain, or are based on, chlorinated solvents. These solvents, or their residues, can combine with excessive amounts of water, which are often found in hydraulic systems, to form hydrochloric acid. This acid will attack internal metallic surfaces in a system, particularly ferrous materials, and produce rust-like corrosion. Such corrosion is virtually impossible to stop and component overhaul and thorough system decontamination is usually necessary to restore the system to a serviceable condition.

3.2 Residual contamination by chlorinated solvents during hydraulic system maintenance or component overhaul must be prevented. When chlorinated solvents are used, care should be taken to ensure that all surfaces, including connectors associated with hydraulic test rigs of ground power supply sources, are free from such residual solvent before assembly or connection to the aircraft system.

3.3 All overhaul agencies and maintenance personnel must be alert to this significant but obscure hazard and are advised to review their maintenance procedures to ensure that chlorinated solvents cannot get into hydraulic systems or components.

3.4 In some fluids, an excess of water, even in the absence of chlorine contamination, may result in a build-up of acidity, or the formation of gelatinous deposits which can clog filter elements and small passageways, therefore, hydraulic fluid in aircraft systems and test rigs should be periodically checked for total acidity and water content to ensure these parameters remain within the appropriate aircraft manufacturer's recommended limits.

APPENDIX 22–1 Auto-pilots on Light Aircraft

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 9 Issue 1 dated 7 November 1973 which was issued following an incident where the aileron control of a light aircraft jammed.

2 Background

The aileron controls of a light aircraft recently jammed in flight; the pilot managed to maintain control by means of the rudder. The incident was caused by the corrosion and seizure of a bearing which supported the output drive gear of an auto-pilot roll servo motor. A slipping clutch associated with this gear had also seized. There was no weak link in the drive between the servo motor and the aileron control system.

3 Airworthiness Considerations

3.1 The type of auto-pilot involved in the incident is installed in many light aircraft, and the use of a slipping clutch to protect the aircraft against excess servo motor torque, or a jammed servo motor, is a feature common to other types of light aircraft auto-pilots. It must be realised that such a slipping clutch does not provide protection against jamming where seizures occur in the drive between the clutch and the flying control system.

3.2 In the operating instructions for the aircraft involved in the incident, the pilot is advised to check the system prior to each flight to ensure that the clutch can be slipped. Wherever practicable a similar check should be made by pilots of all light aircraft fitted with auto-pilots in which slipping clutches are incorporated.

3.3 Any auto-pilot servo motor (including bearings and attachments) which is connected so as to be part of the Flying Control Installation, must be subjected to the same maintenance checks as those called up in the Maintenance Schedule for the Flying Control Installation.

3.4 At all times the manufacturers' recommendations for operating and maintaining the autopilot must be adhered to.

APPENDIX 23–1 David Clark Isocom Intercommunication Amplifiers

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 48 Issue 1 dated 9 November 1992 which was originally issued following a failure of an Isocom intercommunication amplifier.

2 Background

A failure occurred on a light aircraft which resulted in the pilot being unable to transmit on either VHF No. 1 or VHF No. 2. The cause of the defect was an internal failure of the Isocom intercommunication amplifier which prevented the microphone audio and keyline from being connected to the selected transmitter.

3 Design Considerations

To comply with CAP 747 - Mandatory Requirements for Airworthiness, Generic Requirement No. 18, ensure that an alternative means is provided to enable the operation of communication transmitters when either installing a modification or completing a maintenance check to an aircraft when a David Clark Isocom intercommunication amplifier forms part of the radio station.

APPENDIX 24–1 Electrical Power Supplies – Light Aircraft Care and Maintenance

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 21 Issue 2 dated 18 August 1989 which was originally issued following incidents involving a total loss of electrical power on light aircraft.

2 Background

Investigations into incidents involving total loss of electrical power supplies on light aircraft have shown that insufficient care was taken in the maintenance of the major components of the electrical system.

3 Airworthiness Considerations

3.1 A single fault, or a single fault plus a dormant fault, may cause the loss of electrical supplies. For example:

a) If the battery becomes disconnected from a generation system using 'commercial' type alternators, instability may occur with the subsequent loss of the output of both alternators and result in the total loss of electrical power.

b) In a twin-engined aircraft, a slack drive belt may operate quite adequately when both generators/alternators (generator) are sharing the load, but may slip should the other generator fail, with the resultant loss of output from both and leaving the

electrical system demands dependent on the battery. On a single-engined aircraft, the belt may slip with increasing electrical load on the system, with similar results.

c) Faults in the load-sharing system may effect both generators, possibly to such an extent as to result in the loss of output from them both.

3.2 While there are obviously many other faults which may result in generation system failures, these examples are quoted since they have occurred a number of times in service.

3.3 Should both generators fail and difficulty be experienced in re-setting, it may be possible to re-set one of them by reducing the electrical load to a minimum. Having re-set one, it is advisable not to attempt to re-set the other, since this may cause permanent loss of the output of both.

3.4 The attention of Owners and Operators is drawn to the necessity for ensuring that the following items are checked periodically:

a) The battery and its control relay must be correctly installed and the battery terminals must be free from corrosion and correctly tightened.

b) Voltage settings and load-sharing adjustment (where applicable) must be correct.

c) All cable connections must be secure with locking devices in place and with end fittings showing no signs of fatigue fracture or corrosion. Earth connections are equally as important as the positive connections.

d) Drive belts for generators must be checked to ensure that they are in good condition and correctly tensioned.

3.5 It is recommended that these checks should be carried out approximately every 100 flying hours or three months whichever is the sooner. The appropriate Maintenance Schedules should be reviewed and, where necessary, adjusted to take these recommendations into account.

3.6 The operation of the appropriate indicators and failure warning devices should be checked daily or during the pre-flight drill.

3.7 Whilst the CAA considers that the situation should be contained by the diligent application of maintenance procedures, owners and operators may, nevertheless, wish to consider modifications to improve the reliability of their own particular aircraft by, for example, the introduction of an emergency battery to act as a power source for vital services should the main electrical system fail. Such batteries have already been introduced on certain aircraft, and installation information is available.

APPENDIX 24–2 Silver Tantalum Capacitors

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 30 Issue 1 dated 18 June 1984 which was originally issued following reports of problems associated with the use of silver tantalum capacitors.

2 Background

2.1 Despite the issue of manufacturers bulletins and information from other interested parties, reports of problems associated with the use of silver tantalum capacitors are still being received, i.e. capacitors containing silver and non-solid electrolyte.

2.2 Well-documented evidence exists showing that non-solid electrolyte silver tantalum capacitors can, with age, or under adverse electrical operating conditions, suffer from active failure, or modes which can involve explosion, electrical short-circuit, or electrolyte seepage. Because the electrolyte in such capacitors is highly corrosive, consequential damage to equipment is usually caused and a hazard to personnel may also exist.

2.3 Tantalum capacitors have been produced which do not contain silver and such 'tantalum'– 'tantalum' capacitors should, wherever possible, be used to replace types employing silver. Equipment designers are advised that capacitor manufacturers have derived, or have access to, data which will permit them to offer detailed guidance on the correct operating conditions and the limitations of use of their products. Such guidance may preclude the use of older designs of capacitor in applications which were previously considered to be safe. Designers are further reminded that, in addition to ensuring that they have adequate data, they are also required to employ products which are available on a continuing basis from controlled and suitably approved sources. The use of capacitor types produced to BS9000 or CECC specification is desirable and CAA release is generally available.

3 Airworthiness Considerations

3.1 Equipment overhaulers and other users should query any application of silver tantalum capacitors in airborne equipment with the appropriate design authority, who would normally be the manufacturer of the equipment. Instances of significantly disruptive capacitor failure within airborne equipments should be reported to the CAA.

3.2 It should be noted that the Ministry of Defence has issued similar advice in Standards in Defence News – Serial 61.

APPENDIX 24–3 Electrical Cable Failure

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 32 Issue 2 dated 10 December 1986 which was originally issued following incidents in which damage to the insulation of electrical cables was the cause of an electrical system failure.

2 Background

In a well-documented occurrence, damage to the insulation of electrical cables, caused by defective circuit identification printing, was a contributory factor to a significant aircraft electrical system fault in flight. The incorrect application of hot stamp printing resulted in excessive penetration of insulation and a group of individual cable damage sites coincided physically in a loom. Fluid from a leaking toilet waste

system contaminated the cables in the damaged area and severe electrical arcing occurred which was of sufficient intensity to rupture the damaged cables and also others in close proximity.

3 Airworthiness Considerations

3.1 Study of the pertinent factors has indicated that in addition to avoiding damage to cables during installation, modification or repair activity, there is a need for vigilance in the following areas:

a) Fluid contamination of electrical equipment is obviously to be avoided but it is particularly necessary to appreciate that certain contaminants, notably that from toilet waste systems (which is saline) and fluids which contain sugar, such as sweetened drinks, can induce electrical tracking of degraded electrical cables and unsealed electrical components.

b) Cable looms are particularly vulnerable to liquid contamination because they can provide a drainage path. Care should be taken to route cables away from known areas of possible leakage but, should contamination occur, cable looms must be thoroughly cleaned and dried and any unsealed electrical items removed to workshops for examination.

c) In areas where it is not possible to provide segregation between electrical cables and pipes which carry fluid, it is good design practice to keep pipe joints to an unavoidable minimum. The fitment of drip shields or drained enclosures to joints in liquid waste systems is recommended.

d) The CAA will pay additional attention to the quality control of hot stamp printing applied by cable users and will expect to see appropriate testing of cables after printing. The preferred method of ensuring that the insulation of printed cable has not been degraded is to employ a High Voltage Test using one of the systems defined in British Standard BS G.230 Test 16. Continuous testing is not required provided an adequate sample is tested whenever any machine setting is altered, including changes of alpha numeric characters.

e) It is important to note that hot stamp printing may only be applied onto cable types and sizes which have been certified as capable of accepting such marking. Cable manufacturers whose products have approval under BCAR Section A, Chapter A/B4–8 procedures are able to give appropriate guidance on a Declaration of Design and Performance (DDP) and they will be able to advise on suitable test and inspection methods.

3.2 It has been further reported that certain types of widely-used cable insulation are susceptible to 'arc track' when seriously abused in service. The failure detailed in paragraph 2 related to a wet 'arc tracking' condition and designers of installations should be aware that, in addition to the factors noted in paragraph 3.1, it is recommended that cable selection should include evaluation of 'wet-arc tracking' characteristics. BS2G.230 defines test conditions for aircraft electrical cables and Test 42 provides a test regime which facilitates comparison between cable types. Cable manufacturers are evaluating their existing products using Test 42 criteria and in consequence some new cable manufactures have been developed.

3.3 A further failure mode which has been established by laboratory testing and widely canvassed, is that of 'dry-arc tracking', which is a secondary failure condition resulting from the short circuiting of cables. The primary aim of the testing was to explore 'battle damage' failure but it may be postulated that cable to cable abrasion or other 'cut-through' faults can permit intense local heating at power levels which are well

within the short term no-trip characteristic of the associated electrical protection. In such conditions some insulation materials can form a conducting char and if this extends to cables not involved in the original fault, a 'cascade' failure may develop. The CAA and other agencies are seeking to establish if this failure mechanism has any relevance to civil aircraft beyond placing further emphasis on the need for good design, installation and maintenance of electrical interconnect systems.

Personnel engaged in servicing of aircraft are reminded that the discovery of a potentially hazardous failure condition during maintenance or fault finding may well justify the raising of a Mandatory Occurrence Report (MOR). In the context of this Appendix, any disruptive failure of electrical cables would warrant such a report. Physical evidence should be retained for investigation.

APPENDIX 24–4 Thermal Circuit Breakers

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 40 Issue 1 dated 16 September 1988 which was originally issued to clarify the role of electrical thermal circuit breakers.

2 Background

There would appear to be some misunderstanding of the intended role of electrical thermal circuit breakers, which is reflected in the selection, maintenance and in-flight use of such devices. This Appendix relates to push button operated single pole and three pole units but does not embrace the simple thermal devices which are not capable of being manually switched (such units are occasionally fitted to light aircraft).

3 Airworthiness Considerations

3.1 The basic function of a thermal circuit breaker (CB) is to detect an electrical overload condition which is, for rating and calibration purposes, assumed to be a constant current. The first point to note, therefore, is that electrical faults may be of a form which do not represent an overload to a given CB and that faults seldom present a constant value of current for a continuous time. The CB can only be expected to isolate faults which will overload the circuit and therefore any protection which is afforded to a consuming equipment, such as a motor, is often a matter of chance. Where consumer equipment requires protection against an internal fault or functional overload, then an appropriate form of current or temperature sensing protection needs to be incorporated as an integral part of the design.

3.2 Distribution faults of a 'splashing' nature, which cause intermittent currents of high instantaneous value, will also be undetected by a thermal CB unless the integral sum of the fault currents does constitute an overload within the relevant trip characteristics. It follows that, where other constraints permit, the current rating of CBs should be selected at the lowest value consistent with the avoidance of nuisance trips caused by, for example, high ambient temperatures within the CB enclosure. Such derating of detection below the nominal level appropriate for a given cable size will afford a greater possibility of fault protection for fault conditions which do not conform to the idealised overload failure pattern as represented by circuit breaker characteristic curves.

4 Operational Use

4.1 In-flight operational use of CBs will usually involve the action of resetting a circuit breaker which has tripped because of an electrical overload or fault. Clearly the re-establishment of electrical power to a circuit which is at fault does involve, however slight, an element of risk. Accordingly, flight crews should be advised not to attempt to reset CBs in flight for other than essential services and, even then, only when there is no clearly associated condition of smoke or fumes. A second reset should not be attempted.

4.2 Cabin crew should be advised that CBs associated with domestic services should not be reset in flight because, by definition, the circuits involved are mostly within the passenger areas and the inconvenience caused by the loss of service would not justify any possible distress occasioned by 'electrical smells'.

4.3 A Technical Log entry should be made whenever any circuit breaker trips when the aircraft is in operation and a thorough investigation should subsequently be undertaken, including a visual inspection of the appropriate cable harnesses wherever possible (see CAAIP Leaflet 11–22 Appendix 24–3).

5 Maintenance Considerations

5.1 It has become apparent that the progressive development of the Maintenance Review Board determining scheduled maintenance has led to a significant erosion of maintenance checks of circuit breakers. Users are reminded that there is a continuing duty to monitor the performance of equipment and that items such as circuit breakers which are largely passive in nature should be assessed for dormant faults.

5.2 As a minimum and where Maintenance Schedules do not require a high level of checking, all CBs which are not regularly exercised by mechanical switching should be checked for correct mechanical operation by performing two manual switching cycles at periods of not more than two years. The necessary action should be taken to revise Maintenance Schedules as appropriate.

5.3 Where aircraft maintenance organisations are required to undertake scheduled calibration checks of circuit breakers, corresponding reliability data should be gathered. Simple pass/fail criteria is not sufficient for circuit breakers, or indeed any other equipment, where an analysis can make a significant contribution to reliability and airworthiness.

5.4 When installing CBs, any units which have not been supplied directly from an Approved source or have been stored for two years or more, should be checked for correct mechanical and, ideally, electrical operation before fitment to an aircraft.

APPENDIX 24–5 Battery Terminal Failure – GA Aircraft

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 44 Issue 1 dated 12 November 1990 which was originally issued following incidents of loose, melted or detached battery terminals on GA aircraft.

2 Background

There have been a number of reported incidents of loose, melted or detached terminals of batteries in service on GA aircraft. In one particular case, a light twin-engined aircraft experienced a fire in the nose compartment, on the ground, whilst attempting to start an engine. The fire resulted from ignition of hydrogen gas (emitted from the battery) caused by arcing of a loose battery terminal. Upon examination after the incident, the positive battery terminal had become completely detached with the top of the battery badly deformed as a result of the fire. The battery was a Rebat type R35. In addition, Concorde and Gill batteries of the same series have terminals of identical manufacture and have all been found prone to the same problem.

3 Design Considerations

3.1 Following this incident, the CAA issued a letter to Operators (LTO No. 795) giving details of the dangers associated with loose battery terminals.

3.2 The terminals are basically square headed brass bolts, tinned and fluxed and placed with thread uppermost in a lead casting assembly. Cables are held on to the terminal post by a wing nut so as to maintain contact between the cable terminal pad and the battery terminal post.

3.3 The FAA conducted their own investigation with the manufacturers of the batteries and a General Aviation Airworthiness Alert No. AC 43–16 was issued. This alert recommended certain actions as preventative maintenance which is supported by the CAA and are outlined below:

a) Ensure that before installing any battery into an aircraft, it is the correct model for the installation.

b) Inspect the battery terminal and stud. If it is at all loose or deformed, it should not be installed.

c) Ensure that the battery cable terminal is clean and free from corrosion, oxidation and contamination.

d) Ensure that the battery cable terminal fits correctly on the terminal.

e) Ensure the battery terminal post wing nut is correctly tightened (it should not be possible to move the terminal lug by hand).

CAUTION: Do not overtighten the terminal post wing nut. Overtightening may result in deformation of the terminal post material which will eventually result in the terminal becoming loose in service.

3.4 Personnel are reminded that the discovery of a potentially hazardous failure condition during maintenance or fault finding may well justify the raising of a Mandatory Occurrence Report (MOR). In the context of this appendix, any broken or detached battery terminals discovered would warrant such a report. Physical evidence should be retained for investigation.

3.5 CAAIP Leaflet 11–22 Appendix 24–1 also deals with battery terminals.

APPENDIX 24-6 Lithium Batteries

(Previously issued as AN 12, Appendix 39)

1 Introduction

1.1 The development of primary cells employing Lithium in combination with other materials has resulted in the availability of batteries with energy densities which are very significantly higher than those which have previously been achieved. In-service experience and the results of safety tests carried out to Lithium batteries has shown that there is a potential for hazard. It is therefore necessary for users to consider the possible hazardous consequences of abuse or failure of such devices and this Appendix considers the safeguards which should be observed.

1.2 Lithium sulphur dioxide cells have been available for aircraft use for many years but early experience showed the risk of disruptive failure if batteries did not incorporate adequate protective devices. In the USA Technical Standard Order C97 was produced and this has represented an acceptable standard for Lithium Sulphur Dioxide cells, but because other Lithium based systems have now been developed, TSO C97 has naturally become outdated. In 1984 the CAA sought the assistance of the BSI in preparing a British Standard to cover all known systems which was published as British Standard G239; this standard has now been updated and re-issued as 2G 239. Since initial publication of this Appendix, advances in Lithium technology have resulted in Secondary (rechargeable) Lithium batteries becoming available. At present no appropriate standard is available covering the use of these batteries on aircraft. The CAA have again sought BSI assistance in formulating a standard similar to 2G 239 for secondary Lithium batteries. It is the policy of the CAA to continue to implement BS 2G 239 and, in the absence of a specific standard for secondary Lithium batteries, implement the safety requirements defined in BS 2G 239.

2 Intending users of Lithium batteries, as defined in paragraph 3, are advised that the CAA will seek positive assurances regarding the design and build standard of such batteries. The following guidelines should, therefore, be observed:

2.1 The specification for the battery should embrace all the relevant requirements of BS 2G 239.

2.2 The procuring design authority should invoke BCAR Chapter A3-3 requirements for the approval of a Controlled Item and a Declaration of Design and Performance to the format given in BS 2G 239 should be obtained in all cases. This will normally involve a supplier who holds an appropriate approval to BCAR Chapter A8-1 as a Group A1 Company.

2.3 Due regard should be taken of the possibility that some types of cell may fail such that gases will be vented. Such failure is usually associated with accidental electrical charging, the puncturing of cells, or the application of heat. It follows that Lithium batteries should not be installed in proximity to passengers or flight crew if any of these conditions can be foreseen.

2.4 The CAA has approved suitable organisations for the design and manufacture of Lithium batteries. The assembly of batteries by unapproved organisations is not acceptable unless the user can, under the terms of his own approval, demonstrate that such batteries do satisfy the requirements of BS 2G 239. Continuing control of the design standard and production quality of such items should be maintained.

2.5 Where Lithium batteries have been installed in aircraft prior to the issue of this Appendix evidence should be sought that such batteries were approved to TSO C97

or that the safety requirements of BS 2G 239 are met. Should such assurance not be available, as a minimum, evidence of safe operation under the abusive failure conditions which are relevant to individual installations should be sought.

2.6 When batteries are removed from aircraft at the end of life, it is in the interest of safety that the disposal procedures given in BS 2G 239 be followed.

3 For the purpose of this Appendix a single cell fitted in aircraft as a Line Replaceable Unit (LRU) may be taken as representing a battery and thus be eligible for Accessory Approval (BCAR Chapter A3-3). However, small button cells which are hard wired within equipment may be considered as a component part of the equipment (as defined in Airworthiness Notice No. 39) and be approved within the overall type test. Such cells should be fully assessed by equipment designers, who should be aware of the precautions which need be taken to avoid abusive failures and be able to demonstrate that the effects of failure have been considered. They may, therefore, seek a Declaration of Design and Performance from the cell manufacturer as supportive evidence.

4 Overhaul manuals for equipment containing Lithium batteries or cells should include cautionary notes and refer to the methods of disposal given in BS 2G 239. Attention should be drawn to the corrosive nature of any chemical contamination which may result from disruptive failure, with appropriate advice on cleaning methods.

5 Attention is also drawn to Guidance Note GS43 entitled 'Lithium Batteries' which is published for the Health and Safety Executive by HMSO.

APPENDIX 25–1 Single Lock Airframe Seat and Furnishing Attachments

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 37 Issue 1 dated 6 November 1987 which was issued following an accident in which passenger seats had become detached from the floor.

2 Background

Investigations into an aircraft accident revealed that some of the passenger seats had detached at the floor attachment points, resulting in injury and fatalities of passengers. The fittings used, in this particular case, were of a claw and locking collar device on the seat legs mating with mushroom headed studs on the cabin floor. The fitting part number was D1416–2 manufactured by General Logistics in America. Normally the seat leg fitting and collar have an inter-connected secondary locking device. On the seats in question, the seat leg fitting was of an early design that did not have the secondary locking device. It is believed that impact forces allowed the locking collar to be driven out of engagement allowing the claw to disengage from the floor attachment, thus releasing the seats.

3 Airworthiness Considerations

3.1 All aircraft should have their seats and other items of furnishings (e.g. Galleys) inspected for this type of fitting. Where such fittings are found, they should be

replaced with a style of attachment fitting which requires positive manual actions to release it. If it is intended that the claw and mushroom head type be retained, then they should be of a type possessing a minimum of four groups of holding claws plus two interconnected locking devices. The second locking device must be of a type that requires a positive physical action to operate it before the primary claw locking collar can be moved.

3.2 All future designs for furnishings should use fittings similar to those described in paragraph 3.1 above.

APPENDIX 25–2 Stowage and Accessibility of Lifejackets

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 27 Issue 1 dated 2 October 1981 which was originally issued as a result of an incident where passengers had difficulties in retrieving lifejackets.

2 Background

An enquiry into an accident to a UK passenger transport aircraft revealed that some passengers experienced difficulty in obtaining the valise containing the lifejacket (hereinafter referred to as the 'valise') which was stowed underneath their seat. Subsequent investigation showed that because the stowage pouch in which the valise was retained was not positioned close to the front edge of the seat pan, difficulty arose for some passengers in locating and releasing the valise.

3 Maintenance Checks

3.1 Attention of operators and manufacturers is drawn to the need for careful interpretation of the requirements for accessibility of safety equipment* as they relate to the occupants of aircraft, and particularly passengers, having ready and easy access to the valise during all phases of the flight. These requirements apply not only to the initial certification of the aeroplane type but also to modifications to seats, seating arrangements, and equipment stowage arrangements.

3.2 Interpretation of the requirement for ease of accessibility will in most installations, necessitate the valises, when stowed under seats, being located near to the front edge of the seat pan, arranged so as to allow the occupant of the seat readily to remove the valise from the stowage pouch, which may be a two handed operation, in the shortest possible time. The method for removing the valise from the stowage pouch should not, therefore, necessitate any extensive body movement by a seated passenger with safety belt fastened. Furthermore, the possibility of the valise being ejected or falling from its stowage pouch onto the cabin floor either during normal operation or in an emergency should be minimal.

* JAR 25.1411, Section D, Chapter D6-1, 3.13, and Section K, Chapter K6-1, 2.14, Section G, Chapter G6-1, 2.17.

APPENDIX 25–3 Protection of Liferafts and Flotation Bags from Damage after Deployment, by Sharp Projections of an Airframe

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 36 Issue 1 dated 10 December 1986 which was originally issued following the rupturing of inflated liferafts during deployment from helicopters.

2 Background

Investigations into incidents which have involved a helicopter ditching and the subsequent deployment of liferafts, have shown that the numerous small projections which occur on a helicopter fuselage such as aerials, overboard vents, unprotected split pin tails, guttering, and any projection sharper than a three-dimensional right-angled corner can cause an inflated liferaft or flotation bags to be punctured and consequently deflated to a point of being useless.

3 Airworthiness Considerations

3.1 It is recommended that all projections likely to cause damage in a zone delineated by boundaries which are approximately 4ft (1.22m) above and 2ft (0.61m) below the established static waterline when the helicopter is on the water, should be modified, or suitably protected, to minimise the likelihood of their causing damage to a deployed liferaft, and that all relevant approved maintenance schedules should be amended to ensure such protection remains effective.

3.2 This modification and protection is recommended for all helicopters carrying liferafts and/or fitted with flotation bags.

3.3 Whilst the boundaries specified in paragraph 3.1 are intended as a guide, the total area which should be considered should also take into account the likely behaviour of a liferaft after deployment in all sea states up to the maximum in which the helicopter is capable of remaining upright.

3.4 Operators and maintenance organisations are therefore reminded that whenever a modification or alteration is made to a helicopter, within the boundaries specified, consideration should be given to affording such protection as may be required to prevent the modification or alteration causing damage to a deployed liferaft or flotation bag.

3.5 Particular care should also be taken during routine maintenance to ensure that additional hazards are not introduced, for example, by leaving inspection panels with sharp corners proud of the surrounding fuselage surface or allowing door sills to deteriorate to a point where sharp edges become a hazard.

3.6 It should be noted that a Direction to Operators was issued to some operators engaged in oil and gas exploitation, covering, in part, the subject of this Appendix.

APPENDIX 25-4 Adjustable Seat Locking Mechanisms

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 58 Issue 1 dated 16 March 1998 which was issued as a result of an investigation into a fatal accident involving a light aircraft, which concluded that it was caused by the pilot's seat sliding rearwards during a critical stage of flight.

2 Background

As a consequence of the seat movement, the pilot was unable to maintain control of the aircraft, which resulted in the over-pitching of the aircraft, loss of control and subsequent impact with the ground.

3 Airworthiness Considerations

The investigation found that the crew seat locking pins were bent, possibly by loads caused by engaging the pins to arrest seat motion, during adjustments of seat position. The CAA, therefore, wishes to draw attention to the importance of maintaining the integrity of crew seat locking mechanisms, as the failure may have an adverse affect on the ability of operating crews to retain control of their aircraft.

In every case the inspection criteria for adjustable seat locking mechanisms specified in the aircraft's maintenance schedule or maintenance manual should be observed. In the absence of detailed inspection instructions, seat locking mechanisms, including seat rails, should be visually inspected and checked for correct operation. The visual inspection should include confirmation of freedom from signs of damage, corrosion, distortion and excessive wear. Particular attention should be given to locking pins to ensure that they fully engage into, and disengage from, the associated recesses. Seat travel rollers should be checked for excessive play that may reduce locking pin engagement.

APPENDIX 25-5 Seat Belts in Light Aircraft - Orientation of Stitched Joints

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12, Appendix 62, Issue 1 dated 29 October 2001 which was issued as a result of a fatal accident.

2 An investigation into a fatal accident involving a light aircraft concluded that the seat belt failed during a forced landing. The orientation of the stitched joint on the harness and its interaction with a hard object, probably a trouser belt buckle, was cited as the probable cause of the failure.

3 Background

A high proportion of light aircraft seat belts have the release box, tongue and overlap stitching positioned so that they fall well to the side or behind the occupant’s body when installed and adjusted. These belts are considered satisfactory and are

excluded from this notice. Care should be taken to ensure that any overlapped joints do fall behind the body on all occasions allowing for all reasonable variations of adjustment of the seat belt to accommodate a full range of adult human body height and girth.

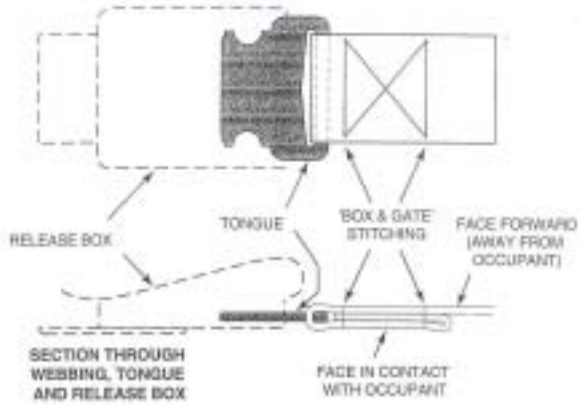
4 Where the Original Equipment Manufacturer (OEM) provides instructions on the installation of their seat belts / harnesses, these should be followed.

5 In the absence of OEM instructions, the CAA would advise using the following best practice.

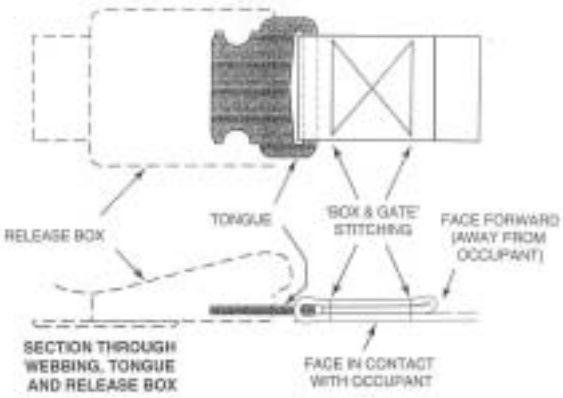
5.1 During routine maintenance and inspection by owners, the Popular Flying Association, the British Microlight Aircraft Association, licensed aircraft maintenance engineers and approved maintenance organisations, the joint between harness webbing and metal components (release boxes, tongues and adjusters) should be checked.

5.2 Where the webbing reversed overlapped and stitched sections are orientated towards the body, if practical, the joint orientation should be reversed.

Incorrect



Correct



APPENDIX 26-1 Fire Hazards

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix 60 Issue 1 dated 18 March 1999.

2 Background

The collection of debris, dust and discarded catering materials found in various areas of aircraft has, in a number of cases, created conditions which have resulted in the outbreak of fire or the production of sufficient fumes for an emergency to be declared.

3 Airworthiness and Operational Considerations

3.1 Recently reported flight deck incidents have been attributed to:

a) the collection of dust around the flight crew foot warmers which subsequently ignited when a high temperature setting was selected;

b) fumes produced by shorted electrical equipment as the result of metal objects falling onto connections (as many as 7 metal cutlery knives have been found behind a glare shield).

3.1.1 Fumes have also been produced when equipment cooling systems have collected sufficient dust and lint to drastically reduce the airflow. This has on a number of occasions resulted in the smell of burning and/or smoke and emergency in-flight action having to be taken.

3.2 Collection of debris in other areas also provides the potential for various electrical sources to ignite combustible materials. Areas such as the void beneath toilet shrouds, behind light fittings and behind sidewall-to-floor panels in the passenger cabin are all places where flammable materials can accumulate. Such accumulations pose an obvious fire risk where electrical equipment and wiring carries sufficient current to create sparks.

3.3 Modern interior carpeting often produces large quantities of lint which finds its way into equipment cooling filters and toilet smoke detector sampling tubes often resulting in a reduction in performance or complete failure.

3.4 The design of most aircraft is such that large objects cannot fall into sensitive areas, but the omission of gap fillers, seals, electrical terminal shielding and insulating boots during maintenance can create conditions that may initiate a fire.

3.5 Maintenance personnel should ensure that design standards of sealing are restored after equipment and panels are refitted and that all loose objects are removed prior to closure.

3.6 Maintenance Organisations and Operators should ensure that cleaning programmes are designed to address the removal of clogging and combustible materials at regular intervals.

3.7 Quality sampling programmes should address cleanliness standards of aircraft interiors, particularly flight deck areas. Flight crew should be reminded of the dangers of placing any loose objects (including catering) on flight deck glare-shields and pedestals.

APPENDIX 27–1 Flutter of Flying Control Surfaces

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 4 Issue 1 dated 1 March 1973 which was originally issued to warn of the possibility of control flutter on certain light aircraft.

2 Background

Incidents of in-flight vibration on certain light aircraft, believed to be flutter of the manually controlled stabilator, have emphasised the need to give close attention of

mass balance and rigidity characteristics of flying control surfaces. Control surfaces on aircraft are designed to a degree of balance necessary to prevent the occurrence of control surface flutter in flight. In some cases, balance weight is added forward of the hinge line to achieve this. As it is important that this degree of balance should be retained, work on control surfaces, such as repair or repainting, should be carefully controlled.

3 Airworthiness Considerations

3.1 As a general rule, any repair to a control surface should be made in such a manner that the structure remains essentially identical to the original. Alternatively, the surfaces may be repaired in accordance with a scheme approved by the manufacturer.

3.2 The cumulative effect of repainting and use of paint fillers may seriously affect the balance of a control surface, and any manufacturer's recommendations regarding this should be followed. In the absence of such recommendations, the CAA's Survey Department should be consulted.

3.3 The balance of control surfaces should be checked after repainting to ensure that the manufacturer's tolerances have not been exceeded. When it is necessary to adjust balance in order to bring the control surface balance within the tolerances, the manufacturer's procedures should be carefully followed.

3.4 Another case of control surface flutter is slackness in hinges and linkages of the main control surfaces or tabs, and particular attention should therefore be paid to these points during routine maintenance, to ensure that any free play remains within the manufacturer's tolerances.

APPENDIX 27–2 Flap Systems on General Aviation Aircraft

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 19 Issue 1 dated 31 August 1977 which was issued following occurrences of sudden asymmetric flap retraction.

2 Background

Incidents in which aircraft have experienced a sudden asymmetric flap retraction have occurred in the UK. Two of these incidents, one of which resulted in a fatal accident, involved different types of aircraft of United States origin and were caused by malfunctioning of a single 'down' limit microswitch. Subsequent mechanical failures in the flap operating mechanism resulted from repeated high loading when the flap drive system reached the mechanical limits of its travel. Other incidents have been reported in which asymmetric flap retractions have resulted solely from mechanical failure of the flap drive system, e.g. operating cables or flexible drive assemblies.

3 Airworthiness Considerations

3.1 During functional checks, it is recommended that particular attention should be paid to the correct operation of all microswitches which affect the travel limits of the flaps

and to the condition of all visible elements of the operating mechanism. The Light Aircraft Maintenance Schedule has been amended to require a check based on these recommendations.

3.2 Where the 'up' and 'down' limits of flap travel are governed by the operation of single microswitches and one of these microswitches is found to be faulty, the operating mechanisms should be checked for any evidence of static overloading.

3.3 Where a modification to introduce an additional microswitch is available, it is strongly recommended that it should be embodied.

APPENDIX 27-3 Control and Use of Rigging Pins

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix 55 Issue 1 dated 7 November 1997 which was issued as a result of a serious incident involving a large commercial air transport aircraft due to an unofficial rigging pin being left in the aileron control system following maintenance.

2 Background

Whilst carrying out full and free control movement checks prior to take off, the first officer felt a restriction in the aileron controls. The aircraft captain confirmed there was a restriction and the aircraft returned to the stand where it was found that a bolt, (instead of the correct rigging pin) was installed in the control wheel rigging pin hole at the base of the Captain's control column.

3 Airworthiness and Certification Considerations

3.1 Subsequent investigations revealed that due to the non-availability of the correct rigging pin, (with an attached 'attention getting' red disc/flag), a bolt obtained from a free issue dispensing area was used as an alternative. The correct rigging pin, with a red disc/flag attached, would have been clearly visible at the base of the control column. The bolt used as an alternative was not only difficult to see but effectively camouflaged by two similar and adjacent bolts.

3.2 All aircraft maintenance engineers, and in particular those holding certification responsibilities, are reminded of the need for vigilance when working on control systems and in particular during rigging operations when rigging pins are being used. In order to minimize hazards associated with rigging pins and to prevent future occurrences the following points should be noted:

3.3 **Control of Rigging Pins**

3.3.1 All rigging pins should be subjected to a form of control in order that their whereabouts can be established. A tool store procedure which could include visual cues in the form of shadow boards is one possibility.

3.3.2 All rigging pins should be subjected to serviceability checks prior to use, with particular emphasis being placed on the secure attachment of 'attention getting' flags/discs.

3.3.3 The installation and removal of rigging pins should be controlled by the use of worksheets, or stage sheets (CAAIP Leaflet 11-22 Appendix 5-2 refers).

3.3.4 For maintenance in accordance with JAR-145 requirements, AMC145.40(a) dictates that alternative tools, to those specified by the manufacturer, can only be used by agreement of the organisation's Quality Department and subject to a control procedure.

3.4 **Use of Rigging Pins**

3.4.1 Only rigging pins having adequate 'attention getting' devices attached should be used.

3.4.2 Where any maintenance task necessitates installation of a rigging pin(s), an open entry should be made, to this effect, in the controlling Stage Sheet, Technical Log or Additional Work Sheet at the time of its installation.

3.4.3 Upon completion of the maintenance task the rigging pin(s) should be removed and the open entry in the Stage Sheet, Technical Log or Additional Work Sheet appropriately annotated and certified.

3.4.4 Upon completion of any control system rigging operations, full and free movement checks should be carried out as a matter of practice thus providing the final opportunity to locate that forgotten rigging pin.

NOTE: The reader's attention is drawn to CAAIP Leaflet 2-13 Control Systems which contains additional information concerning the use of control system rigging pins.

APPENDIX 27-4 Control Cable End Fittings

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12, Appendix 65, Issue 1 dated 18 March 2003 which was issued as a result of information received from the FAA.

2 Background

In November 2001 the CAA received information from the FAA of a NTSB investigation of control cable end fittings. The NTSB has investigated the failure of flight control cable end fittings on six aircraft. Four of the failures occurred in-flight, although not leading to serious accident or loss of life.

3 Additional end fittings from some of the incident aircraft as well as from four other aircraft were examined and found cracked. Most of the end fittings had fractured or cracked in a transverse manner through the shaft on the threaded end of the fitting close to the spanner/wrench flats. A few showed evidence of cracking in the swaged portion of the fitting.

4 The NTSB investigation identified a number of common features to the failures and cracking of the end fittings:

- The material of manufacture of the fittings was a free machining stainless steel grade containing selenium and a high sulphur content.

- The fittings surfaces were generally corrosion pitted. Where locking wire was wrapped around the fitting it was noted that the pits had a higher density beneath the wire.
- The predominant fracture mode was stress corrosion cracking, initiated at corrosion pits.

5 Stress corrosion cracking only occurs under specific environmental conditions, in susceptible materials when tensile stresses are induced in the material. The end fittings examined were all taken from light aircraft which had been in service for at least 20 years, however the specific environmental conditions that caused the corrosion have not been identified. Although, not all stainless steels end fittings are considered susceptible, it is not possible to identify the grade of stainless steel used for a fitting by inspection.

6 The initial indication of degradation would be surface pitting of the steel. As the attack progresses surface breaking cracks will become evident, and possibly staining and discolouration of the steel.

7 It is recommended that all control cable end fittings are inspected for degradation when access allows.

APPENDIX 31–1 Altimeters In Aircraft

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 23 Issue 2 dated 6 November 1987 which was originally issued following incidents whereby altimeter pressure scales had become detached from altimeter pointers.

2 Background

2.1 Instances have occurred in flight whereby altimeter pressure setting scales have become detached from altimeter pointers when the pilot was attempting to set an appropriate QNH. This has resulted in large indicated altimeter errors.

2.2 Subsequent investigation has revealed that satisfactory operation of the altimeter depends on the barometric adjustment control knob being attached to the spindle so that no fore or aft play exists between the knob and instrument bezel. If such play exists, forward or rearward pressure on the knob may disengage the barometric adjustment scale from the altimeter pointer.

2.3 A number of altimeters of US manufacture are known to be prone to this particular defect. Included amongst these are the following:

Aero Mechanism 8040, 8140, 8141, 8142, 8503 Series
Kollsman Altimeters,
Narco AR 800 Series,
Bendix 3252013 Series, and
United Instrument Altimeters.

3 Maintenance Considerations

3.1 The Federal Aviation Administration have issued Airworthiness Directive 86–05–02 which is applicable to a range of part numbers of United Instruments Altimeters manufactured after 1 February 1985. The affected instruments were discovered to have a deficient locking clamp which resulted in a possible de-synchronisation of the barometric adjusting knob and altitude pointers. As a consequence of this and other reports detailed in paragraph 2.1 above, the CAA have raised an Additional Airworthiness Directive (006–02–87). This AD requires that those instruments listed in paragraphs 2.3 above, comply with the requirements of paragraph 3.2 of this Notice.

3.2 It is strongly advised that before each flight the following checks are made:

a) That rotation of the barometric adjustment control knob results in a movement of both the pressure setting scale and the altimeter pointers, and that forward and rearward pressure on the knob during rotation does not disengage the barometric adjustment scale from the altimeter pointers.

b) That the relevant altimeter pointer reading is compatible with the setting on the barometric adjustment scale.

APPENDIX 31-2 Vertical Speed Indicators on Imported Aircraft

(Previously issued as AN 53)

1 Introduction

1.1 A recent incident on an imported light aircraft has shown the possible danger of the presentation of false information to the pilot due to reversed indication by the vertical speed indicator during a fast rate of descent.

1.2 United Kingdom approved instruments and instruments complying with JAA JSTO Specification C8d or the United States TSO Specification C8d are fitted with stops to prevent such occurrences. It is not known whether other instruments, particularly those likely to be installed in imported aircraft of less than 5700 kg (12 500 lb) maximum weight, are similarly equipped.

2 Action

2.1 Before issue of the Airworthiness Certificate and subsequent reviews for continued airworthiness of an imported aircraft, it shall be established whether the vertical speed indicator is fitted with limit stops. This may be done by test or reference to the manufacturer.

2.2 If stops are not fitted, either the vertical speed indicator shall be replaced by an instrument that has stops, or alternatively the placard defined in paragraph 3 shall be fitted.

3 Placard

3.1 The following placard shall be fitted adjacent to a vertical speed indicator not fitted with stops:

'This indicator is not fitted with limit stops and a rate of change of altitude in excess of the maximum calibration will cause indication in the reverse sense.'

3.2 The placard may, as a temporary measure, be typewritten on white card, but shall be replaced by a more permanent placard as soon as possible.

4 Record

A record of the action taken to comply with paragraph 2 above shall be made in the aircraft log book, quoting the serial number of the instrument.

APPENDIX 32–1 Brake And Anti-skid Systems

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 8 Issue 2 dated 8 October 1974 which was originally issued to alert operators of the possibility of malfunction of anti-skid protection.

2 Background

Instances have occurred in which wheel brake systems incorporating antiskid protection have not functioned in a fully effective manner. Subsequently, in most instances, a fault has been discovered in the braking system which has prevented the brakes from operating efficiently on all wheels. Loss of efficiency can result from a variety of causes, e.g. incorrect assembly or failure of components in either an electrical or hydro/mechanical anti-skid system. In one instance, a cross connection of units in combination with a dormant fault contributed to an accident.

3 Airworthiness Considerations

3.1 Experience has shown that dormant faults which reduce the maximum energy absorption capability of the brakes can exist without being detected during normal energy stops. These only become apparent when the full effectiveness of the brakes is called into use, such as during a rejected take-off. In order, therefore, to guard against such troubles, it will be necessary to institute checks, at agreed periodic intervals and also after any disturbance or replacement of the brake or parts of the anti-skid system, to ensure that:

a) the operation of each anti-skid sensor controls the brake on the wheel with which it is associated and

b) the operation of the whole braking system, including any anti-skid facility, is normal and satisfactory

3.2 If functional checks carried out in accordance with the relevant Maintenance Manuals would not achieve the objectives stated in 3.1 a) and b), the aircraft manufacturer

should be consulted in order to agree suitable amendments to the Manuals to include tests which will verify the functional integrity of the system.

3.3 Operators having Maintenance Schedules approved by the CAA should review these Schedules, and if necessary, forward suitable amendments which will ensure that functional checks prescribed in the Schedule will cover the particular matters stated in 3.1 a) and b) and that any necessary cross references to the Maintenance Manual are amended or added.

3.4 In the event of difficulty in obtaining agreement with manufacturers, the CAA's Survey Department should be consulted.

APPENDIX 32–2 Tyre Maintenance And Reliability

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 24 Issue 1 dated 26 May 1978 which was originally issued following a series of accidents and incidents caused by tyre failure.

2 Background

2.1 Multiple tyre failures have become more significant with the growth in aircraft size and weight and have resulted in serious accidents and incidents. Inadequate maintenance of tyres directly affects their performance and reliability. This is particularly so for the high pressure and/or high speed rating tyres, i.e. marked in excess of 160 mph, used on multi-wheel landing gear.

2.2 A marked reduction or loss of inflation of one tyre can, through over-deflection, result in the failure of other tyres on the same axle, or in a marked reduction in its own ability to carry the increased load after another tyre failure. The risk of such failures is likely to be greater during take off when wheel loads and/or speeds are highest or during extended taxiing. Braking performance may also be affected to the extent that stopping distances are increased or the remaining effective brakes are over-heated. Tyre and wheel debris may damage hydraulic and anti-skid systems. One large aircraft was completely destroyed by fire and other serious fires have occurred. In some accidents, aircraft have left the runway during rejected take-offs associated with tyre problems during the take-off run.

3 Airworthiness Considerations

3.1 Adequate inflation pressure levels and leakage checks are necessary if adequate tyre performance is to be achieved. The maximum permissible inflation pressure improves a tyre's capability to sustain abnormal loads. Tyre pressures should be accurately checked on at least a daily basis, visual inspection is totally inadequate. Tyres should be inspected for external condition at every available opportunity bearing in mind that fitted stationary tyres cannot be entirely inspected.

3.2 Tyre removal criteria should be adhered to, and particular attention should be paid to tyres which have been over-deflected or underinflated or subjected to excessive brake heat.

3.3 The possibility of tyre carcass and tread failures which may damage structure, systems and engines and thus jeopardise safety, can be directly reduced by timely attention to, and adequate maintenance of, tyre and wheel assemblies.

APPENDIX 33–1 Bonding Of Strobe Lights

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 13 Issue 1 dated 27 January 1975 which was originally issued following an explosion and fire in a light aircraft prior to take-off.

2 Background

2.1 An incident of an explosion followed by a fire occurred on an American light aircraft, prior to take-off. This was caused by the ignition of spilt fuel by an electrical spark at an incorrectly bonded strobe light fitting. Following this incident Emergency Airworthiness Directive 74–20–11, covering Beech aircraft, was issued by the FAA. Since this hazard could develop during service on any aircraft to which strobe lights are fitted, the attention of owners and operators is drawn to the need to ensure that such strobe light units are correctly bonded, as outlined in paragraphs 3.1 – 3.3.

2.2 The recommendations of paragraph 3 are applicable to strobe lights which are fitted either during the initial build of the aircraft, or by subsequent modification action.

3 Airworthiness Considerations

3.1 For all aircraft, it is recommended that all strobe lights installed in areas which may be subjected to either spilt or vented fuel, or to high concentrations of fuel vapour (such as the wing tips or lower fuselage) should be inspected to ensure that a positive bond, not greater than 0·05 ohms resistance, is provided between the airframe and light housing. The inspection and any necessary rectification action should be carried out as soon as is practical, but in any event not later than the next schedule airframe maintenance inspection.

3.2 Wherever practical the bond should be a short, flexible, metal strap, attached between the light housing and the aircraft local structure, and with clean metal-to-metal contacts. After completion, the bonding attachments and surrounding areas should be adequately protected against corrosion.

3.3 Where the form of bonding described in paragraph 3.2 is impractical, a good metal-to-metal contact between the light housing and the aircraft structure must be ensured. This contact area must be clean and free from paint, dirt or corrosion.

APPENDIX 34–1 Maintenance of Radio Navigation Equipment Course and Alarm Signal Current Limits

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 12 Issue 2 dated 22 August 1974 which was originally issued following an accident caused by an aircraft's signal current settings on the ILS Localiser and Glide Path systems being set too high.

2 Background

Following an aircraft accident it is understood that investigation of the ILS Localiser and Glide Path systems revealed that the signal current settings were set too high. This could result both in the course indicator being over-sensitive and in the flag warnings failing to appear in fault conditions.

3 Airworthiness Considerations

3.1 Engineers must ensure that the instructions contained in the relevant maintenance/ overhaul manuals are complied with, particularly those applicable to course deviation and alarm current settings.

3.2 Prior to installation in an aircraft, engineers must ensure that the current settings of units are compatible with the particular aircraft system.

3.3 Any adjustment found necessary must only be carried out in a workshop where the necessary test equipment and maintenance/overhaul manuals are available and by persons appropriately approved.

3.4 Most ramp test equipment, whilst capable of checking alarm circuits for some gross failures, is inadequate for checking their operation in other important cases. In particular, it will not reveal whether current settings are such as to prejudice proper flag operation. The CAA is discussing with manufacturers the possibility of modifying such equipment, e.g. by making provision for the interruption of the tone sources so as to enable a check of the operation of alarm circuits of the installation to be made, and the outcome of these discussions would be the subject of manufacturers bulletins.

3.5 It is good practice, which the CAA will expect operators and maintenance organisations to implement, that all units incorporating adjustments for variable loads, whether in aircraft or held as spares, have a label indicating the loads for which the unit has been adjusted, fixed in a prominent position on the front of the unit. Aircraft using such units should have a similar label fixed to the unit mounting.

APPENDIX 35–1 Oxygen Fire Risk

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 3 Issue 1 dated 1 March 1973 which was originally issued to warn operators of the damage which can be caused when fire is fed by the aircraft's oxygen system.

2 Background

2.1 Serious fire damage to aircraft has been caused where fires (which would probably otherwise have been insignificant) have been fed by oxygen from the aircraft's piped oxygen system. In some cases an oxygen leak contributed to the outbreak of fire, in others the oxygen was liberated by the fire which as a result then became much more severe.

2.2 Although the increased flammability and heat of combustion of many materials in the presence of oxygen is well known, it appears that due regard for this fact is not always paid in the design of aircraft, particularly in the consideration of minor modifications after original manufacture.

3 Airworthiness Considerations

Precautions should be taken to ensure that an oxygen leak will not create a fire hazard where none previously existed and that a minor overheat or an electrical fire condition cannot damage the oxygen system, thus promoting far more serious consequences.

APPENDIX 35–2 Passenger And Crew Oxygen Systems

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 50 Issue 1 dated 16 March 1993 which was originally issued following an increasing number of incidents in which the passenger/crew oxygen systems failed.

2 Background

2.1 The CAA has noted an increasing number of occurrences relating to failures of passenger/crew oxygen systems. In a significant proportion of the cases reported, the failures were attributed to installation errors following maintenance, operation or test. These occurrences were mostly in connection with, but not confined to, passengers/crew oxygen automatic drop out systems.

2.2 Due to the nature of the design of the automatic drop out systems, an installation error may lay dormant and undetected until the system is used (possibly in an emergency). Faulty installation has, on a number of occasions, subsequently led to a functional failure of part or all of a system, leading to an obvious lowering of safety levels. On a number of occasions, it has been reported that supply pipes have been crushed and rendered inoperative by faulty installation.

3 Maintenance Considerations

3.1 Operators should ensure that staff who may need to maintain, test or re-install oxygen systems, especially the more elaborate passenger/crew oxygen drop out systems, are adequately trained for the task and are retrained as necessary to ensure retention of their competency levels.

3.2 Operators should ensure that maintenance schedules adequately address the need to assess the functional integrity of these otherwise mostly dormant systems.

Additionally, test and installation instructions to maintenance staff and crew members (where necessary) should be reviewed to ensure that such instructions are adequate and unambiguous. The instructions should emphasise the need to ensure that following functional testing or maintenance, all functional inhibiting devices are removed.

3.3 In the case of portable oxygen systems in particular, care should be taken to ensure that not only is the bottle addressed during routine maintenance and check (contents and pressure testing etc.) but the condition of masks and piping should be continuously monitored during service, possibly by cabin staff as well as maintenance staff. Consideration should be given to invoking pre-flight checks by cabin staff where appropriate.

APPENDIX 51–1 Inspection in Relation to Spillage or Collection of Fluid

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 6 Issue 2 dated 5 October 1973 which was originally issued to warn of corrosion occurring in the event of spillage or collection of fluid.

2 Background

2.1 Fluid spillage and accumulation of fluids resulting from inadequate drainage can cause serious corrosion in aircraft structures, and can affect the correct operation of electrical control and distribution services (an incident resulted in a potentially serious electrical fire and the reported loss of all generated power in flight). Since the type and extent of corrosion or other damage will depend on the type of fluid, it is important for the fluid to be identified and the extent of contamination assessed, so that correct action may be taken.

2.2 In some instances the fact that fluids had been present may not have been appreciated because the affected areas had been cleaned before being seen by an inspector. Therefore, if fluid spillage or accumulation of fluids are reported or found, these should be made known to an inspector before the area is cleaned. Accidental fluid spillage which is known to have occurred during flight should be recorded in the technical log, and particular attention should be paid to the regions below the floor when inspecting for the effects of such spillage.

3 Airworthiness Considerations

3.1 Cleanliness of the aircraft internal structure is also important because dirt and dust may act as a sponge and retain fluids, thus increasing the risk of corrosion.

3.2 To prevent corrosion, it is essential to ensure the proper functioning of drains and drain holes. Inspectors should be aware of all the drainage means in the areas for which they are responsible and should check that these are free from obstruction.

APPENDIX 51–2 Primary Structural Fasteners Made in H-11 Steel

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 35 Issue 1 dated 10 December 1986 which was issued following an abnormally high failure rate of H-11 steel bolts.

2 Background

An abnormally high failure rate in service of H–11 steel bolts has been reported from the USA. Such failures are mainly caused by stress corrosion. H–11 is a 5% chromium molybdenum tool steel to specifications such as BS 4659; BH–11; DTD 5222; AMS 6488; AISI H–11 Modified. It is heat-treatable to tensile strength above 1400Mpa (over 200,000 lbf/in^2) with good strength retention at high temperature. Typical applications are specialised bolts in engine, nacelle, flap track and undercarriage mounting structures and H–11 is also offered as a material in some standard ranges of fasteners.

3 Airworthiness Considerations

3.1 Aircraft manufacturers are asked to review their current and projected designs and take any necessary action to avoid the use of H–11 fasteners wherever practicable, particularly in locations where any fastener is:

a) in a tension application,

b) a single load path,

c) exposed to phosphate-ester hydraulic fluid above 120°C (250°F),

d) exposed to exhaust gases,

e) subject to weathering.

3.2 When failures have occurred in service, the remaining H–11 fasteners should be replaced by a fleet campaign rather than on an attrition basis. The aircraft manufacturer should be consulted regarding replacement fasteners of a suitable alternative material.

3.3 Owners and operators are asked to review their aircraft fleets in respect of such fasteners to ensure:

a) adequate maintenance of corrosion protection schemes,

b) implementation of manufacturer's SB on the subject,

c) correct torque tightening (without over-torque) of such fasteners on re-installation.

APPENDIX 51–3 Corrosion Inhibiting (Temporary Protective) Compounds

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 46 Issue 1 dated 18 March 1991 which was originally issued following a review of corrosion inhibiting compounds.

2 Background

In conjunction with the international activity on ageing aircraft, the CAA has been reviewing the nature of corrosion inhibiting (temporary protective) compounds and their use in the transport aircraft operating industry.

3 Design Considerations

3.1 Overall it has become clear that operators may be using such compounds that are different from those recommended or approved by the manufacturer of the aircraft they operate. Operators are reminded that in such circumstances it is their responsibility to ascertain, and technically justify, the fitness for purpose of the compound they use in their particular applications. Furthermore, adequate procedures should be in place to ensure that the material procured consistently meets its specification.

3.2 On this latter point a local authority trading standards department has advised the CAA that in recent years one product of intermediate viscosity has been supplied to the industry with its viscosity clearly above specification maxima.

3.3 One consequence of too high viscosity is the lack of penetrating capability which could lead to areas of structure, particularly mating surfaces, remaining unprotected. Operators are advised to check that their stocks of such material are of the appropriate viscosity. Should they believe that they have used such non-conforming materials on an aircraft, the area of application should be cleaned and reprotected with appropriate conforming material, at the next maintenance opportunity.

APPENDIX 51–4 Lock-Bolt Failures

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 26 Issue 1 dated 15 January 1981 which was originally issued as a result of problems encountered with lock bolts.

2 Background

2.1 An airframe manufacturer has experienced a problem whilst inserting steel swage locking pins (lock-bolts).

2.2 When auto setting ¼" dia. lock-bolts (U.S.A. NAS 1468) in a rear wing spar assembly some failures of the lock-bolt occurred on the first locking ring groove instead of at the break groove. Other ¼" dia. lock-bolts removed from the same assembly were

found to be 'necked' with cracking evident in the first locking ring groove. This cracking is not visible without removing the bolt but may result ultimately in the loss of the locking collar.

2.3 Subsequent investigations revealed that defective lock-bolts have a carburised surface with a hardness above the upper limit of the U.S.A. Procurement Specification (NAS 1413).

3 Airworthiness Considerations

Manufacturers using this type of fastener are recommended to check that their stocks are within specification, with particular reference to hardness values. Owners and Operators of aircraft are advised to check such fasteners for security of collar on an opportunity basis.

APPENDIX 51–5 Control of Precision Cutting Tools

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 49 Issue 1 dated 9 November 1992 which was originally issued following incidents during airframe manufacture which highlighted the ease with which incorrect countersink angles and knife edge holes may be cut when adequate controls are not in place.

2 Background

In the latest incident, a series of 90° countersinks were cut when 100° was specified. This was not revealed during fastener installation or the subsequent inspection of the fasteners, as the countersinks were covered by the fastener heads.

3 Design Considerations

3.1 Manufacturers and maintenance organisations are reminded of the need to ensure that adequate procedures are in place to control the issue and use of precision cutting tools and the installation of correct fasteners.

3.2 Incorrectly cut countersinks can cause a severe decrease in the strength of a joint leading to a serious reduction in airworthiness and to the need for costly repair or replacement.

APPENDIX 51-6 Self-locking Fasteners

1 Introduction

This Appendix supersedes Airworthiness Notice No.12 Appendix No. 17 Issue 3 dated 16 March 1998.

2 Background

A recent incident investigation concluded that the cause was the loss of a number of bolts, used to secure a helicopter tail rotor drive shaft fairing, and that the bolts were lost because the self-locking function of the associated stiffnuts had become ineffective.

3 Airworthiness Considerations

Previous issues of Airworthiness Notice No. 12 Appendix 17 highlighted that there have been a number of incidents concerning the use of self-locking fasteners in helicopter control systems. These incidents arose when self-locking fasteners on control system linkages had become detached, allowing the control system to separate. The scope of this Appendix 51-6 has now been broadened to further emphasise that the hazards associated with self-locking fasteners used in control systems are also applicable to aircraft access panels on both rotary and fixed wing aircraft.

The disturbance of fasteners to facilitate maintenance tasks may result in degradation of the effectiveness of the friction component. Where the aircraft manufacturer permits the re-use of self-locking fasteners, maintenance personnel are reminded that careful attention must be given to their security, and the effectiveness of the self-locking function.

In every case the aircraft manufacturers' guidance should be adhered to in relation to the use and re-use of self-locking fasteners. Such fasteners must not be re-used unless the user is satisfied that the self-locking characteristics have not deteriorated to a point where there is an ineffective friction element. Where no guidance is available from the aircraft manufacturer, it is recommended that the guidance given in CAAIP (CAP 562) Leaflet 2-5 paragraph 8, including the advice not to re-use certain fasteners, should be followed.

APPENDIX 51-7 Foreign Objects and Loose Articles – Danger of Jamming

1 Introduction

This Appendix shows information also published in Airworthiness Notice No. 12 Appendix 7 Issue 6 dated 2 April 2004.

2 Background

Jamming of aircraft flight control systems by foreign objects and loose articles such as those identified below continues to be a major threat to aircraft safety. Approved Organisations, Aircraft Owners and Licensed Aircraft Engineers must remain alert to the hazards of entrapment of such items and ensure that adequate precautions are taken to prevent items falling into or being left in critical areas. Good design, high standards of cleanliness and the implementation of standard practices can reduce the risks of such incidents. However the awareness of personnel involved in all aspects of aircraft operation is one of the most important elements in preventing such potentially dangerous incidents.

3 Manufacturing, Airworthiness and Operational Considerations

3.1 As the presence of foreign objects and loose articles can cause jamming or restriction of engine and flight control systems, organisations involved in the manufacture, operation and maintenance of aircraft, should establish standard practices to address foreign object and loose article control. Such practices should require personnel to check that all equipment, tools, rags or any loose objects/articles, which could impede the free movement and safe operation of a system(s), have been removed and that the system(s) and installation in the work area are clean and unobstructed.

3.2 In particular maintenance personnel are the front line of defence against such problems. As such they should remain vigilant of the need to remove foreign objects and loose articles during and after any scheduled or non-scheduled maintenance. Consideration should also be given to the potential to introduce loose articles into control systems from adjoining structure e.g. loose or incorrectly torqued fasteners. While a structure may remain safe with one fastener missing, the aircraft safety may be severely compromised if that fastener jams a control system.

NOTE: The Duplicate Inspection is intended to ensure the correct operation and assembly of controls, it will not prevent loose articles or foreign objects from becoming a hazard to their continued safe operation.

3.3 Some of the reported incidents:

- Throttle movement found to be stiff due to a broken plastic spoon, lodged between throttle levers and adjacent components in throttle pedestal.
- A bolt lodged between a flying control hydraulic-booster jack and its chassis.
- Hydraulic fluid top-up cans and meal trays fouling primary control runs.
- A spare control rod left in a fin by the manufacturer, causing intermittent jamming of rudder and not found during twelve months of operation.
- A nut left on a control chain adjacent to the sprocket, causing the chain to fail and jamming one flap surface.
- A ring spanner which had remained undiscovered for two and a half years in a wing bay which had been opened several times for control systems inspection.
- An incorrectly fitted screw on a fin leading edge which rolled across the top of the fin and jammed the elevator during the take off climb.
- A rudder pedal control jammed during taxi checks due to a coat hanger in a footwell.
- The AAIB investigation of an accident involving a jammed elevator, found numerous foreign objects which potentially may have restricted control system movement.
- An AAIB investigation of a fatal accident to a light aeroplane, revealed a small screwdriver had jammed the elevators such that they could not be moved beyond neutral in a nose-up direction.

APPENDIX 56-1 Aircraft Windshields and Transparencies

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix 54 Issue 1 dated 7 November 1997 which was issued as a result of a General Aviation accident review.

2 Background

The CAA wishes to draw attention to the importance of maintaining the visibility of windshields and transparencies to ensure that a clear and undistorted view is provided for flight crew.

3 Operational and Airworthiness Considerations

Operators and maintenance organisations are reminded that the optical standard and the standard of cleanliness of cockpit windshields and transparencies can have a direct effect on the flying of the aircraft especially in conditions of poor visibility. A hazy screen blurs the details, reduces black to grey and dims outlines. Dirt or slight scratching scatters the light and may make it impossible for the pilot to see against the sun.

Section 7 of the Light Aircraft Maintenance Schedule (LAMS) requires the inspection of windscreens at Check A intervals, with a further inspection of all windows at 50 hour, 150 hour and Annual check periods. Where other maintenance schedules do not refer to this subject, action should be taken to revise the schedule as appropriate.

APPENDIX 70–1 Molybdenum Disulphide Lubricants – Effect on Turbine Engines

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 38 Issue 1 dated 16 March 1988 which was issued following incidents of premature component failure in turbine engines.

2 Background

There have been a number of incidents over the years, of premature component failure in turbine engines, attributable to the effect of molybdenum disulphide based lubricants on high temperature components. In the extreme, these have resulted in non-contained turbine failures. Molybdenum disulphide is a very effective anti-seize lubricant, available as either a paste or a dry film, and is widely used in aircraft and engine assembly, however, at temperatures of 300°C and above, it decomposes yielding sulphur dioxide and molybdic oxide, the combination of which is both acidic and abrasive. Nickel base alloys, which are to be found in abundance on turbine engines (and especially in high temperature applications), are particularly susceptible to sulphur corrosion attack from the degradation products of molybdenum disulphide.

3 Airworthiness Considerations

A number of engine manufacturers have banned the use of molybdenum disulphide in dry film form on turbine engines and therefore, personnel involved in turbine engine maintenance work are reminded that they should make particular reference to the manufacturer's publications to ensure that the use of molybdenum disulphide lubricants is permitted. If molybdenum disulphide is used in turbine engine maintenance work, consideration should be given to the specific form and on which components it may be used.

APPENDIX 70–2 Allison 250 Series Gas Turbine Engines

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 47 Issue 1 dated 25 October 1991 which was issued following incidents which occurred as a result of non-compliance with the Allison Engine Operation and Maintenance manual.

2 Background

2.1 Resulting from an enquiry into an accident and numerous other similar incidents which have occurred world-wide, attention is drawn to the importance of complying with the Allison engine Operation and Maintenance Manual requirements for the proper installation and assembly of pneumatic control system, lubrication or fuel system tube assemblies, on the Model 250 engine. Particular attention is drawn to the fuel system air pressure sensing lines (Pc sensing) as non compliance with the established manufacturer's assembly procedures can and has resulted in engine failure. The following warning notices are clearly posted in the engine Operation and Maintenance Manuals to draw attention to the proper assembly procedures.

WARNING: AIR LEAKS IN THE FUEL SYSTEM OR THE PNEUMATIC SENSING SYSTEM CAN CAUSE FLAMEOUTS, POWER LOSS OR OVERSPEED.

WARNING: PROPER TIGHTENING OF ENGINE TUBING CONNECTIONS IS CRITICAL TO FLIGHT SAFETY. CORRECT TORQUE VALUES MUST BE USED AT ALL TIMES, EXCESSIVE TORQUE ON PNEUMATIC SENSING SYSTEM CONNECTIONS RESULTS IN CRACKING OF THE FLARE CAUSING AN AIR LEAK WHICH CAN CAUSE FLAMEOUT, POWER LOSS, OR OVERSPEED.

WARNING: FAILURE TO PROPERLY INSTALL, ALIGN AND TORQUE; FUEL, OIL, AIR FITTINGS AND TUBES COULD RESULT IN AN ENGINE FAILURE.

3 Airworthiness Considerations

Personnel involved in turbine engine maintenance work are therefore reminded that they should make particular reference to the engine and aircraft manufacturer's

publications to ensure that the proper assembly, torque loading, and anti creep procedures are adhered to and applied when working on the subject systems.

APPENDIX 70–3 Effects of Chloride Based Materials on Stainless Steel and Titanium

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 41 Issue 1 dated 18 August 1989 which was issued following premature failure of stainless steel pipes.

2 Background

2.1 Premature failure of stainless steel pipes has occurred in engines due to the unauthorised applications of chloride based materials, such as Neoprene tube and glass fibre tape, used as wrappings to protect pipes from chafing against adjacent parts. Whilst the desire to minimise wear due to fretting is quite reasonable, the need to ensure that the correct materials are used cannot be over-emphasised.

2.2 Chloride based materials break down with heat (temperatures above 150°C) to produce corrosive salts which will attack stainless steel and titanium components, resulting in premature failure.

2.3 It is possible that smears of chloride material may be left on components which have been touched by PVC (Plasticised Polyvinyl Chloride) sheeting while covered over by, or packed in, such material.

3 Airworthiness Considerations

Operators and Maintenance Organisations are reminded of the need to refer to the approved publications and use only the equipment and materials specified therein.

APPENDIX 72–1 Air Intake Filters

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 31 Issue 1 dated 1 April 1985 which was issued following a series of forced-landings involving piston-engined aircraft attributable to collapsed air intake filters.

2 Background

2.1 Forced-landings have occurred involving piston-engined aircraft which were directly attributable to collapsed air intake filters obstructing the carburettor. In one case only a fortunate combination of circumstances enabled the pilot to avoid a potentially serious accident.

2.2 Investigation suggests that the maintenance applied to the air intake filters on piston-engined light aircraft may not always be adequate. The LAMS Schedules concern

themselves with the cleanliness and condition of air intake filters, but under the definition of 'inspect', imply that this can be done in situ and as viewed externally. Individually approved maintenance schedules are generally similar in this respect.

3 Airworthiness Considerations

3.1 In practice it is apparent that for a typical air intake filter installation:

a) Visual inspection of the downstream face is usually not possible in situ. It is this face which may show the first signs of collapse.

b) Varying degrees of dismantling may be necessary to gain access to it.

c) In nearly all cases it must be removed for cleaning.

d) Methods of cleaning vary and some methods may not be effective for all types of filter.

3.2 When completing scheduled maintenance inspections, engineers and pilots who may accomplish 50-hour checks on Private Category aircraft maintained to the LAMS Schedules must be satisfied that air intake filters are clean and fully serviceable. If visual inspection of both faces of the filter is not readily possible, consideration must be given to gaining access sufficiently often to ensure continued serviceability.

APPENDIX 76–1 Single Path Control Systems

1 Introduction

This Appendix supersedes Airworthiness Notice No. 12 Appendix No. 20 Issue 1 dated 31 August 1977 which was originally issued following an incident which occurred as a result of failure of a carburettor mixture indicator.

2 Background

An incident which could easily have been a serious accident occurred because the single strand inner core of a flexible push pull mixture control failed at the mixture control lever on the carburettor and the lever subsequently vibrated into the lean position, resulting in a loss of engine power during take-off.

3 Design Considerations

Designers embodying such controls should consider the consequence of failure and the practicability of mitigating any serious effect by the provision of a friction device or by spring biasing the part to be operated by such a control to the safest position.

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Leaflet 11-23 Microbiological Contamination of Fuel Tanks of Turbine Engined Aircraft

(Previously Issued as Airworthiness Notice No. 21)

1 Introduction

This leaflet supersedes Airworthiness Notice No. 21 Issue 3 dated 15 May 1970 which was issued following reports of contamination of fuel tanks.

2 Background

2.1 Reports have been received that aircraft regularly operating in climatic conditions such as those prevailing between the latitudes 30° North and 30° South, have been contaminated in the fuel tanks by fungus. Another aircraft, regularly operating from the United Kingdom, was found to have localised areas of heavy growth when inspected after standing in a heated hangar for two months with fuel in the tanks. It is considered that the storage conditions were a contributory factor.

2.2 In one case contamination was found during an investigation into the cause of erratic fuel contents indication, when white crusty deposits and brown stains were seen on the probes. Further examination revealed the presence of brown/black slimes adhering to horizontal upward facing surfaces within the tanks. Examination by the Commonwealth Mycological Institute, Kew, confirmed that this substance was a fungal growth of the type Cladesporium Resinae.

3 Effects of Contamination

3.1 The problems associated with microbiological growths have been known for some years and research into their behaviour has been conducted throughout the world. In the case of Cladesporium Resinae, the spores of the fungus can exist in a dormant state in kerosene fuels in most parts of the world. These will only develop when in contact with water in fuel at temperatures such as those reached when the aircraft or storage tanks are exposed to a warm ambient temperature such as radiation from the sun for long periods in a tropical or sub-tropical environment, or prolonged periods in a heated hangar. If developing fungus forms on water not drained off and which adheres to the tank surfaces, the fungus is able to absorb water later introduced with fuel or condensing following a cold soak.

3.2 Where fungus has formed there is a probability that corrosion will occur. Corrosion has been found where fungus had formed on the bottom tank skin, on the chordal support member in the wing root and on fuel pipes within the tank. In some cases aircraft have been sufficiently affected to necessitate replacement of some component parts.

3.3 The fungus itself, if dislodged by fuel during refuelling, can obstruct fuel filters.

4 Inspection

4.1 Operators uplifting fuel or operating regularly in areas having high normal ambient temperatures and high humidity or where fungus development is known to have been encountered, are advised to scrutinise tank areas for signs of fungus whenever access is gained for any purpose. It is further recommended that, for aircraft operating under these conditions, Maintenance Schedules should be amended to include a visual internal tank check at periods prescribed by the aircraft manufacturer. It is also important, whenever fuel tanks are inspected, to ensure that all passage ways between rib cleats, etc. are not obstructed, so that a drainage path for water is maintained at all times. If the aircraft has been standing in a heated hangar for a prolonged period the fuel in the tanks should be treated with biocide (see paragraph 5).

4.2 If contents gauges give suspect indications, immediate consideration should be given to the possibility that tank probes may be contaminated with water and/or fungus and appropriate inspections should be carried out.

4.3 Whenever fuel filters are checked, they should be closely examined for the presence of slimes of any colour.

4.4 The need to prevent water collection by good maintenance practices and control of fuel supplies is emphasised. A high degree of protection can be maintained by strict adherence to water drain checks before and after refuelling and again, if the aircraft has been standing for any length of time, before the next flight. Fuel quality control checks should be rigorously applied.

5 Treatment

5.1 If fungus is discovered, the fuel system should be cleaned as soon as possible by a method approved by the aircraft manufacturer and the engine manufacturer. It must be appreciated that if the fungus is allowed to develop, cleansing and rectification could become a major operation involving grounding the aircraft for a long period.

5.2 It is strongly recommended that when aircraft operate in an area where fungal growth can be encountered, or where there is any possibility of temperatures in the fuel tanks frequently rising above 25°C, a fungicide additive should be used in the fuel as approved by the aircraft manufacturer and the engine manufacturer. The frequency of treatment and the dilutions prescribed by the aircraft manufacturer and the engine manufacturer must be adhered to. Introduction of an unapproved fungicide or inhibitor may jeopardise the safe operation of the aircraft.

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

1 Introduction

This Leaflet has been raised to provide guidance on the use of standard parts in aircraft restoration projects and their subsequent maintenance. This Leaflet should be read in conjunction with the relevant aircraft manuals, manufacturers instructions, British Civil Airworthiness Requirements (BCAR) and CAA Airworthiness Notice No. 11.

2 Background

2.1 BCAR Chapter A4–8 prescribes procedures for the Design Approval of Aircraft Equipment and Accessories. In particular paragraph 3 refers to Standard Parts with a statement that BCAR A4–8 need not be followed for Aircraft General Spares (AGS) and other standard parts complying with National or International specifications or standards recognised by the CAA.

NOTE: This is intended to cover minor items complying with AGS, SBAC, BSI or similar standards, where these are limited to manufacturing drawings from which the approved Organisation can assess the items as suitable for the intended application.

2.2 From time to time, whilst carrying out aircraft restoration projects usually associated with vintage aircraft, the standard parts, or AGS of the original design standard are no longer available. To enable the project(s) to be concluded successfully, there are methods and procedures required to be followed by the restorer(s) for the use of alternative parts of AGS.

3 Critical/Non Critical Nature

3.1 In the context of this Leaflet the term 'Critical Nature' is used to describe any bolted joint or attachment where stress levels are high and where inadequate assembly techniques or inappropriate fasteners could result in fatigue or catastrophic failure of the structure. Examples of critical nature joints are:

a) Spar or wing attachment joints

b) Fin/tailplane attachment joints

c) Engine/strut mounting structure

d) Flying control systems or surface attachments

3.2 In the context of this Leaflet the term 'Non Critical Nature' is used to describe any attachment or fastener of ancillary structure or fairings which are not critical to the airworthiness of the aircraft or structure. Examples of fasteners or attachments of a non critical nature are not exhaustive but could be associated with:

a) Fairings

b) Cabin interior furnishing

c) Panel attachment

4 Alternative Parts

4.1 **Standard Parts – Critical Nature** Standard Parts which are replaced by those of equal or improved specification with regard to dimensional tolerances and material properties, can only be embodied by modification procedure in accordance with the requirements of BCAR A/B2–5, or be in accordance with the product support publications of the aircraft Type Certificate holder or Type Design (See Airworthiness Notice 26).

4.2 **Standard Parts – Non Critical Nature** Where the manufacturer's airworthiness data permits, it is acceptable to replace original standard parts used in areas of a non critical nature with items of equal or improved specification with regard to dimensional tolerances and material properties, without the need for CAA involvement. In all other instances the requirements of BCAR A/B2–5 are applicable.

Leaflet 11-25 Compact Disc - Read Only Memory (CD-ROM) Technical Library

1 Introduction

1.1 The availability of information as digital libraries providing information, guidance and Airworthiness data in CD-ROM format is now widespread throughout the aviation industry. Airworthiness data (e.g. JAR 145.45) published in this format potentially offers the user simplified search and access functions when compared with Airworthiness data produced in the more traditional formats. Increasingly the CAA is being asked if it is permissible to accept commercially produced CD-ROM libraries as an alternative to the more traditional 'hard copy' or Microform (Microfiche) manuals.

1.2 Commercial library systems provide a useful service in consolidating all related information into digital format with regular updating by reissue of the disc. Users therefore have the benefit of a comprehensive information source without the difficulty of incorporating frequent amendments.

1.3 The purpose of this Leaflet is to provide guidance on the acceptance of Airworthiness data provided in CD-ROM format. When promulgated by either the appropriate Type Certificate holder, Design Organisation or Airworthiness Authority, in any format, it is referred to as 'Primary Source'. When promulgated by a third party it is referred to as 'Secondary Source'.

1.4 It should be borne in mind that, in respect of CAA Approval, firstly, access to the Airworthiness data is required by the requirement for gaining and maintaining that approval. Secondly, the CAA must be satisfied that the person (or organisation) which the CAA has licensed or approved to make reports is qualified to do so, and remains so. The need for that person or organisation to have access to the up to date appropriate Airworthiness data is therefore essential.

NOTE: JAR 145.45 defines Airworthiness data as follows:

'Airworthiness data' means any information necessary to ensure that the aircraft or aircraft component can be maintained in a condition such that airworthiness of the aircraft, or serviceability of operational and emergency equipment as appropriate, is assured.

2 Use of Primary Source Airworthiness Data

Primary Source material need not necessarily be in hard copy format as the use of computer recorded Airworthiness data is now recognised in many areas of the law. Hence there appears to be no reason for not accepting it in aviation. The source of information rather than its format will, therefore, be the CAA's primary concern.

3 Use of Secondary Source Airworthiness Data

3.1 In all cases, an organisation choosing to use Secondary Source Airworthiness data will be responsible for ensuring that the source of the Airworthiness data will provide a level of accuracy equal to that provided by Primary Source Airworthiness data. Furthermore, the revision frequency will need to be such that it reflects that of the Primary Source Airworthiness data. In entering into an arrangement based on

Secondary Source Airworthiness data, users will need to determine that the organisation providing the Airworthiness data is legally entitled to do so.

3.2 When selecting a supplier, consideration should be given to any particular Airworthiness limitations which may be applicable to UK registered aircraft.

NOTE: This is particularly true of suppliers who have initially produced the Airworthiness data to market in foreign countries whose Airworthiness Authority may impose airworthiness limitations different to those of the CAA.

3.3 Persons or Organisations wishing to make use of such library services should also consider the publishers stated limitations and waivers. These will often contain statements such as – 'It is at all times the sole responsibility of the user to interpret and assess the validity of the information provided by the library'. Furthermore, it is to be remembered that the majority of the manufacturer and regulatory information contained in these libraries was not originally designed for electronic delivery. Therefore, users should be aware that variances in spelling, ATA indexing, and conventions may impact the effectiveness of searches and usage. Where any doubt exists the user should refer to the Primary Source Airworthiness data.

4 Procedural Control Considerations

4.1 Any person (or organisation) using Airworthiness data is responsible to satisfy himself that it has been supplied by an appropriate competent person and is in a form which is acceptable to the originator of the Primary Source material. Organisation procedures should be such that it can be demonstrated that the Airworthiness data is both up to date and available at all times when needed.

4.2 The library controls necessary for more traditional forms of Airworthiness data are in many cases equally applicable to that supplied in CD-ROM format. However, organisations in choosing to use Airworthiness data provided in CD-ROM format should take into account the following additional aspects:

a) It is normal industry practice to provide amendments to Airworthiness data in CD-ROM format by issuing replacement discs; these amendments are often supplied at frequent intervals.

b) Organisations should implement procedures which ensure that only current versions of discs remain in circulation. Where it is considered that there is a need to have available previous issues of CD-ROM discs, an archive system should be implemented.

c) Airworthiness data, including associated temporary revisions and the ability to read the Airworthiness data, should be provided in close proximity to where the work is to be undertaken. Where printing facilities are provided, such printed material should be automatically annotated by the software to clearly identify the source of the Airworthiness data and its edition date.

d) The number of CD-ROM terminals is sufficient in relation to the volume of work to be undertaken. Suitable arrangements should also be made to ensure that in the event of a system failure, an alternative means of providing the Airworthiness data is available.

e) The operating system selected should not allow the unauthorised alteration of the Airworthiness data it displays.

f) A contract with a supplier or suppliers, should be established to maintain both the necessary hardware and software needed to read CD-ROM Airworthiness data, reflecting the working patterns of the user. The contract should provide for the support of the system which reflects the working patterns of the users.

g) Training as appropriate on the use of the CD-ROM software and hardware is to be provided to all potential users. In addition 'User Instructions' should be available at all times, at all terminals.

h) Revision frequency in particular must be such as to ensure that users are aware of current mandatory requirements.

i) The library subscriber is expected to be in possession of confirmation that a contract, or agreement, exists between the publisher and the manufacturer for the continuing supply of manufacturers information for the specific aircraft type.

NOTE: Further information on CD ROM Libraries may be found in:

BSi Code of Practice PD0008
FAA AC 120-69
ATA Specification 2100

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Leaflet 11-26 Passenger Service and In-Flight Entertainment (IFE) Systems

This Leaflet is superseded and cancelled by JAA Administrative and Guidance Material, Section One: General, Part 3: Temporary Guidance leaflets, Leaflet No. 17 Passenger Service and In-Flight Entertainment (IFE) Systems, and by Airworthiness Notice No. 60, Continuing Airworthiness and Safety Standards of Passenger Service and In-Flight Entertainment Systems, Issue 1 dated 21 March 2005.

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Leaflet 11-27 Disposition of Scrap Aircraft Parts and Materials

(Previously issued as AN 96)

1 Purpose

The purpose of this Leaflet is to provide information and guidance to persons involved in the maintenance, sale, or disposal of aircraft parts. It provides additional guidance material and should be read, where applicable, with the requirements of Part-145.A.42 paragraph (d) and Part-M.A paragraphs (c), (d) and (e), to prevent scrap aircraft parts and materials from being sold or acquired as serviceable parts and materials.

2 Introduction

It is common practice for owners of aircraft parts to dispose of scrap parts and materials by selling, discarding, or transferring such items. In some instances, these items have reappeared for sale in the active parts inventories of the aviation community. Misrepresentation of the status of parts and material and the practice of making such items appear serviceable could result in the use of non conforming parts and materials.

3 Types of Parts and Materials that may be Misrepresented

Persons disposing of scrap aircraft parts and materials should consider the possibility of such parts and materials being misrepresented and sold as serviceable at a later date. Caution should be exercised to ensure that the following types of parts and materials are disposed of in a controlled manner that does not allow them to be returned to service:

a) Parts with non-repairable defects, whether visible or not to the naked eye;

b) Parts that are not within the specifications set forth by the approved design, and cannot be brought into conformance with applicable specifications;

c) Parts and materials for which further processing or rework cannot make them eligible for certification under a recognised released system;

d) Parts subjected to unacceptable modification or rework that is irreversible;

e) Life-limited parts that have reached or exceeded their life limits, or have missing or incomplete records;

f) Parts that cannot be returned to an airworthy condition due to exposure to extreme forces or heat (see Leaflet 11-28 of this CAP);

g) Principal Structural Elements (PSE) removed from a high-cycle aircraft for which conformity cannot be accomplished by complying with the mandatory requirements applicable to ageing aircraft.

4 Methods to prevent misrepresentation of scrap parts and materials

4.1 Persons disposing of scrap aircraft parts and materials should, when appropriate, mutilate those parts and materials prior to release. Mutilation should be accomplished in such a manner that the parts become unusable for their original intended use, nor should they be able to be reworked or camouflaged to provide the appearance of being serviceable, such as by re-plating, shortening and re-threading long bolts, welding, straightening, machining, cleaning, polishing, or repainting.

4.1.1 Mutilation may be accomplished by one or a combination of the following procedures, but is not limited to:

a) Grinding;

b) Burning;

c) Removal of a major lug or other integral feature;

d) Permanent distortion of parts;

e) Cutting a hole with cutting torch or saw;

f) Melting;

g) Sawing into many small pieces.

4.1.2 The following procedures are examples of mutilation that are often less successful because they may not be consistently effective:

a) Stamping (such as a stamped 'R' on a part);

b) Spraying with paint;

c) Hammer marks;

d) Identification by tag or markings;

e) Drilling small holes;

f) Sawing in two pieces. Persons who rework scrap parts and materials may be skilled technicians and attempt to restore parts cut in two pieces in such a manner that the mutilation proves difficult to detect.

4.2 With regards to persons disposing of scrap aircraft parts and materials for legitimate non-flight uses, such as training and education aids, research and development, or for non-aviation applications. In such instances, mutilation is not appropriate and the following methods should be used to prevent misrepresentation:

a) *Permanently* marking or stamping the parts, subparts, and material as 'NOT SERVICEABLE'. (Ink stamping is not an acceptable method);

b) Removing original part number identification;

c) Removing data plate identification;

d) Maintaining a tracking or accountability system, by serial number or other individualised data, to record transferred scrap aircraft parts and materials; and

e) Including written instructions concerning disposition and disposal of such parts and materials in any agreement or contract transferring such parts and materials.

NOTE: Scrap or expired life-limited parts and materials should not be passed on to any person or organisation who may end up placing the parts and materials back in actual use, due to the criticality of parts and material failure and the potential safety threat.

4.3 Organisations handling scrap or expired life-limited aircraft parts and materials should establish a quarantine store area in which to segregate such items from active serviceable inventories and to prevent unauthorised access. Caution should be exercised to ensure that these parts and materials receive the disposition specified in this Leaflet.

4.4 Manufacturers producing approved aircraft parts should consider maintaining records of serial numbers for 'retired' life-limited or other critical parts. In such cases, the owner who mutilates applicable parts is encouraged to provide the original manufacturer with the data plate and/or serial number and final disposition of the part.

5 Method to identify misrepresented parts

All purchasers of aircraft parts and materials should ensure that misrepresented scrap parts and materials are not received into active inventory. The following are examples of conditions to be alert for when receiving parts:

a) Parts showing signs of rework which were purchased as ‘new’;

b) Used parts showing signs of unapproved or inappropriate repair;

c) Parts with poor workmanship or signs of rework in the area of the part data plate, number or serial number inscription;

d) Used parts lacking verifiable documentation of history and approval;

e) Parts with prices ‘too good to be true’;

f) Questionable part numbers, fraudulent or suspicious Technical Standard Order or FAA-Parts Manufacturer Approval markings and/or re-identification, stamp-overs or vibro-etching on the data plate;

g) Parts delivered with photocopied or missing JAA Form 1 or other acceptable maintenance release documentation;

h) Parts with a finish that is inconsistent with industry standards (e.g. discoloration, inconsistencies, resurfacing);

i) Parts purchased as new but with release documentation reflecting a status other than new;

j) Parts with poor documentation exhibiting incomplete or inconsistent part identity information;

k) Intact ‘scrap’ unsalvageable parts offered in bulk weight for prices higher than for mutilated parts with identical weight and content.

NOTE: Suspected Unapproved Parts Notification can be found on FAA Internet address: http://www.faa.gov/avr/sups.htm and Special Airworthiness Information Bulletins can be found on FAA Internet address: http://www.faa.gov/certification/aircraft/av-info/AD/saibs.asp

An approved organisation or LAME who receives suspect parts should report to the CAA as detailed in paragraph 6 of Airworthiness Notice No. 19.

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

(Previously issued as AN 97)

NOTE: For the purpose of this Leaflet the term 'items' includes all components, parts, engines and accessories.

1 Introduction

1.1 This Leaflet reviews the factors involved in establishing the acceptability of aircraft items recovered from aircraft involved in accidents/incidents, and states the conditions to be met before such items may be returned to service.

1.2 The Civil Aviation Authority has evidence that some aircraft items, (including highly stressed rotating parts) have been released to service after having been recovered from aircraft involved in accidents/incidents even though the accident circumstances may have caused damage or changed characteristics from those of the type design. Since such items may not manifest any visual evidence of damage, distortion or changed characteristics, a serious airworthiness hazard could result from their use without special precautions being taken as detailed in this Leaflet.

NOTE: The subject of this Leaflet was first promulgated to industry by a CAA Letter to Operators Number 461 (revised to LTO 461/A on the 18 December 1981), following informal consultation with industry and with aviation insurers.

2 Establishing Origin of Recovered Items

2.1 When an aircraft has been involved in an accident/incident, the title to the salvage may pass from the insured owner to other persons (e.g. aircraft insurers) and this salvage may be offered for sale either complete or as separate aircraft items in an 'as is - where is' condition. While some items may be totally unaffected by the accident/incident which caused the aircraft to be declared as salvage, it is essential to obtain clear evidence that this is the case. If such evidence cannot be obtained, the item may not be returned to service.

2.2 All such items must therefore be subject to competent assessment and inspection in the light of adequate knowledge of the circumstances of the accident, subsequent storage and transport conditions, and with evidence of previous operational history obtained from valid airworthiness records, before overhaul and re-installation can be considered.

2.3 In particular, if a crash load is sufficient to take any part above its proof strength, residual strains may remain which could reduce the effective strength of the item or otherwise impair its functioning. Loads higher than this may of course crack the item, with an even more dangerous potential. Further, a reduction in strength may be caused by virtue of the change of a material's characteristics following overheat from a fire. It is therefore of the utmost importance to establish that the item is neither cracked, distorted nor overheated. The degree of distortion may be difficult to assess if the precise original dimensions are not known, in which case there is no option but to reject the item. Any suggestion of overheating would be cause for a laboratory investigation into significant change of material properties.

2.4 The standard procedures appropriate to items removed for overhaul following normal service life may not therefore be sufficient for items from salvaged aircraft. If the information in the Manufacturer's Manual, or other technical publications, is insufficient to deal with the considerations detailed above then the manufacturer must be consulted for guidance. If the manufacturer provides the additional information, and the item can be shown to meet this, then it may be returned to service.

2.5 Where a difficulty exists in classifying the airworthiness significance of an aircraft item recovered after an accident/incident, the question should be referred to the CAA Airworthiness Division, Survey Department, for advice. The CAA will require full details of the circumstances of the accident/incident before a response is made to the enquiry.

3 Information obtained from Aviation Insurers

3.1 Aviation insurers and other persons who obtain title to salvage parts may supply to salvage purchasers the details of the accident/incident leading to the aircraft, or aircraft item, being declared as salvage. It is also common practice for aviation insurers to pass over the airworthiness records to the salvage purchaser. Whilst such information and records are an essential part of the assessment, where return to service is being considered, they are not a guarantee that the item is acceptable for re-installation.

3.2 Some aviation insurers have agreed to co-operate with the CAA's attempt to prevent items being returned to service if their airworthiness cannot be confidently confirmed. They have agreed to supply details of the occurrence, and to identify the party to whom the salvage has been sold, to the Airworthiness Division, Application and Approvals Department. This information may be relevant when CAA advice is sought under paragraph 2.5 of this Leaflet, but does not excuse the enquirer from furnishing the information required by that paragraph.

4 Supplementary Information

4.1 Attention is drawn to Airworthiness Notices Nos. 11 and 19 which also deal with the safeguards necessary for users obtaining aircraft parts in the open market, particularly in relation to the release documentation and evidence of previous history.

4.2 This Leaflet provides additional interpretive material and should be read in conjunction with AMC.145.A.50 (a) paragraph as appropriate.

Leaflet 11-29 Light Aircraft Emergency Locator Transmitters

(Previously issued as AIL/0019. This leaflet has not been technically revised but is scheduled to be reviewed in the near future.)

1 Purpose

This leaflet provides guidance material for the acceptance of Emergency Locator Transmitters on UK Registered Aircraft of less than 5700 kg all-up-weight.

2 References

BCAR Section A Chapter A4-10
FAR Part 37 paragraph 37.200 (TSO C91)
FAR Part 91 paragraph 91.52

3 Federal Aviation Regulation 91.52 is now in force in the United States and states that with the exception of:

a) Turbo-jet engined aircraft;

b) Scheduled operations (other than charter flights) conducted by a domestic or flag air carrier;

c) Training flights conducted within a 20 mile radius of the airport from which the flight began; and

d) Agricultural aircraft operations;

an Emergency Locator Transmitter must be attached to all US registered aircraft imported or manufactured after 30 December 1971 and to all other US registered aircraft after 30 December 1973.

4 The Federal Aviation Regulations state that all emergency locator transmitters must conform to the applicable requirements of FAR 37.200. These requirements are in the form of a Technical Standard Order C91 which specifies the design and operational characteristics required for approval. Such locator transmitters are required by the TSO to be marked with the FAA TSO number C91, they must carry a label concerning unlawful operation of the transmitter and a label on which must be inscribed the replacement date of the transmitter's battery or recharge date in the case of a rechargeable battery. Personnel (hand-held) type locator transmitters must also carry a label recommending that the transmitter be held under the user's jacket, with the antenna correctly deployed outside, in order to increase the battery operating temperature and hence the battery operating life.

5 As a result of this recent legislation, it is probable that a large proportion of General Aviation aircraft imported into the UK from the United States will be fitted with an emergency locator transmitter.

6 The Air Navigation Order requires that all radio equipment installed in aircraft registered in the United Kingdom be of a type approved by the Civil Aviation Authority but does not at present specifically require the carriage of Emergency Locator Transmitters, other than those associated with the mandatory carriage of Liferafts. (Emergency Locator Transmitters which comply with the requirements of this Leaflet will not necessarily be acceptable for such mandatory carriage use.) For UK approval of Emergency Locator Transmitters an application must be made to the CAA in accordance with BCAR Section A Chapter A4-10. Compliance with the following additional requirements in respect of the equipment and its installation must also be demonstrated.

7 In order to avoid, as far as possible, nuisance as a result of inadvertent transmission from emergency locator transmitters:

a) Manual activation switches must be adequately guarded.

b) A transmitter 'ON' indicator must be mounted in view of the pilot.

c) When a manual activation switch is provided in the crew compartment it must be installed next to the transmitter 'ON' indicator.

d) The transmitter 'ON' indicator in the crew compartment must be powered from a supply which is not isolated by the ground switch.

e) Any automatic activation device, e.g. a 'g' switch, must not operate when subjected to normal in-flight turbulence, to normal manoeuvres on the ground and in flight, to heavy landings, or to the impact of objects on the airframe in the region of the transmitter, e.g. during loading and ground maintenance.

f) The power in any spurious emission (excluding emissions within plus and minus 25 kHz of the two emergency frequencies 121.5 and 243 MHz) must not exceed 25 micro watts.

8 Instructions must be included in the Pilot's Notes to keep any test transmissions as short as possible (in order to minimize interference and battery drain) and to conduct such test transmissions only with the local ATC Unit's permission.

9 Installation instructions must be provided which ensure compliance with 1 a), b), c), d) and e).

10 The transmitter manufacturer must specify the battery to be used, its shelf life, its in-service life and any other limitations associated with the battery, e.g. temperature, which could affect the transmitter performance in service.

Leaflet 11-30 Portable Battery Powered Megaphones

(Previously issued as AIL/0045. This leaflet has not been technically revised but is scheduled to be reviewed in the near future.)

1 Purpose

The purpose of this Leaflet is to provide guidance in the form of a specification to an operator who has to install portable megaphones in order to comply with the Air Navigation Order.

2 References

Air Navigation Order

3 Introduction

The Air Navigation Order has been amended to require that all UK registered aircraft used for the purpose of Public Transport, having a seating capacity for 60 or more passengers will be required to carry a complement of Portable Battery-Powered Megaphones for use by the crew should an emergency arise.

This Leaflet presents an acceptable means of compliance with the ANO, in the form of a specification which states minimum characteristics and other necessary features and additionally covers associated installational aspects.

It is intended after gaining experience of its application to embody the material into a CAA specification. This specification is intended for guidance to an Operator who may wish to install a commercially available megaphone. Appendices to the specification state recommendations on methods of meeting the specification requirements.

The Federal Aviation Regulations also prescribe in FAR Part 121.309(f) the carriage of portable battery-powered megaphones, but no Specification similar to that proposed by this Paper has been issued by the FAA.

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Appendix A

1 Specification for Portable Battery-Powered Megaphones

Intended for use in emergency conditions in Civil Transport Aircraft.

2 Basic Requirements

Portable megaphones to comply with this Specification should have the following characteristics:

a) **Intelligibility**

Under normal ground conditions in the cabin, messages spoken into the megaphone should be intelligible to at least 90% of the occupants in the passenger cabin in the aircraft in which it is expected to operate. See paragraph m) and Annex 1.

b) **Acoustic Power**

As a criterion it can be taken that when the megaphone is used in open country where a reasonably quiet sound background exists it should be capable of providing intelligible speech at a distance of 100 metres. See Annex 1.

c) **Power Supply**

They should have a self-contained power supply. This should not be interpreted to exclude connection, when not in use, to the aircraft power supply system.

d) **Design Standard**

The design of the megaphone and its power supply arrangements should be such that the likelihood of satisfactory operation when needed is high.

e) **Environmental Resistance**

The megaphone should be shown to be suitable for withstanding the environmental conditions which it will experience in the aircraft. It should be so installed as to minimise any adverse effects from the environment.

f) **Mounting in Aircraft**

It should be so installed and retained that it will withstand the emergency accelerations specified in British Civil Airworthiness Requirements Chapter D3-8 paragraph 2 without breaking loose or having its performance impaired.

g) **Compass Interference**

Should powerful magnets be incorporated in the device, it must be so installed that it does not interfere with any magnetic compass in the aircraft beyond the limits stated in the British Civil Airworthiness Requirements Chapter D6-8.

h) **Acoustic Operational Characteristics**

The microphone should be such as to render the system satisfactorily resistant to the risk of feedback howl. The microphone should also be not unduly critical regarding the distance between it and the mouth of the person speaking. Consideration should be given to making this appropriate distance neutral and self-evident to the user.

i) **Controls**

The number of controls should be minimal, of a type which are self-evident and are easily operable by a crew member even under conditions of stress. The control of volume by the user of the megaphone should preferably be by switch setting although continuous control could be considered. Two levels should be incorporated which can be pre-set on checking a particular installation, one for use inside and one for use outside the aircraft.

j) **General Design**

The megaphone should be so designed that inadvertent operation is unlikely.

k) **Portability**

A suitable means of carrying (such as a harness) should be provided.

l) **Battery Checking**

Arrangements should be made in the maintenance schedule for the checking of the battery. Labels should be attached to the exterior to render battery replacement times easily identifiable.

m) **Tests**

It is necessary to test the megaphone for intelligibility. This should preferably be done in the environments in which it is intended to be used. An alternative test is indicated in Annex 1.

n) **User Instructions**

The megaphone should incorporate simple but effective instructions for its use, on its outside. These should cover switching on and off, volume control and proper use of the microphone.

Annex 1

1 Test for Intelligibility and Acoustic Power

The acoustic conditions in aircraft interiors vary considerably and according to the aircraft design, the number of passengers who may be expected to hear a particular message will vary in accordance with the internal arrangements of the aircraft and the corresponding crew training.

Ideally each type of megaphone should be tested in the cabin environment in which it is liable to be used. Volunteers should be used to simulate the passenger complement. A number of messages should be broadcast containing occasional unexpected words and the volunteers invited to write them down. A 90% correct recording would be regarded as acceptable.

However, it is recognized that the assembly of people required for such a test is expensive and may only be warranted when there are special unknowns. Experiments have shown that there is a reasonable correlation between the performance of a megaphone in the highly absorbent acoustic environment of an aircraft and its ability to be heard at a distance in a quiet open-air environment. It has been established that the megaphones found satisfactory in typical aircraft cabins were all capable of good intelligibility at ranges of 100 metres in the open air.

The open-air test should be conducted in an area where the acoustic environment is reasonably quiet. If it were felt that 'reasonably quiet' is in need of a more formal definition the suggested level would be that the ambient noise should not be greater than 40 dBA. Not less than three observers, spaced apart but all at 100 metres distance from the megaphone should be asked to record appropriate messages. It might well be desirable to use more than one speaker to eliminate the effects of exceptional voice characteristics or lack of training in microphone usage. Again a 90% correct recording would be acceptable having regard to the redundancy provided in a situation by the natural repetition tendency of a speaker in a crisis – particularly if trained to do so.

2 Proof of Suitable Enviromental Resistance

Since the portable megaphone does not function continuously, the cost of testing in a simulated environment is considered unwarranted. On completion of a satisfactory intelligibility test, the equipment should be installed in the aircraft with its proper retaining arrangements and then checked for functioning at appropriate intervals (e.g. three months). Completion of a year's flying with proper functioning at three-monthly intervals would be regarded as suitable confirmation that the chosen megaphone was resistant to the effects of temperature, vibration and humidity encountered on that installation. However, extension of overhaul periods would depend on the trust that can be placed on the battery.

3 The Battery

It could well be that the megaphone would be most satisfactory if it incorporated re-chargeable cells in its battery. These could be trickle-charged from a detachable lead connected to the aircraft supply. From what is known, successive checks might easily establish an effective time between overhauls of several years of such a combination.

However, most of the readily available specimens incorporate simple batteries containing zinc-carbon or similar dry-cells. These have the great advantage of cheapness and so there is little discouragement of frequent replacement. It is felt essential that only cells date-coded by the manufacturer should be used. The battery should then be tested under load at three-monthly periods. Such tests will enable the build up of useful experience and a realistic replacement time to be deduced. Account should be taken of the temperature conditions in which the aircraft operates. It is particularly important to examine the battery and casing, and the connectors, for corrosion. On an aircraft with good control of the cabin air-conditioning system, a reasonable replacement time of six months, or even a year, might be established. It may well be that shorter periods will be necessary, however.

Experience has shown that the spring type pressure contacts commonly used for batteries comprised of unit cells (e.g. AA or HP7 size) are not satisfactory. This is particularly so with alkaline cells, usually installed to achieve a greater replacement life than the recommended three months limitation for zinc carbon cells. It is recommended that cells should be assembled, preferably by the battery manufacturer, into a proper battery pack which can be incorporated with highly reliable screw-on connectors.

The maintenance organisation of the airline should keep records of the dates of manufacture, installation and testing of the particular cells which they use.

It is possible to obtain more sophisticated primary cells such as the manganese-alkaline or mercury types which could have a longer life. However, whichever cell is chosen, the Airworthiness Division of the CAA finds that there is no substitute for the standard procedure of periodical functional testing. Thus the intervals between tests can only be extended cautiously.

Where longer life type cells are incorporated, even when confidence on the longer life has been established by sample discharge tests, it is useful and conventional to conduct a terminal voltage test on the batteries on interim maintenance. It is pointed out that when fairly high impedance volt meters are used (e.g. AVO) the reading is useless for assessing battery state if the battery is not suitably loaded. Thus while making such a measurement the tester could either operate the megaphone (shouting loudly into it) at the same time, or impose a resistive load so adjusted as to create a current drain of say 300 mA. Cells showing less than 1.1 volts under this condition should be rejected.

Leaflet 11-31 Radio Apparatus for use in Aircraft for other than Flight Operational Purposes

(Previously issued as AIL/0167. This Leaflet has not been technically revised but is scheduled to be reviewed in the near future.)

PURPOSE: This Leaflet provides information and guidance concerning the approval and installation of Radio equipment for use in aircraft for other than Flight Operational Purposes.

The Leaflet is only applicable to those aircraft that are excluded from EASA under Annex II of EC Regulation No. 1592/2002 and others excluded through being in service with the military, customs, police or similar services (under Article I of the regulation). For all other aircraft whose Type Certificates have been transferred to EASA, minor and major change procedures of Part-21 to EC Regulation No. 1702/2003, Subparts D and E apply. For the remainder of this Leaflet, no further reference will be made to Part-21 procedures.

REFERENCES: Air Navigation: The Order and the Regulations, CAP 393.

British Civil Airworthiness Requirements (BCAR), Sections A, B and R.

Joint Aviation Requirements: JAR-23, JAR-25, JAR-27, JAR-29 and JAR-TSO.

EASA CS-ETSO

Radio Communications Agency.

Radio Frequency Allocations, (see website: http://www.radio.gov.uk/).

Airworthiness Notices CAP 455.

CAA Airworthiness Information Leaflet, AIL/0165, 'Applications for the Approval of Aircraft and Modifications to Aircraft'.

CAA Airworthiness Information Leaflet, AIL/0176, 'Use of Electrically Powered Medical Equipment on Aircraft'.

JAA Administrative and Guidance Material, Section One: General, Part Three, Temporary Guidance Leaflet: Leaflet No. 17: Passenger Service and In- Flight Entertainment (IFE) Systems.

JAA Administrative and Guidance Material, Section Four: Operations, Part Three, Temporary Guidance Leaflet (JAR-OPS) No. 29.

EC Regulation No. 1592/2002

CANCELLATION: This Leaflet supersedes and cancels AIL/0167 dated 29 October 2004.

1 Introduction

The Air Navigation Order requires all radio equipment carried on UK registered civil aircraft to be of a type approved by the CAA or EASA. This Leaflet provides guidance on the approval procedures to be followed to gain CAA approval of radio equipment that is to be used for purposes other than normal flight operations. Typically, such equipment includes radio transceivers for work involving surveillance, survey, marine

communications, emergency services operations, passenger communications, and trials.

This Leaflet is updated to: amend the applicability of the Leaflet with respect to the introduction of EASA; revise the documents listed in the References section; modify the reference to JAR-TSO to CS-ETSO in section 2; remove the date of 14 January 2002 in paragraph 3.4 b) relating to license issue as the date has passed; add a statement in section 3.4 c) explaining that the CAA may continue to approve these radios for Annex II, military, customs, police or similar aircraft; and delete the reference to AIL/173 in paragraph 3.4 c).

2 Approval Categories

BCAR Section R and Volume 2 of CAP 208 (now obsolescent – Airworthiness Notice No. 6 refers) lists five approval categories which have the following designations:

Approval number prefixed by – WR, VC, LAI, LAII or LAIII.

Within BCARs other approval categories exist which have been applied to radio, they are:

Approval number prefixed by – Q, MISC, SA or G.

Non flight operational radios must be approved either in one of the latter categories or through the procedures described in section 4 of this Leaflet.

NOTE: The EASA CS-ETSO (formerly JAR-TSO) system is not currently applicable to non-flight operational radios.

3 Approval Considerations

3.1 The approval considers that the radio equipment should function as intended but no 'credit' is given for the performance capability of the system. Substantiation is required to demonstrate that the equipment and its installation shall not affect the safety of persons or the safe operation of the aircraft and shall not interfere with other radio users.

3.2 Article 20(5)(a) of the United Kingdom Air Navigation Order 2005 (as amended) (contained in CAP 393) states 'All radio and radio navigation equipment installed in an aircraft registered in the United Kingdom, or carried on such an aircraft for use in connection with the aircraft shall be of a type approved by the CAA in relation to the purpose for which it is to be used…..' .

3.3 Radio equipment are generally common user, non-aircraft specific items which are CAA approved under a unique radio approval reference.

3.4 The following criteria shall be complied with and the appropriate evidence submitted with the approval application:

a) The radio frequency or frequencies used by airborne transmitters shall comply with the frequency allocations for Aeronautical Mobile use as referenced in the UK table of Radio Frequency allocations, or have specific agreement from the Radio Communications Agency.

b) The Radio Operators Licence required for the operation of the equipment shall not preclude airborne use. License issue and renewal applications and enquiries should be made to:

WT Radio Licensing
Surveillance & Spectrum Management
Directorate of Airspace Policy
K6 Gate 6
CAA House
45-49 Kingsway
London WC2B 6TE

Tel. 0207 453 6529
Fax. 0207 453 6546
E-mail radio.licensing@dap.caa.co.uk

c) The CAA may continue to approve these radios where it is determined that they are to be installed in an Annex II aircraft or aircraft excluded from EASA under Article I of EC Regulation No. 1592/2002.

Organisations applying for CAA approval for such radio apparatus shall provide adequate declarations and reports together with appropriate technical information; including statements of transmitter frequency range, spurious radiation, output power, frequency tolerance and modulation characteristics and evidence of radio regulatory approval, e.g. Department of Trade and Industry (DTI), Federal Communication Commission (FCC), BCAR Section A, Chapters A4-8 and A4-10, BCAR Section B, Chapters B4-8 and B4-10 refer.

d) The method of use and installation shall be approved by the CAA in accordance with BCAR Section A, Chapter A2-5 and A3-11,BCAR Section B, Chapter B2-5 and B3-11, AIL/0165 and Section R, Chapter 4 in order to ensure that the use of this category of radio apparatus shall not adversely affect the safe operation of the aircraft in which it is installed.

i) The organisation undertaking the design of the installation shall ensure that adequate Electromagnetic Compatibility (EMC) tests are performed. These tests should be performed with the aircraft engines running, and with all required electrical and avionic equipment which can be operated on the ground in operation. The installed radio equipment shall be operated over a range of frequencies throughout the operating band such as to establish that the level of radio and electrical interference is such as not to reduce the performance of any aircraft required system below a level compatible with the characteristic performance of the system. Systems that could be susceptible to interference include FADECs, engine computers, cockpit displays, required communication and navigation equipment and autopilot/flight director systems.

These tests shall be agreed with the Civil Aviation Authority.

ii) Where it is not practical to perform ground tests (for example, on aircraft with engines controlled by FADEC), it may be necessary to perform a flight test.

Such tests shall also be agreed with the Civil Aviation Authority.

e) Where safety is dependent on particular crew actions, a Flight Manual supplement must be provided to represent the limitations and procedures required for safe operation.

f) The electrical load analysis shall be amended to show that the non-flight operational loads do not compromise the busbar loading, generator ratings and battery duration.

4 Approved Organisation

4.1 Where a CAA or EASA approved design organisation has a recognised special need to install and/or use radio equipment that is not normally designated for civil aircraft use then this section applies.

4.2 This Leaflet is not eligible for use by organisations that do not hold an EASA design approval or, while still applicable, CAA design approvals.

4.3 This is not applicable to equipment operated within the civil aeronautical radio frequency bands.

4.4 Non-flight operational radios may be approved under Component procedures as defined in BCAR Section A, Chapter A4-8, paragraph 5.3 or BCAR Section B, Chapter B4-8, paragraph 5.3.

4.5 The following criteria shall be complied with:

a) Paragraphs 3.4 a), b), d), e) and f).

b) A tabular list of equipment is to be maintained by the design organisation and/or operator. The information contained in the table should be that shown in Table 1a and 1b.

c) The list of equipment should be available for inspection by the CAA on a regular basis.

d) Adequate declarations and reports together with appropriate technical information should be available for inspection.

e) The equipment installed, including the operational constraints for an approved installation, must be recorded on the modification control document. Approval for the equipment only applies to that modification.

f) The purpose and application of the equipment should be defined for the operational area and environment.

g) Monitoring and protection systems should be presented for approval with the equipment.

NOTE: For the purposes of this Leaflet an approved organisation is only that recognised under EASA Part 21, Subpart J, or, while still applicable, BCAR Section A8.

Issue: Date:

AIRCRAFT EQUIPMENT APPROVAL

NON-FLIGHT OPERATIONAL RADIO EQUIPMENT

TABLE 1a

Organisation:

EASA/CAA Approval No:

ITEM	EQUIPMENT MANUFACTURER	EQUIPMENT DESCRIPTION	EQUIPMENT TYPE NO.	DDP NO.	OUTPUT POWER	OPERATING FREQUENCY RANGE
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Distribution: CAA, Radio Communications Agency

Issue: Date:

AIRCRAFT EQUIPMENT APPROVAL

NON-FLIGHT OPERATIONAL RADIO EQUIPMENT

TABLE 1b

Organisation:

EASA/CAA Approval No:

ITEM	AIRCRAFT REGISTRATION	AIRCRAFT TYPE	OPERATIONAL CONSTRAINT	AUTHORISED	APPROVAL STATUS	EXPIRY DATE	REMARKS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

Distribution: CAA, Radio Communications Agency

Leaflet 11-32 VHF Communication Receiver Muting (Squelch)

(Previously issued as AIL/0077. This leaflet has not been technically revised but is scheduled to be reviewed in the near future.)

PURPOSE: This Leaflet recommends a threshold level for the Carrier-Override Circuit of Signal-to-Noise Ratio Squelch facilities. At present this parameter is not controlled by any Regulatory Minimum Performance Requirements.

REFERENCES: None.

1 Introduction

The UK operates a number of 2, 3 and 4 station off-set carrier ('Climax') VHF communication services to achieve wider area coverage for particular channels.

The frequency off-sets of the individual ground transmitters are as follows

No. of Stations	Frequency Offsets (kHz)			
2	+5-5	-5		
3	+7.5	0	-7.5	
4[1]	+7.5	+2.5	-2.5	-7.5
4	+7.5	0	-7.5	plus a fourth transmitter on one of these off-sets

1. Not yet operational

It is therefore possible in the signal overlap area between such transmitters to experience beat notes of 5, 7.5, 10 or 15 kHz. This beat note may then be detected as noise by signal-to-noise ratio squelch circuits and could, without the normally incorporated carrier-override squelch circuit, lead to receiver muting.

The threshold level, however, of such carrier-override squelch circuits is not adequately specified by individual manufacturers and is not a parameter controlled by UK, foreign or international Minimum Performance Specifications.

2 Proposal

In order to ensure that optimum communication is maintained in these signal overlap areas it is essential that the threshold level of the carrier-override squelch circuit is not set too high.

It is proposed, therefore, that all VHF communications receivers incorporating signal-to-noise ratio (automatic) squelch be adjusted so that no more than 12 microvolts of r.f. signal are required at the receiver input to deactivate any carrier-override squelch circuit.

This should be proved, and where necessary adjustment made, using the 12 microvolt r.f. signal modulated at 5, 7.5, 10 and 15 kHz.

3 Minimum Performance Requirements

The UK Minimum Performance Requirement for airborne VHF Communication Transmitter-Receivers (CAP 208 Vol 1 Part 4) will be appropriately amended and the amendment's existence brought to the notice of those foreign manufacturers and standards organisations which are likely to be affected.

Leaflet 11-33 Introduction of 25 kHz Spacing to Aeronautical VHF Communications Band

(Previously issued as AIL/0081. This leaflet has not been technically revised but is scheduled to be reviewed in the near future.)

PURPOSE: This Leaflet gives details of the CAA proposals in relation to the introduction of 25 kHz channel spacing in the Aeronautical Communications Band 118 MHz to 136 MHz.

REFERENCES: ICAO Annex 10, Vol. 1, Part 1, paragraph 4.7.1.1; CAA Airworthiness Notice No. 91 Issue 3 dated 25 October 1994 (now cancelled); CAA Aeronautical Information Circulars 135/1975, 70/1977, 18/1979 and 56/1980; CAA CAP 208 Vol 1.

1 Introduction

Information Circular 135/1975 stated the intention within the European Region to implement the ICAO frequency assignments within the band 118-136 MHz on a 25 kHz channel spacing basis, in order to double the number of available channels. Owners and operators needing such frequencies were advised to ensure that the correct equipment was installed in their aircraft. The ICAO Standard published in 1974 established performance criteria for equipment operating where 25 kHz spacing had been implemented, and in 1974 the Minimum Performance Specifications in CAP 208 Vol. 1 for both airborne transmitters and receivers, were appropriately amended.

The ICAO Standard also established the criteria for equipment with channel spacing greater than 25 kHz which might continue to be operated after 25 kHz spacing is introduced. In the case of an airborne station, the Standard requires that the radio frequency of transmission shall not vary more than plus or minus 0.003% from the assigned frequency (approximately 4 kHz) and the CAA intends this tolerance to apply from 1 January 1981. This was advised in CAA Aeronautical Information Circular 70/1977.

Aeronautical Information Circular 18/1979 warned of the impending introduction of 25 kHz spaced channels within the UK, and the first of such frequencies to be assigned for civil aviation use commenced operation in July 1980.

This Leaflet contains revised information in respect of implementation and equipment which has been approved.

2 Applicability

a) Any new installation after 1 January 1981 should be of a type where the manufacturer's specification declares compliance with the new Standard in respect of transmitter frequency tolerance (see Appendix).

b) In respect of existing installations, the CAA is monitoring aircraft transmissions to determine the extent to which the 0.003% tolerance is being exceeded. This, together with operating experience, will permit a review in January 1983.

c) The CAA does not intend to withdraw the approval of any radio equipment currently installed in UK registered aircraft until at least the 1983 review is completed.

3 Implementation

The Appendix lists that equipment which has been approved to date by the CAA as meeting, or in certain cases as being capable of being adjusted to meet, the required plus or minus 0.003% transmitter frequency tolerance throughout the environmental range declared by the manufacturer.

Operators using the earlier VHF Communications equipment which does not comply with the latest performance specification or not having the full 720 channels may suffer increasingly from the following problems:

a) Interference from transmissions on adjacent 25 kHz channels.

b) Inconvenience through not being able to operate on a particular frequency.

c) A high pitched 'beat' note when receiving a multi-carrier (Climax) transmission.

Repair and overhaul organisations should warn their customers when equipment under test does not meet the new transmitter frequency tolerance. Where maintenance/overhaul manuals specify a tolerance greater than 0.003% the equipment should be adjusted, where reasonably possible, to the new 0.003% tolerance.

Equipment in which the transmitter has been rendered inoperative because it fails consistently to meet the Standard may continue to be used for reception purposes.

Emergency transmitters operating solely on 121.5 MHz in the VHF band are permitted to continue working to the earlier tolerance limit of ± 0.005%.

The frequency tolerance of all CAA approved transmitters manufactured by the following companies is ± 0.003% or better.

RCA

WULFSBERG

T A McMULLIN

EDO-AIRE

AVIONICS SYSTEMS HEATHROW

TERRA CORPORATION

It can be assumed that all VHF transmitters approved by the CAA subsequent to the date of this leaflet will meet the plus or minus 0.003% tolerance.

Appendix

EQUIPMENT APPROVED BY THE CAA

BENDIX AVIONICS[1]

Type Ref	Tx Freq Tolerance ±
RT-241A	.003%
RT-241B	.003%
CN-2011A	.003%
CN-2012A	.003%
CN-2013A	.003%
PA-2018A	.003%
RTA-41( )	.003%
RTA-42A	.003%
RTA-43	.003%

ROCKWELL COLINS[1]

Type ref	Tx Freq Tolerance ±
VHF-20	.0015%
VHF-20A	.0015%
VHF-20B	.0015%
VHF-250	.003%
VHF-251	.003%
VHF-250E	.003%
VHF-251E	.003%
618M-2	.003%
618M-3	.003%
618M-3A	.003%

NARCO[1]

Type Ref	Tx Freq Tolerance ±
COM-10	.003% }
COM-11	.003% }
COM-10A	.003% } or can
COM-11A	.003% } be
COM-11A-H	.003% } retuned
COM-110	.003% } (SB 17)
COM-111	.003% }
COM-111H	.003% }
COM-120	.003%
COM-120/20	.003%
COM-111B	.003%
COM-11B	.003%

KING RADIO CORPORATION[1]

Type ref	Tx Freq Tolerance ±
KTR-905	.003%
KTR-900A	.003%
KTR-9100	.001%
KTR-9100A	.0015%
KX-170BE	.003%
KX-170B	.003%
KX-175BE	.003%
KX-175B	.003%
KY-195B	.003%
KY-196	.0015%
KY-197	.0015%
KY-92	.0015%
KX-145	.003%

CESSNA (ARC)[1]		**BECKER**[1]	
Type Ref	Tx Freq Tolerance ±	Type ref	Tx Freq Tolerance ±
RT-385A	.003%	AR7	.003%
RT-485A	.003%	AR2009	.003%
RT-1038A	.003%	AR2010	.003%
RT-328T	.003%	AR2011	.003%
RT-428A	.003%		
RT-328D	.003%		
RT-831A	.003%		
RT-131B	.003%		

1. The manufacturers' specification for the frequency toleration of all their earlier transmitters is ± .005% or greater.

Leaflet 11-34 LA Class 3 Radio Equipment

(Previously issued as AIL/0086. This Leaflet has not been technically revised but is scheduled to be reviewed in the near future.)

PURPOSE: This Leaflet is to advise all concerned of the changes in procedures related to the installation and maintenance of aircraft radio equipment approved for use in light aircraft.

REFERENCES: BCAR Section R, chapter R3-3.
CAP 208 Vol. 2.

1 Introduction

The purpose of this Leaflet is to introduce information concerning the approval of Light Aircraft Radio Equipment and its subsequent installation and maintenance in aircraft with a maximum all up weight not exceeding 5,700 kg.

The CAA has reviewed its policy with regard to Light Aircraft Radio Equipment with a view to recognising more clearly the limitations of radio equipment which does not qualify for V.C., W.R., or LA Class 1 approval. The following decisions have been taken.

a) No additional equipment will be approved in the LA Class 2 category, with the ultimate object of discarding that classification.

b) Since, to qualify for CAA approval, LA Class 3 radio equipment is required to be inherently safe and comply with performance requirements related to Frequency Stability and Spurious Emissions only, the CAA is relaxing its requirements for the installation of such equipment.

Consequently, the CAA will not concern itself with whether or not such equipments perform properly, either at installation or on a continuing basis, provided that they do not interfere with other equipment on that, or other, aircraft.

This change in policy affects the procedures as follows:

The CAA will still require to be notified of a modification to install LA Class 3 equipment in order to satisfy itself that the installation is intrinsically safe. Although it is hoped that installers will ensure that the aerial is mounted in an approved location the CAA will not require that it shall be. When satisfied, the CAA will continue to issue, or amend, the Certificate of Approval for the Radio Station (AD 917) as heretofore. There will be no requirement for scheduled maintenance on the installation other than that of security, intrinsic safety and frequency tolerance checks on transmitter crystals. The ANO will be amended to permit an engineer licensed in some categories other than radio to issue certification, having ensured that compliance with those requirements have been met.

This procedure will not apply to:

a) Equipment classified LA Class 1 which is not being used to satisfy a mandatory requirement.

b) Equipment classified as LA Class 1 but installed in such a manner (e.g. unapproved aerial location) that the installation itself has been classified LA Class 3. In this

context no further **installations** will be approved as LA Class 3 and attempts will be made to reduce the number of such existing installations.

A pre-requisite for approval of the installation of equipment classified as LA Class 1 is that the associated aerial location has been approved by the CAA. The approval status of the aerial location will be considered on this basis if LA Class 3 equipment is subsequently replaced by that in the LA Class 1 category.

The scheduled maintenance requirements for LA Class 1 radio equipment are unchanged.

Leaflet 11-35 Radio Altimeters for Helicopters

(Previously issued as AIL/0114. This Leaflet has not been technically revised but is scheduled to be reviewed in the near future.)

PURPOSE: This Leaflet provides information and guidance concerning the installation of a Radio Altimeter audio voice warning system.

REFERENCES: BCAR Paper G815
ANO Schedule 4 Scale EE

1 Introduction

1.1 To meet the requirements of BCAR Section G, Chapter G6-1, (Paper G815) and Schedule 4 Scale EE of the ANO, certain helicopters will need to be equipped with a Radio Altimeter and display indicator providing a voice and visual warning of descent below a pre-set height above surface level. This Leaflet provides guidance material on the requirements of BCAR Paper G815.

1.2 Whilst most current Radio Altimeters include a height warning light, this is not considered sufficient for alerting a pilot to an inadvertent descent as his attention may be directed away from the indicator at the critical time. It is for this reason that an audio low height warning is considered necessary. The warning must be distinguishable from other warnings and should therefore be a clear and concise voice message.

2 Requirement

Schedule 4 of the ANO has been amended for public transport rotorcraft to require, with effect from 1 August 1985, the installation of Radio Altimeters. Additionally with effect from 1 February 1986, an audio warning will be required, operating at a pre-set height and a visual warning at a pilot selectable decision height. This is mandatory when flying for more than a total of 3 minutes over water in any flight. BCAR Section G, Chapter G6-1 is currently being amended to reflect this change by means of Paper G815.

3 Warning Format

3.1 In order to gain acceptance, the audio warning requires certain characteristics. They are:

a) The warning should be unique.

b) It should not be inhibited by any other audio warnings.

c) The urgency of the warning should be adequate to gain attention but not such as to cause undue annoyance during deliberate descents through the datum height.

3.2 Research activity has indicated that the characteristics above can be satisfactorily met if the warning format incorporates the following features:

a) A unique tone should precede the voice message. A further tone after the voice may enhance uniqueness and attention-getting without causing undue annoyance.

b) The perceived urgency of the tone and voice should be moderately urgent.

c) The message should be compact as opposed to lengthy, provided the meaning is not compromised, e.g. 'One fifty feet' as opposed to 'One hundred and fifty feet'.

d) An information message is preferable (e.g. 'One hundred feet'). Messages such as 'Low height' do not convey the correct impression during deliberate descents through the datum height.

e) Command messages (e.g. 'Pull up, Pull up' are not acceptable unless they relate specifically to height monitoring (e.g. 'Check height').

f) The volume of the warning should be adequate and not variable below an acceptable minimum value.

3.3 Every effort should be made to prevent spurious warnings.

4 Altitude Trigger

4.1 The height at which the audio warning is triggered by the radio altimeter should be such as to provide adequate warning for the pilot to take corrective action. It is envisaged that most installations will adopt a height in the range of 100 – 160 ft. It will not be permissible for the datum to be altered in flight.

4.2 The pre-set height should not be set such that it will coincide with commonly used instrument approach minima (i.e. 200 ft). Once triggered, the message must sound within 0.5 seconds.

4.3 The voice warning should be triggered only whilst descending through the pre-set height and be inhibited whilst ascending.

5 Approval Considerations

5.1 All Radio Altimeters shall be CAA approved in accordance with BCAR Section A Chapter A4-10, and conform to either CAP 208 Vol. 1, Pt. 13, EUROCAE ED-30, FAA TSO C87 or RTCA DO 155.

5.2 All automatic voice alerting devices shall be CAA approved in accordance with either the Accessory Procedure or Component Procedure of BCAR Section A, Chapter A4-8.

6 Installation Aspects

6.1 The airframe installation shall be approved under the modification procedures of BCAR Chapter A2-5.

6.2 A single Radio Altimeter indicator is permissible provided it is usable by both pilots.

6.3 Radio Altimeters with digital only displays will not be acceptable.

6.4 A suitable 'DH' amber light is acceptable as satisfying the ANO requirement for a 'Visual Warning'.

Leaflet 11-36 Certification and Installation of TCAS 1 Equipment and Other Similar Non-Mandatory Collision Avoidance Systems[1]

(Previously issued as AIL/0186. Although this Leaflet has not been technically changed, it has been updated and should be read in its entirety.)

PURPOSE: This Leaflet provides guidance for the certification and installation of TCAS 1 type equipment. A Flight Manual/Pilot's Operating Handbook (POH) supplement template is provided in Appendix 1 which, when completed, should be submitted to the Flight Manuals and MMEL Unit, Aviation House, Gatwick for approval. Guidance on ground and flight testing is given together with modification classification guidelines.

REFERENCES: JAR-21 Certification Procedures for Aircraft, and Related Products & Parts

JAR-23 Normal, Utility, Aerobatic and Commuter Category Aeroplanes

JAR-27 Small Rotorcraft

JAR 29 Large Rotocraft

JAR-TSO Joint Technical Standard Order (JTSO C147 - pending issue)

FAA TSO C147

Air Navigation Order 2005 (CAP 393)

BCAR Sections A8-1, A8-2, A8-8 and A8-9

AIC 37/2006 (Yellow 199)

BCAR Section K

BCAR Section G

CAA CAP 761 - Operation of IFF/SSR Interrogators in the UK - Planning Principles and Procedures

CAP 747 - Mandatory Requirements for Airworthiness, Generic Requirements (GRs) Nos. 4 and 6

CAP 562 - CAAIP Leaflet 11-37

1 Introduction

This Leaflet is issued in response to the increasing demand for non-mandatory Traffic Collision Avoidance System installations (TCAS 1 and TAS types).

These types of systems provide 'Traffic Alerts' (TA), including approximate bearing and range information. Unlike ACAS II (TCAS II Version 7), TCAS 1 does not provide Resolution Advisories (in the form of vertical guidance to the pilot). The BF Goodrich, Skywatch System is similar in operation to TCAS 1 and for the purposes of this Leaflet it may be considered a TCAS 1 type system.

1. Excludes passive Collision Avoidance Systems that do not transmit signals in order to interrogate nearby SSR transponders, and ACAS II systems (carriage of ACAS II is mandatory for certain aircraft). The term Traffic Advisory System (TAS) may also be used to describe TCAS 1 'type' systems.

The guidance provided in this Leaflet is intended to assist the design organisation, maintenance organisation and aircraft operators to determine the certification considerations required to demonstrate compliance with the applicable airworthiness requirements. This Leaflet also provides some guidance on the installation considerations.

2 Airworthiness Approval

When assessing the installation of TCAS 1 installations the following needs to be considered:

2.1 Equipment Approval Issues

TCAS 1 type systems are not required to be installed on an aircraft to meet any airspace or operational requirement. These systems do, however, transmit and receive radio signals and therefore the equipment must be CAA approved or have a JTSO authorisation, before installation on an aircraft.

2.2 Power Supply Considerations

The equipment should not be connected to the aircraft's emergency or battery supported busbar.

2.3 Performance Considerations

Good bonding and positioning of the TCAS 1 antenna(s) is essential to ensure correct operation of the system, and non interference to other aircraft systems.

The performance demonstration needs to include appropriate ground testing and possible flight evaluation. The ground test should demonstrate correct bearing and range of targets in each quadrant. An EMC (Electromagnetic Compatibility) test should be performed to ensure that the installed system does not affect existing aircraft systems. A flight evaluation is at the discretion of the installer, and may be conducted using targets of opportunity to confirm the correct operation of the system.

2.4 Flight Manual/Pilot's Operating Handbook (POH)

The modification will require a Flight Manual/Pilots Operating Handbook (POH) Supplement which will need to address, at least, the following:

Limitations:

Navigation must not be predicated on the use of the TCAS 1 display.

Normal Procedures:

If a 'Traffic Alert' (TA) is received, the pilot should not initiate a manoeuvre based on the display alone, without first visually acquiring the target .

Emergency Procedures:

None

Abnormal Procedures:

None

Performance:

None

A Flight Manual/Pilot's Operating Handbook (POH) Supplement template for a 'typical' TCAS 1 type installation is contained in Appendix 1 to this Leaflet.

The Design Organisation should submit the Flight Manual/Pilot's Operating Handbook (POH) Supplement, as detailed in Appendix 1, duly completed, to the Flight Manuals and MMEL Unit, Aviation House, Gatwick for approval.

Guidance on the compilation of a Flight Manual/Pilot's Operating Handbook (POH) supplement is provided in Appendix 2 to this Leaflet.

2.5 Electrical Load Analysis

The installation of TCAS 1 will affect the Electrical Load Analysis, and may affect compliance with CAP 747 GR Nos. 4 and 6. Continued compliance with these GRs will therefore need to be demonstrated.

2.6 Structural Analysis

A structural analysis of the installation, including the TCAS antenna(s) and their mountings must be conducted.

3 Classification of Modification

A TCAS 1 type installation may be classified as **MINOR** provided the following conditions are satisfied:

a) The company applying for the modification holds an 'E2' CAA Design Approval and their scope of approval supports this type of work (see Note 1)

b) The Flight Manual/Pilot's Operating Handbook (POH) Supplement requires no additional limitations, other than those listed in the Flight Manual/Pilot's Operating Handbook (POH) Supplement template given in Appendix 1.

c) There is no effect to the existing instruments on the Flight Deck, by installation of the Traffic Display. For example, if the Traffic Display displaces another instrument, causing an overall change to the flight deck, an assessment of the flight deck will be required by Flight Department. Also, if the Traffic Display is located outboard of the main instrument panel by means of a bracket, or if it is located on the glare shield, a Flight Department assessment may be required.

d) Interfacing of TCAS 1 with existing onboard sensors does not introduce possible failures to existing aircraft systems. An assessment may be required if existing systems are affected. Example: failure (signal grounded) of an altitude input to TCAS 1. If this input also supplies altitude information to other aircraft systems, a failure introduced by TCAS 1 could affect existing aircraft systems. (Pilot's display of barometric height could be affected, transponder output of Mode C Altitude could be affected).

e) TCAS 1 aurals do not inhibit any other aurals.

NOTE: The time taken to assess the modification documents provided by a non 'E2' CAA Design Approved Organisation is likely to exceed one hour of a Surveyor's time, therefore as stated in AN 25, a minor classification is not appropriate.

4 Approval to Operate an IFF/SSR Interrogator

All TCAS 1 or TAS systems that transmit interrogation signals on 1030 MHz require a separate approval to operate from the National IFF/SSR Committee. Operators should obtain such an approval prior to commencing installation and flight trials. Applicants should note that although there is currently no charge, TCAS 1 approvals can take up

to 4 months to process. Further details can be found in AIC 37/2006 (Yellow 199), TCAS I Systems Approvals Policy, and in CAP 761, Operation of IFF/ISSR Interrogators in the UK: Planning Principles and Procedures. Enquiries and applications for approval should be submitted to:

NISC Secretariat
K6 G6
CAA House
45-59 Kingsway
London WC2B 6TE

Tel. 020 7453 6536
E-mail: nisc@dap.caa.co.uk

For Airworthiness certification aspects, further information may be obtained from:

Engineering Department
Aviation House
Gatwick
West Sussex
RH6 0YR

Tel. 01293 57 3132

For Flight Manual/Pilot's Operating Handbook (POH) and MMEL aspects, further information may be obtained from:

Flight Manuals and MMEL Unit
Aircraft Certification Department
Aviation House
Gatwick
West Sussex
RH6 0YR.

Tel. 01293 57 3187 or 01293 57 3189.

Appendix 1

TEMPLATE FOR TCAS 1

FLIGHT MANUAL SUPPLEMENT/PILOT'S OPERATING HANDBOOK (POH)

<<Aircraft Type>> Flight Manual (or POH as appropriate) Reference <<XXXX>>

<<Company Name>>

FLIGHT MANUAL/PILOT'S OPERATING HANDBOOK (POH) SUPPLEMENT <<x>> ISSUE <<y>>

Registration Mark:..... Serial Number .....

TCAS 1

Modification Number <<XXXX>>

ADDITIONAL LIMITATIONS AND INFORMATION FOR CERTIFICATION

The limitations and information contained herein either supplement or, in the case of conflict, override those in the Flight Manual/Pilot's Operating Handbook (POH).

LIMITATIONS

Navigation must not be predicated on the use of the (insert name of TCAS 1 type system) display.

NORMAL PROCEDURES

If a 'Traffic Alert' (insert aural message here, for example 'Traffic, Traffic') is received, the pilot should not initiate a manoeuvre based on the display alone, without first visually acquiring the target.

EMERGENCY PROCEDURES

None

ABNORMAL PROCEDURES

None

PERFORMANCE

None

To be inserted in the Flight Manual/Pilot's Operating Handbook (POH) and the record sheet amended accordingly.

Page 1 of **CAA Approval** **Date:**

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Appendix 2

NOTES ON THE PRODUCTION OF FLIGHT MANUAL / PILOT'S OPERATING HANDBOOK (POH) SUPPLEMENT

a) The supplement should be written to fit the size and style of the Flight Manual/Pilot's Operating Handbook (POH) supplied by the aircraft manufacturer and to which it refers, preferably without resorting to photo-reduction.

b) A company logo can be included if desired.

c) The supplement must be uniquely identifiable within the referenced Flight Manual/ Pilot's Operating Handbook (POH).

d) A log of supplements should already be provided in the front of the manual/handbook. This log should be amended to reflect the additional supplement. Where no log of supplements exists, the design organisation/installer will provide one.

e) Aircraft identification (Registration etc.) will be added to the copy which goes in the aircraft copy of the Flight Manual/Pilot's Operating Handbook (POH). Where several aircraft on the same Flight Manual/Pilot's Operating Handbook (POH) document have the same equipment, copies of the same Flight Manual/Pilot's Operating Handbook Supplement may be issued to each aircraft and annotated with the aircraft's identification accordingly.

f) If a supplement is submitted for approval for a specific aircraft registration and/or serial number, the supplement will only be approved for that particular aircraft.

g) Any information contained in the system users manual that addresses: the system's Limitations, Normal Procedures, Emergency Procedures, Abnormal Procedures and/ or Performance, should be detailed in the Flight Manual/Pilot's Operating Handbook (POH). Provision of this information in the Flight Manual/Pilot's Operating Handbook (POH) by referencing the system's users manual should also be carried out with the guidance contained in AC 25.1581-1 & AMJ 25.1581.

h) When approved, one copy of the supplement should be placed, as appropriate in the aircraft's Flight Manual/Pilot's Operating Handbook.

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Leaflet 11-37 Structural Attachment of Aerials

(Previously issued as AIL/0025)

PURPOSE: This Leaflet provides information on the procedure to be adopted when fitting aerials to aeroplanes and helicopters.

REFERENCES: BCAR/JAR/FAR/CS Design and Construction Codes

Several instances have been reported of aircraft skin cracking as a result of inadequate reinforcement of structure following the fitting of blade type aerials. In one instance the cracking extended to include frame, stringer and doubler.

Installers must ensure when fitting aerials that adequate structural strength is provided. Where airframe manufacturer's modification schemes are not utilized, the extent of the structural substantiation necessary, should be discussed with the appropriate Regional Office Surveyor.

It should be noted that the aerials of different manufacturers vary in design and that together with the different aerial locations on the aircraft, varying mounting techniques will be required to ensure adequate structural strength is achieved.

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Leaflet 11-38 A Simplified Means of Approval for Airframe Structural Repairs Design

(Previously issued as AIL/0180)

PURPOSE: To provide information on the procedures acceptable to the CAA for approval for airframe structural repair design on aircraft operating under CAA Regulatory Approval (i.e. Annex II to EU Regulation (EC) No. 1592/2002.

REFERENCES: BCAR Section A and B Chapter 5-3 paragraph 2.1
BCAR A and B Chapter 6-7 paragraph 2.1.1
Airworthiness Notice No. 14, Appendix 5 (to be published 29 September 2006)

1 Introduction

A revised and simplified means of repair design approval has been developed following a review of the procedures within the Airworthiness Division. The procedure places more reliance on repair approval granted by foreign regulatory authorities and does not necessitate a change to any requirement. For the purposes of this document, 'foreign' means non-UK.

2 Background

There are currently two chapters within BCAR A and B that define the CAA's requirements on repair design approval to aircraft.

a) **BCAR Section A and B Chapter 5-3 paragraph 2.1** allows manuals containing information necessary for the repair of aircraft, such as the Structural Repair Manual (SRM), to be certified and published under the authority of the appropriate Approved UK Type Design Organisation (TDO) or in the case of foreign TDOs, under the local regulatory process. Repairs in the SRM, therefore, do not need to be approved directly by the CAA, nor do amendments to the SRM. There has been no change to this procedure.

b) **BCAR Section A and B Chapter 6-7 paragraph 2.1.1** requires that repairs shall be carried out in accordance with .... 'the approved Manuals, drawings and schedules related thereto, **and any other documents required or recognised by the CAA.**' In this context 'approved' means certified by the UK TDO, or in the case of foreign TDOs, under the local regulatory process.

The change to the CAA's procedure is in the interpretation of the bold text above.

3 Revised Procedure

It is now the intention that, for repairs designed by the TDO, a document approved under the local regulatory process is considered by the CAA as '...documents..... recognised by the CAA.'

Repairs designed by foreign and domestic TDOs need to be considered separately:

- **Repairs of Foreign TDO origin.** Where the repair has been designed by the foreign TDO responsible for the type, documentation for the repair approved under the local regulatory process (e.g. on behalf of the FAA by the US TDO Designated Engineering Representative (DER) using the FAA Form 8110-3) will be considered as a recognised document in accordance with BCAR B6-7, paragraph 2.1.1.
- **Other foreign repairs.** Where the repair has been designed by a foreign organisation that is not the TDO for the type and has been approved under the local regulatory process, it will need to be investigated by the CAA. However, appropriate credit will be given for the domestic certification in the CAA validation process. STC holders fall under this category.
- **Repairs of UK TDO origin.** As the CAA is the local regulatory authority, all repairs may be processed under the normal BCAR Section A procedures. However, as an alternative, if the UK TDO wishes to avoid the potential delay associated with seeking CAA approval of each repair, repairs may be associated with the SRM. Such associated repairs may be certified under the authority of the TDO (see BCAR A5-3 paragraph 2), providing the TDO's Terms of Approval permit the design of repairs and there are applicable procedures referenced in the Company's Exposition. Note that these associated repairs must be subject to the same airworthiness controls as the SRM.
- **Other UK repairs.** For UK Approved Design Organisations who are not TDO, and who are taking full design responsibility for the repair, the current procedures of BCAR A2-5 still apply.

4 General Points

Apart from the normal auditing of the UK TDO, the CAA reserves the right to directly investigate any repair from the TDO (UK or foreign) in exceptional circumstances. Examples of this might be:

- if survey of an aircraft raises questions about a repair's suitability;
- if the repair is novel or very extensive;
- if the repair is found to conflict with the applicable CAA requirements.

Repairs may be approved and aircraft released to service while awaiting any required damage tolerance evaluation. Up to a 12 month period for evaluation to be completed and for incorporation into the Aircraft Maintenance Schedule (AMS) is acceptable. There must be a procedure for any resulting inspections to be placed in the AMS. Under normal circumstances aircraft would not be released into service without the requisite approval documentation being in place. This would include documents such as 8110-3 or Repair Assessment Sheet (RAS), but not a 'No Technical Objection' (NTO).

A statement of 'No Technical Objection' from the TDO does not constitute approval of a repair, although this may be necessary supporting documentation for repair approval.

5 Repairs to Aircraft Operating under EASA Design Control

Reference should be made to Airworthiness Notice No. 14, Appendix 5 - Acceptable Data for use by Part-145 Organisations.

Leaflet 11-39 US Acceptance of UK Design Change Approval Related to Transport Category Aeroplane Repairs and Alterations

(Previously issued as AIL/0188)

PURPOSE: To advise UK operators and other interested organisations of a special arrangement for US acceptance of CAA approved design data.

REFERENCES: UK/US Bilateral Aviation Safety Agreement Implementation Procedures for Airworthiness (BASA IPA) dated 23 May 2002.

1 Introduction

This Leaflet is to inform owners, operators, designers, modifiers, and maintainers of aircraft of a special arrangement between the CAA and the Federal Aviation Administration (FAA). This special arrangement provides for the FAA acceptance of CAA approved design data associated with repairs and minor modifications on transport category aeroplanes eligible for import into the US from the UK. It does not extend to the mutual acceptance of repair designs proposed for aircraft in-service in the UK or US.

2 Background

On 23 May 2002 the CAA and FAA agreed the provisions of the BASA IPA between the UK and US. The purpose of the BASA IPA is to define the civil aeronautical products, parts, and appliances eligible for import into the US and the UK, and to define the interface requirements and activities between the authorities for the import and continued support of those civil aeronautical products.

These procedures do not currently cover the FAA acceptance of CAA approved design changes to US State of Design transport category aeroplanes. As a consequence UK owners and operators of such aircraft have had to generate FAA approved data to fulfil leasing conditions and/or to enable the aircraft to be eligible for a US Certificate of Airworthiness (C of A). Obtaining FAA approval has been perceived as a paperwork exercise with no contribution to aircraft safety. After representations from UK operators the CAA and FAA were motivated to decrease the unnecessary duplication of approving repair and minor modification data.

In February 2003 the FAA sent a team to evaluate the comparability of the CAA design change system with the US repair and alteration data approval system. The conclusion of the FAA team was to recommend FAA acceptance of CAA approved design data for repairs and minor modifications as applied to US State of Design transport category aeroplanes. This has culminated in a special arrangement in accordance with Section V of the BASA IPA.

3 Applicability

a) The following are the procedures for US acceptance of the CAA approved design change data, i.e. design approval of repairs and minor modifications (alterations), for the purpose of US airworthiness certification of US State of Design aeroplanes returning to US registry[1]. This special arrangement applies to design change data that do **not** constitute a major change rising to the level of an amended type certificate or supplemental type certificate.

b) This arrangement applies to approvals executed under the UK aircraft certification system as well as future approvals executed by the CAA on behalf of the European Community as contracted by the European Aviation Safety Agency (EASA).

4 Design Approval of Repairs and Alterations

4.1 CAA Approvals

Under the terms of this arrangement, the CAA, acting through an authorised employee of the CAA or a UK approved design organisation, may approve design changes or any portion of the data used to support the repair or minor modification of a US State of Design transport category aeroplane. Findings of compliance or approvals issued by an authorised person shall be performed in accordance with the approved design organisation's scope of authority and the organisation's CAA approved Engineering Procedures Manual/Exposition.

4.2 CAA Responsibilities

a) The CAA approved design organisation shall provide data packages that contain the following information:

- definition of the repair or minor modification;
- its classification (major/minor);
- its certification basis;
- method of approval;
- indication of approval; and
- additional maintenance requirements.

b) The CAA will sign a certifying statement attesting that the reviewed data was approved under the CAA approved process:

The data identified in this document have been examined and were approved under the authority of the Civil Aviation Authority of the United Kingdom. Additional maintenance requirements that must be incorporated into the aircraft maintenance program are identified within the approved data.

Name (Print):

Signature:

Date:

The above statement will normally be signed by the CAA surveyor responsible for the organisation which compiled the data package.

1. Other Authorities/Organisations may elect to recognise the FAA Approval of this data arising from this special arrangement.

c) The certifying statement will accompany each returning aeroplane's records. Alternatively, the statement can be incorporated into the leading page of the aeroplane handback record as long as it is reviewed and signed by the CAA.

d) The CAA will provide the FAA with timely information and assistance regarding any specific questions related to a design approval package accepted under the terms of this arrangement.

5 Acceptance of Repair Design Approvals

5.1 FAA Responsibilities

a) The FAA may accept the following design change data approvals for transport category aeroplanes presented for US airworthiness certification:

   i) Repair and alteration design approvals issued by either the UK CAA or an appropriately authorised UK CAA approved design organisation on transport category aeroplanes where the US is the State of Design for the aeroplane. Such data is considered to be "FAA approved" under the BASA IPA.

b) The FAA or its designees will accept data packages that meet the requirements of paragraph 4.2 and will consider data generated in accordance with this special arrangement as approved by the FAA without any other required actions. The FAA retains the right to request a review of any data approved through the CAA/EASA system.

c) The FAA will develop and circulate appropriate publications to:

   i) inform the public of the terms of this arrangement, and

   ii) advise FAA employees and designees of appropriate procedures.

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Leaflet 11-40 Acceptance of Ex-UK Government Gipsy Major 8 Engines and Fixed Pitch Fairey Reed Metal Propellers

(Previously issued as AIL/0177. This Leaflet has not been technically revised but is scheduled to be reviewed in the near future.)

PURPOSE: This Leaflet provides information on the acceptance of ex-UK Government Gipsy Major 8 engines and Fairey Reed metal propellers for installation on UK registered DH Chipmunk aircraft.

REFERENCES: Rolls-Royce Technical News Sheet TNS GE No. 27 dated 24 October 1974.
Airworthiness Notice No. 4 (AN 4)
Airworthiness Notice No. 16 (AN 16)
Airworthiness Notice No. 35 (AN 35) issue 17 dated 16 March 1993.

The following information is additional to that given in the above references:

1) In order for military engines/propellers to be used in aircraft with a UK Certificate of Airworthiness, acceptance by the CAA is normally required in accordance with AN 16. However, AN 16 approval can be waived for the subject engines/propellers provided the following information is supplied prior to acceptance of an engine or propeller:

   a) Statement of serviceability from the UK military body from which the engine/ propeller was obtained.

   b) Statement of the engine/propeller build standard from the UK military body or from a CAA approved overhaul organisation, in order to verify that all modifications embodied are CAA approved and that all CAA mandatory modifications have been embodied.

   c) Statement from the UK military body or from a CAA approved overhaul organisation that all engine/propeller repairs are CAA approved.

   d) Engine log book. It must be verified that all mandatory inspections have been complied with.

2) Rolls-Royce TNS GE No. 27 states that the civilian TBO for the Gipsy Major 8 Mk 2 is 1500 hours. This TBO can be exceeded subject to meeting the requirements of AN 35. It should be noted however, that paragraph 3.1.2(c) of this AN states:

   'The engine must have been operated in an aircraft registered in the UK for a period of at least 200 hours immediately prior to completing the engine manufacturer's overhaul period recommendations'.

   For the subject engines, the requirement of this paragraph can be waived. This allows engines with a TSO up to 2250 hours (this being the MOD overhaul period limitation) to be accepted by the CAA subject to all other requirements of AN 35 and Section 1 of this Notice being satisfied.

1 All Gipsy Major 8 modifications up to and including 4037 have CAA approval. For engines incorporating modifications later than modification 4037, application shall be made to the CAA preferably through the Type Certificate

holder for approval or confirmation of civil approval of the modification(s). This may involve the applicant being charged for the investigation.

2 Propellers approved for use on the civil Chipmunk aircraft are stated in AN 4.

NOTE: This Leaflet is applicable to UK Government engines, whether obtained directly from the UK Government or from another source.

Leaflet 11-41 Acceptance of Ex-UK Government Lycoming IO 360-A1B6 Engines and Variable Pitch Propellers

(Previously issued as AIL/0181. This Leaflet has not been technically revised but is scheduled to be reviewed in the near future.)

PURPOSE: This Leaflet provides information on the acceptance of ex-UK Government Lycoming engines and Hartzell propellers for installation on UK registered Bulldog aircraft.

REFERENCES: Textron Lycoming Service Instruction No 1009AN
Airworthiness Notice No. 16 (AN 16)
Airworthiness Notice No. 35 (AN 35) Issue 17

The following information is additional to that given in the above references:

1 Acceptance onto UK Register

In order for military engines/propellers to be used in aircraft with a UK Certificate of Airworthiness, acceptance by the CAA is normally required in accordance with AN 16. However, AN 16 approval can be waived for the subject engines/propellers provided the following information is established by the owner's/operator's JAR-145 maintenance organisation or an appropriately type rated CAA Licensed Aircraft Engineer, prior to acceptance of an engine or propeller:

a) Serviceability, based on an appropriate statement from the UK military body from which the engine / propeller was obtained.

b) Engine/propeller build standard based on an appropriate statement from the UK military body or from a CAA approved overhaul organisation, in order to verify that all CAA mandatory modifications and inspections have been accomplished.

c) All engine/propeller repairs are CAA approved based on an appropriate statement from the UK military body or from a CAA approved overhaul organisation.

d) Engine and propeller log books issued.

e) Civil identification plates are fitted.

2 Engine TBO Recommendations

Textron Lycoming Service Instruction No 1009AN states that the recommended TBO for the IO 360-A1B6 engine is 2000 hours. Paragraph 10 states that 'Some engines in the field have been altered to incorporate an inverted oil system in order to perform aerobatic manoeuvres. Whenever this modification is done to an engine, the TBO of the engine must be determined in the same manner listed for AEIO engines of the same model series'.

It could be considered therefore that the manufacturer's recommended TBO for the engine is reduced to 1400 hours. However, the aerobatic capability of the Bulldog aircraft is limited by the airframe, and is not increased by the fitment of the inverted

oil system. It has therefore been decided that a TBO of 1800 hours should be established, which is consistent with the TBO applicable in military service.

This TBO may be subject to extension under Airworthiness Notice 35. However, it should be noted that paragraph 3.1.2(c) of the AN states:

'The engine must have been operated in an aircraft registered in the UK for a period of at least 200 hours immediately prior to completing the engine manufacturer's overhaul period recommendations'.

Since the subject engines have clearly been operated and maintained in the UK the above requirement for 200 hours to be completed on the UK register can be waived. This allows engines with a TSO up to 1800 hours (this being the military TBO limitation) to be accepted for AN 35 TBO extension subject to all other requirements of AN 35 and Section 1 of this Notice being satisfied.

3 Propeller TBO Recommendations

For the propeller, the TBOs should be as per the manufacturer's instruction for propellers of this type when fitted to aerobatic aircraft.

4 Timing of TBO

The next TBO for both engine and propeller should be timed from the last overhaul in military service.

NOTE: This Leaflet is applicable to ex-UK Government engines whether obtained directly from the UK Government or from another source. If the engines have been operated since being obtained from the UK Government, and are to be registered for use in Public Transport Category, then the Leaflet does not apply.

Leaflet 11-42 Restoration, Airworthiness Control and Maintenance of Aircraft of Ex-military Origin under a BCAR Chapter A8-20 Approval

(Previously issued as AIL/0170)

PURPOSE: This information is issued for the guidance of applicants seeking an approval under BCAR A8-20 and CAA staff when they are investigating such an approval.

BCAR A8-20 contains the requirements for making submissions to the CAA for the grant of initial approval and the maintenance of ex-Military aircraft above 2730kg. The other requirements of BCAR sections A and B remain applicable, in particular chapters A3-7/B3-7.

REFERENCES: BCAR Chapters A3-7, B3-7, A8-20, CAP 632, AIL 0165.

1 Introduction

1.1 An organisation approved under BCAR A8-20 may according to the scope of its approval, make a submission to the CAA for initial approval of an ex-military aircraft, perform maintenance, repair, defect rectification, inspection and modification of an aircraft and its related components, including complete rebuild or restoration of the aircraft, and make a recommendation for the issue or renewal of a Permit to Fly.

1.2 This Leaflet should be read in conjunction with BCAR A8-20. This Leaflet is issued primarily to give guidance for those organisations that are applying for approval under BCAR A8-20. The guidance is provided in two separate appendices to this Leaflet. Appendix 1 corresponds with paragraph 1.2.1 of BCAR A8-20 (E4 approval) covering design related aspects of ex-military aircraft. Appendix 2 relates to those organisations requiring approval for recommending the renewal of a Permit to Fly under paragraph 1.2.2 of BCAR A8-20 (M5 approval).

1.3 The information provided in the Appendices of this document is intended to provide guidance on the interpretation of the requirements and procedures required of the organisation in order to obtain approval for ex-military aircraft.

1.4 The organisation must be defined in an exposition and this must contain adequate control procedures for review and approval of the aircraft in question. The types of aircraft to which the approval relates will be defined in the exposition of the organisation by means of capability lists. These lists will be subject to the agreement of the CAA and the exposition must contain adequate control procedures for review and approval of these lists.

1.5 Organisations holding an approval under paragraph 1.2.1 (E4) or paragraph 1.2.2 (M5), if applying for an extension for the other associated approval, will be required to meet the criteria of the other approval and amend the existing exposition.

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Appendix 1

BCAR CHAPTER A8-20 EX-MILITARY AIRCRAFT

DESIGN ASPECTS - E4 APPROVAL

1 Introduction

1.1 This Appendix provides guidance on the organisational requirements and responsibilities for organisations requiring to hold an E4 approval in accordance with paragraph 1.2.1 of BCAR A8-20. This approval is required for organisations to recommend that the CAA make initial issue of a Permit to Fly for an ex-military aircraft.

2 Personnel

2.1 The organisation should nominate the key design and/or engineering staff who are to support its operation. These staff should be employed under a formal agreement between the organisation and the staff member concerned with details of their terms of reference as senior members of the organisation provided within the exposition.

2.2 The organisation should have a staff member - see A8-20 3.2(b) - who should be a senior engineer and who will be the nominated contact with the CAA Design Liaison Surveyor and who will gather, co-ordinate and submit evidence required to the CAA in order to establish the standard of particular aircraft (see A8-20 3.2(c)). This person should have adequate qualifications and experience appropriate to the category of aircraft concerned.

2.3 Additional part time staff may be used to supplement the company resources where necessary, providing that there are in existence suitable control procedures within the organisation exposition. A form of agreement should be raised which gives detailed terms of reference in writing to each such person. Such arrangements may be required in order that the organisation is able to draw upon sufficiently qualified and experienced personnel to cover specific design aspects such as the research needed to establish the design standard of particular aircraft (see A8-20 3.2(c)), or structural substantiation (or check stress signatory) of a repair or material substitution.

2.4 CAA Forms AD458 declaring relevant qualifications and experience for persons nominated under the A8-20 approval should be submitted to the CAA Airworthiness Division, Organisations Section at Gatwick.

2.5 The Exposition will include charts showing chains of responsibility and signatories for documents to be submitted to the CAA.

2.6 The Exposition of organisations approved to cover *Complex* aircraft will include copies of the formal agreements with each external organisation providing support of the *Complex* aircraft and its systems and equipment.

3 Procedures

3.1 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 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.

3.2 The basis upon which ex-military aircraft may qualify for issue of a Permit is referred in BCAR A3-7/B3-7 paragraph 3.1(d) and the Appendix 1 to BCAR A3-7/B3-7 lists the evidence required to substantiate applications for Permits on this basis. The A8-20 E4 organisation responsible for gathering the evidence necessary for substantiation of submissions to the CAA is responsible for maintaining documentary records covering these submissions. Particular aspects covered by the organisations procedures covering the following may need to be covered in the exposition:

3.2.1 **Initial Application to CAA and Establishment of Aircraft Complexity Grouping.**

The organisation should make initial application to the CAA for approval of the aircraft early in the process (Form CA3). The applicant should also propose and obtain CAA agreement of the grouping (see paragraph 1.2.1 of BCAR A8-20) of the particular aircraft early in the process. The proposal should contain sufficient information on the design features of the type to justify the recommendation.

3.2.2 **Establishment of Safety Record (BCAR A3-7/B3-7 Appendix 1 paragraph 2.1)**

Investigation of *Intermediate* and *Complex* aircraft of a specific type which the CAA have not yet 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 peculiarly military operational causes such as low level training may be discounted but a review employing such judgements should be made by appropriately qualified personnel. The organisations procedures should include presentation of the safety record (total loss and fatal accidents per million flying hours) to the CAA for acceptance prior to commencement of the main investigation of design and build standard. Such presentations to be made by the nominated personnel accepted by the CAA for the purpose.

NOTE: It may be possible to establish that particular aircraft were hazardous in specific operational circumstances, or that particular modifications rendered the aircraft hazardous. In this event, it may be that application of particular limitations may render the aircraft type acceptable to the CAA. In the case of complex aircraft, in most cases, the CAA will require that such submissions are supported by the manufacturer.

3.2.3 **Continued Airworthiness Support/Information**

The more complex the aircraft, the more necessary it will be to have adequate technical/design expertise of the type in order to maintain the level of continued airworthiness support. For organisations supporting only Simple or Intermediate types, it may not be possible to retain permanent staff of adequate capability to cover initial approval of a given aircraft. In these cases adequate arrangements should exist to cover initial approval and continued support of each aircraft.

Complex aircraft will require permanent support covering each aspect, and may require additional specialist support covering aspects such as powered flying control systems, variable geometry intakes and nozzles, reaction control systems, digital (computer) controlled systems. Some types may only be considered supportable by the armed forces who operated them or by the manufacturer. The Exposition of organisations approved to cover *Complex* aircraft should include procedures for the necessary interface with the manufacturers providing support for the aircraft and of its critical equipment, and/or an acceptable Military Authority. The nature and depth of such procedures will be subject to the agreement of the CAA.

In all cases where the type continues to be actively supported by the manufacturer (i.e. examples of the type are still in operational service), arrangement should be made with the manufacturer to provide copies of all continued airworthiness information (i.e. SBs, STIs etc.) to the organisation.

3.2.4 **Establishment of Conformity to Type Design Standard** (BCAR A3-7/B3-7 Appendix 1 paragraph 2.2)

The organisation will have a procedure to establish that the individual aircraft conforms to the type Design Standard to which the established safety record is related. This involves ensuring that any modifications necessary to maintain the standard of airworthiness are determined and incorporated. This includes obtaining lists (in the English language) of Manufacturers (and/or the Military Engineering Authority's, Military Operators) modifications which were considered essential for airworthiness, and reviewing the aircraft and its accompanying paperwork to ascertain that each such modification is embodied. The Exposition will show that the signatory in respect of BCAR A8-20 3.2(c) will compile a statement against each such modification showing embodiment or acceptable alternative.

This may also include RAF Special Technical Instructions (STIs), Service Instructions (SIs) etc. Compliance with Mandatory Permit Directives promulgated by CAA for the type is also required.

The following aspects will be covered as part of establishing conformity to Design Standard:

a) **Fatigue State**

The organisation will:

i) research and identify fatigue critical components, their lives and accounting procedures;

ii) check that all such components are identifiably within these limits and this is supported by documentary evidence covering the full life of the aircraft;

iii) obtain CAA agreement for procedures as applied to civil operation of the aircraft (role factors etc.)

NOTE: Statements for submission to the CAA should be signed by nominated personnel (BCAR A8-20 paragraph 3.2(c)).

b) **Identification of Limitations**

The organisation will identify and record normal operating limitations appropriate to the aircraft and to observe any limitations that the CAA may determine having regard to the safety of third parties and occupants during intended operations of the aircraft.

NOTE: Limitations should normally be supported by copies of published documentation. Examples of circumstances where more restrictive limitations may be applied (subject to agreement of the CAA) are:

i) where flight test has identified an unsafe part of the envelope to be avoided;

ii) where the equipment fit renders more restrictive limits appropriate, for instance restriction of maximum altitude as a consequence of lack of oxygen system;

iii) where the operator chooses to operate an engine within published limitations in order to conserve engine condition.

NOTE: Specialist Equipment such as Ejector Seats and Drop Tanks should be subject to particular investigation.

c) **Published Information**

The organisation will obtain copies (English language) of all documentation necessary in order to operate and maintain the aircraft. This will normally include Aircrew Manual or Pilots Notes, and schedules and manuals covering airframe, engine and propeller overhaul, maintenance and repair. Any specialist systems should be covered adequately.

3.2.5 **Modifications made by the A8-20 E4 Organisation**

In general the normal CAA procedure as detailed in BCAR A2-5/B2-5 will apply. The E4 approval granted under BCAR A8-20 approval does not confer approval of any activity to design or seek approval for Major Modifications on this class of aircraft. Minor modifications to aircraft or components are required to be submitted either to the local CAA Regional Office, along with technical justification, to substantiate such change or alternatively be submitted via a suitably CAA approved design organisation.

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, but all such applications should be discussed with the CAA. If the E4 approved company wishes to undertake such work they should make application for CAA Approval under A8-8(E1) and/or A8-2(A2), but approval may require additional personnel with specialist qualifications and experience.

While the aircraft should conform as closely as possible to the Type Design Standard in respect of which the safety record has been accepted, it is recognised 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). The A8-20 E4 organisation's Exposition will include a procedure whereby such modifications are identified, defined, and submitted to the CAA for approval (these may form part of a submission for initial approval of an aircraft). 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.

NOTE: 1 In the event that the initial basis of acceptance of an aircraft into service is not known in detail, the justification for approval of such a modification is subject to agreement of the CAA (e.g. compliance with a appropriate parts of a design code such as BCAR Section K, JAR-23 etc.).

2 Material substitution during manufacture of replacement parts (in accordance with paragraph 8 of Appendix 2 to this Leaflet) or any repairs not identifiably made in accordance with manufacturers repair manuals constitute modifications which must be properly approved.

Major Modifications to *Complex* aircraft should be accepted in writing by the manufacturer supporting the aircraft prior to CAA approval.

3.2.6 **Compilation of Draft Airworthiness Approval Note (AAN)**

The organisation will have a procedure to submit a draft AAN for CAA acceptance in order to summarise the results of investigations as above prior to issue of the Permit to Test. Although the AAN will continue to be produced and signed by the CAA, in order to minimise administration involved, the applicant (E4 organisation) is expected to provide a draft which will summarise all the aspects covered above and culminate

in a recommendation (signed by nominated signatory) that the CAA issue the Permit to Fly. AIL 0165 provides detailed guidance on the content of AANs.

The applicant's procedures should provide for submission of the draft AAN to the CAA and arrangement of the CAA survey of the aircraft to occur prior to flight test.

NOTE: 1 The CAA will on request provide examples of AANs.

2 Maintenance schedules, where they differ from published schedules are subject to the agreement of the CAA Regional Office. A maintenance schedule should be agreed prior to issue of a Permit to Fly.

3.2.7 **Flight Test Arrangements**

The organisation will have a procedure covering conduct of the necessary flight testing of the aircraft as required by the CAA. The test schedule and the pilot should be accepted by the CAA and a draft AAN (see 3.2.6 above) accepted by the CAA prior to test.

4 Exposition

4.1 The Exposition should be kept as simple as possible, appropriate to the size of the organisation to be approved. Full quality functions are not required but may be accepted if already in place.

4.2 The Exposition should contain a capability list. This list may include blanket coverage for aircraft in the Simple or Intermediate categories (see paragraph 1.2.1 of BCAR A8-20), but will be on a type-by-type basis for Complex aircraft.

4.3 The Exposition should have a BCAR approval certified statement signed by the accountable manager as follows:

This Exposition defines the Organisation and Procedures upon which Civil Aviation Authority Approval AI/...../.... is based. These procedures are approved by the undersigned and must be adhered to as applicable when the Organisation is performing the functions relating to which the approval is granted.

It is accepted that the Organisation's procedures do not over-ride the necessity for compliance with the Air Navigation Order, British Civil Airworthiness Requirements, Airworthiness Notices or other requirements published by the Civil Aviation Authority from time to time.

The Company will ensure, prior to undertaking any overhaul, repair, modification, test or inspection, that all Manuals, Service Bulletins, Modification Standards, Mandatory Documentation, Special Tools (including test equipment) and any necessary training required by the Manufacturer or Civil Aviation Authority are obtained.

HEAPWARBIRD LTD

signed

Accountable Manager.

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Appendix 2

BCAR CHAPTER A8-20 EX-MILITARY AIRCRAFT

MAINTENANCE ASPECTS - M5 APPROVAL

1 Introduction

This Appendix provides guidance on the organisational requirements and responsibilities for organisations requiring to hold a Group M5 approval in accordance with paragraph 1.2.2 of BCAR A8-20. This approval is required for organisations to maintain and recommend that the Authority renew a Permit to Fly for an ex-military aircraft.

2 Personnel and Staff

2.1 The organisation should nominate the key engineering staff who are to support its operation. These staff should be employed under a formal agreement between the organisation and the staff member concerned with details of their terms of reference as senior members of the organisation provided within the exposition.

2.2 The organisation should have a minimum of one staff member who is nominated as a senior engineer who holds CAA licences without type ratings appropriate to the aircraft to be maintained. Where this cannot be satisfied in the case of established organisations, well known to the Regional Office, an unlicensed person with long association with the CAA may be acceptable.

2.3 Additional part time staff may be used to provide additional resources providing there are in existence suitable control procedures within the organisation exposition. A form of agreement should be raised which gives detailed terms of reference in writing to the volunteer.

2.4 CAA Forms AD458 Biographical Details for persons nominated under the A8-20 approval should be submitted to the regional office.

3 Organisation Personnel Authorisations

3.1 A nominated senior person as required under BCAR A8-20 paragraph 3.2(b) will be accepted by the CAA to grant personnel authorisations under the organisation's approval, appropriate to the staff who are to carry out nominated functions and activities whilst contracted to or in the employ of the organisation.

3.2 A limited number of full authorisations may be granted, on a restricted basis, for issuing a flight release certificate after scheduled maintenance or defect rectification. In respect of aircraft nominated under A8-20 paragraph 1.2.1 as *Complex*, the signatory of the Flight Release Certificate (see BCAR A3-7 appendix 2) would be a suitably qualified person with appropriate practical experience, gained whilst employed by either the manufacturer or an acceptable Military Authority.

3.3 Authorisations may be granted for specific functions as are seen to be necessary to support operations either at the main base or away from that base. e.g. taxiing, ground runs, pre-flight checks etc.

3.4 Records of authorisations given shall be kept and issued to the persons involved.

4 Inspection and Certification

The organisation should ensure that all maintenance and defect rectification is recorded and certified by the appropriate staff with details of the necessary action taken. The procedure should be in a form acceptable to the CAA and take due account of any flight record system required by CAP 632 for the operation that is supported.

It is expected that the normal aviation practices for the documenting of maintenance checks and recording defects with subsequent rectification will satisfy this requirement.

Maintenance check sheets should provide information of the amendment status of the maintenance programme when work is certified. A work records control system should be established to show the status of completion of work at any time and be readily capable of review.

5 Maintenance Programmes

5.1 The compilation of maintenance programmes and the associated schedules should where possible be based upon the original aircraft type documentation and should reflect both the original servicing elements and any additional requirements of the CAA, e.g. Airworthiness Notices. This should take into account any known service experience such as NDI programmes and supplementary inspections and be adjusted to suit the aircraft utilisation rate. The need to change the periods from flying hours or cycles to calendar based periods should be considered and agreed by the CAA. Part of the maintenance schedule should contain life limitation listings and reflect any component overhaul or life limitations, fatigue limits or other significant data.

5.2 In some instances major structural inspections are not included in the military service notes, this should be taken into account when compiling the programme of maintenance. Where possible the original manufacturer should be consulted if doubt exists regarding the adequacy of the structural programme, or the CAA Aircraft Certification Department.

5.3 The maintenance schedules for the aircraft should also take into consideration the general requirements of the LAMS schedule; e.g. compass swings, radio checks etc.

6 Spares Procurement

6.1 All the required spare parts and components procured for this type of aircraft should, wherever possible, be obtained from original sources or through known and reputable distributors.

6.2 Where items are obtained via Military, or other related sources these items should be inspected and evaluated with regard to physical condition, life details, completeness of records, modification status and compatibility to aircraft serial by the organisation purchasing the item. Acceptance of the item following such inspection should be assessed and recorded by a certifying engineer prior to fitment. This procedure should be reflected in the associated exposition.

6.3 During the conditional assessment of components consideration must also be given to the need to carry out an internal examination to assess the effects of age and corrosion. It may be necessary to carry out a strip investigation, partial or full, if the

component's condition cannot be readily assessed by other means, e.g. boroscope, NDT, etc.

6.4 Structural components, forging and castings should be visually inspected for condition and damage and consideration given to utilising NDT techniques to assist such an inspection, whenever possible the manufacturers advice should be sought.

6.5 Engines, propellers and gearboxes should be overhauled prior to their initial fitment to the aircraft except where the item's service history and current status is known and documented. The overhaul should be carried out by an organisation approved for the purpose or by a company as agreed within the terms of the A8-20 organisation's exposition.

6.6 AGS and Standard Parts. Standard aircraft hardware such as fasteners, e.g. nuts and bolts, should be purchased from normal aviation sources. These should conform to the specified part number in the manufacturer's maintenance information. Where this information differs from the current specifications for those items in civil use, acceptance via a certificate of conformity showing equivalence will suffice.

6.7 Where items are no longer manufactured or available from known sources, caution should be exercised on the acceptance of items unless their serviceability can readily be determined by inspection and/or overhaul. The use of alternative parts in the overhaul or maintenance of aircraft or components is only permitted when supported by the agreement of the manufacturer or an approved Design Organisation, through modification action, or where agreed in individual circumstances with the CAA Regional Office.

7 Arrangements for Maintenance of Specialised Equipment

7.1 The arrangements for the maintenance and overhaul of items and systems as detailed in paragraphs 3.2. and 3.4 of A8-20 Supplement No. 1 should be defined in the organisation's exposition. Where the organisation does not hold the capability itself to satisfy this requirement, suitable letters of agreement with appropriately approved organisations should be held detailing the provisions made to cover all such undertakings.

8 Component Manufacture

8.1 With regard to the manufacture of components, the A8-20 approval is not intended to replace the requirements of a BCAR A8-2 Group A2 Supplier Approval. Manufacture of non critical parts may be permitted subject to the organisation having the necessary drawings and facilities, equipment, etc. where the part is intended to be produced only for an aircraft supported by the approved organisation.

8.2 Major structural items should be manufactured under the control of a BCAR A8-2 company to the required specifications and original drawings, unless agreed otherwise in advance by the local CAA Regional Office. Any deviation in material specification, heat treatment or manufacturing process will need to be supported by technical justification and a prepared case should be submitted in the form of individual requests to the CAA Regional Office.

8.3 Manufacture to pattern is normally prohibited, however specific items may be agreed by the CAA Regional Office in conjunction with Aircraft Certification Department.

9 Modifications

9.1 The normal CAA procedure as detailed in BCAR A2-5/B2-5 will apply. The E4 approval granted under BCAR A8-20 does not confer approval of any activity to design or approve modifications on this class of aircraft. Minor modifications to aircraft or components are required to be submitted either to the local CAA Regional Office, along with technical justification, to substantiate such a change or alternatively be submitted via a suitably CAA approved design organisation.

9.2 Significant changes to the aircraft in terms of powerplant changes, propeller type, alternative material specifications or equipment changes may be the subject of major modification action, but all such applications should be discussed with the CAA Regional Office concerned in the first instance.

10 Secondary Site Control

10.1 Where the organisation intends to conduct activities at sites other than the main site of the approval but remaining under the control of the basic approved organisation, the additional geographical locations will be considered as secondary sites for approval purposes. The secondary sites should be environmentally suitable for the needs of the operations to be carried out and defined in the exposition. Short term agreements for secondary sites may be arranged by letter with the local CAA Regional Office and may be subject to any special conditions that are deemed necessary.

10.2 The term secondary site is not intended to include activities associated with line support of the aircraft during normal operations. Repairs or scheduled maintenance away from base may require to be reflected in a short term agreement as above.

11 Recommendations for the Renewal or Validation of Permits to Fly

11.1 The Permit to Fly will be a non-expiring document that requires an associated Certificate of Validity. These documents will be contained in a wallet.

11.2 The validation will be predicated upon an inspection report prepared by an organisation approved for the purpose (A8-20), and a recommendation made on Form AD202P.

11.3 Following an annual inspection, the approved organisation will submit the following documentation to the CAA:

a) AD200 application for renewal;

b) Statutory fee;

c) Flight Test (if applicable - see 11.8);

d) AD202P recommendation.

11.4 The documentation listed in 11.3 should be sent to the CAA at the following address:

Applications and Approvals Department
Civil Aviation Authority
Safety Regulation Group
Aviation House
West Sussex RH6 OYR

11.5 Subject to the submitted documentation being acceptable, a Certificate of Validity will be returned, valid for a twelve month period. The Certificate should be placed in the 'pocket' of the Permit to Fly wallet.

11.6 The validation process may be anticipated by a maximum period of thirty one days without loss of the twelve month consecutive validity period. If the anticipation period is more than thirty one days the Certificate of Validity will be limited to one year and thirty one days following the recommendation date. If the validity certificate has expired, the validity certificate will be dated from the date of receipt by the CAA and expire one year from the recommendation date.

11.7 If the Certificate of Validity has expired and a flight test is required, it will first be necessary to submit the AD200 application together with the statutory fee in order that the CAA may issue a Permit to Fly for test purposes. Following completion of the test, the flight test report and the AD202P should be submitted as in 11.3.

11.8 The Flight Test period has been extended to three years but must be completed for the first issue of the non-expiring Permit to Fly. The next flight test due date will be stated on the Certificate of Validity.

NOTE: AD202P pads will be supplied by the CAA.

12 EXPOSITION

12.1 The Exposition should be kept as simple as possible appropriate to the size of the organisation to be approved. Full quality functions are not required but may be accepted if already in place.

12.2 The exposition should state the level of basic approval granted in the terms of one or more of the following:

a) Maintenance of airframes and engines;

b) Overhaul of engines;

c) Restoration of airframes and associated systems;

d) Component Overhaul.

12.3 The Exposition should contain a capability list. This list may include blanket coverage for one or more Groups (see paragraph 1.2.2 of BCAR A8-20) but will specify individual aircraft types for those classified as Complex in accordance with paragraph 1.2.1(c) of BCAR A8-20.

12.4 The Exposition should have a BCAR approval certified statement signed by the accountable manager as follows:

This Exposition defines the Organisation and Procedures upon which Civil Aviation Authority Approval AI/ ---/--- is based.

These procedures are approved by the undersigned and must be adhered to as applicable when orders qualifying for release under the Approval are being progressed.

It is accepted that the Organisation's procedures do not over-ride the necessity for compliance with the Air Navigation Order, British Civil Airworthiness Requirements, Airworthiness Notices or other requirements by the Civil Aviation Authority from time to time.

The Company will ensure, prior to undertaking any overhaul, repair, modification, test or inspection, that all Manuals, Service Bulletins, Modification Standards, Mandatory Documentation, Special Tools (including test equipment) and any

necessary training required by the Manufacturer or Civil Aviation Authority are obtained.

HEAPWARBIRD LTD

signed

Accountable Manager.

Leaflet 11-43 Approval of Maintenance Schedules For Aircraft Above 2730 kg MTWA not Operated for Commercial Air Transport

(Previously issued as AIL/0171. This leaflet has been revised and should be read in its entirety.)

PURPOSE: This Leaflet is intended to provide guidance material for the compilation of a maintenance schedule for aircraft within the above group.

REFERENCES: CAA Standard Maintenance Practice No. 19.

1 Introduction

1.1 The CAA is changing the current Certificate of Airworthiness (C of A) renewal process which has historically required CAA technical staff involvement at the renewal interval. One aspect of this change is that CAA Approved Maintenance Schedules are required for aircraft within this scheme. A principal benefit will be the flexibility of renewing C of As without disrupting the aircraft operation and minimising CAA technical staff effort.

1.2 Where the aircraft maintenance schedule is approved by the CAA a recommendation to renew the C of A can be made to CAA by an organisation approved under BCAR A8-3 Supplement No.2. As of 1st April 1995, all aircraft within this group will be required to be maintained to a CAA Approved Maintenance Schedule.

1.3 In order to ensure that the Approval process is as simple as possible the procedures assume the use of the manufacturers schedule (as amended), and Standard Maintenance Practice No. 19 (including Appendices A, B and C).

2 Maintenance Schedule Approval Procedure

2.1 A copy of Standard Maintenance Practice No. 19 is available in CAP 562 - CAAIP Part 14 as Leaflet 14-19 and may be copied for use.

2.2 The SMP is formatted with space for details to be added. It can however, be produced and formatted on a word processor providing the intent is not changed. This document will identify the manufacturer's schedule reference and revision status. It must also contain information regarding the aircraft type, serial no., and the registration mark. The CAA will record the aircraft registrations and schedule references. Anticipated annual utilisation is to be stated to enable the operator/ contracted maintenance organisation to assess the maintenance periods against the manufacturer's predicted utilisation.

2.3 The SMP 19 contains three Appendices:

Appendix A Which should be completed to address supplementary maintenance requirements. This should list, Equipment Manufacturer's Maintenance Requirements, and Life Limits not covered by the Airframe Manufacturer's maintenance programme.

Appendix B Which should be completed to address Maintenance Tasks arising from SBs, SLs and other service information as required by the Operator.

Appendix C Which gives guidance on permitted variations to Maintenance periods.

2.4 When SMP 19 has been completed two copies should be submitted to the CAA Survey Department Regional Office with a copy of the manufacturer's schedule. The Regional Office will assess the submission and will advise if the manufacturer's schedule is acceptable. Approval of this submission will be signified by the issue of Form AD271, and the allocation of a CAA Approval Reference.

2.5 The operator must instigate a formal method of amendment. Any proposed changes to the AD271 or SMP19 shall be submitted to the CAA Survey Department Regional Office for approval. Amendments to the manufacturer's programme must be incorporated and advised to the CAA Regional Office, without the need for individual CAA approval.

NOTE: Amendments may be in the form of Service Bulletins issued by the manufacturer prior to full revision of the maintenance programme.

3 Alternative to Manufacturer's Schedule

3.1 It is not the CAA's intention to promote the use of an Alternative to the Manufacturers schedule. However, if the operator or his contracted maintenance organisation wishes to use an alternative schedule, than a detailed submission should be made to the CAA setting out the justification for such an alternative and this should be accompanied by suitable substantiation for the revised scheduled maintenance tasks. A fee may be charged for this process.

3.2 The schedule with the completed SMP 19 should be sent to the CAA Survey Department Regional Office. Once the schedule has been reviewed any comments raised will be communicated to the applicant for corrective action to be taken. When all outstanding items have been addressed, approval will be signified by issue of AD271, and the allocation of a CAA Approval Reference.

4 Alignment Check

Where the aircraft is transferred from one schedule to another, an alignment or bridging check will be required. The extent of the check should be decided by the operator/contracted maintenance organisation following a review of the maintenance carried out to date, but will as a minimum, need to ensure that the requirements of the new schedule have been met.

5 Maintenance Certification

The organisation contracted to carry out maintenance of the aircraft will enter the details of the maintenance carried out in the appropriate Aircraft Log Books and indicate the reference number of the schedule used. This reference number will be shown on the Approval Document AD271. At the time of C of A renewal an annual check in the form of a Maintenance Review is to be carried out. A statement to this effect must be made in the Aircraft Log Book. (Details of this annual check can be found in SMP 19.)

Leaflet 11-44 Applications for the Approval of CAA Supplemental Type Certificates

(Previously issued as AIL/0189)

PURPOSE: To advise applicants of the information they will have to provide in support of an application for the approval by the CAA of a Supplemental Type Certificate (non-EASA) for an aircraft, engine or propeller as defined by Annex II.

REFERENCES: Regulation (EC) No 1592/2002 of 15 July 2002 including amendments, Establishing a European Aviation Safety Agency.
Regulation (EC) No 1702/2003 of 24 September 2003, including amendments, Implementing Rules for Airworthiness and Environmental
EASA Website: www.easa.europa.eu
CAA Scheme of Charges, Official Record Series 5
Part 21.101; Changed Product Rule

1 Introduction

This Leaflet is for Annex II aircraft only and does not apply to any product under the authority of EASA as defined by Regulation 1592/2003. Mutual recognition is not automatically achieved within EASA Member states for STCs to Annex II products.

This Leaflet is to inform owners, operators, designers and modifiers of aircraft of the CAA procedures for the approval of Supplemental Type Certificates (STC). The Leaflet has particular emphasis on the information which the applicant will be expected to provide to the CAA. The procedure to be followed is similar to that required by EASA under Regulation 1702/2003 however it must be noted that EASA has developed their own procedure for STC applications that can be found on the EASA website.

The EASA STC Procedures classify STCs from a procedural point of view into Significant and Non-Significant. A Significant 1 STC is defined as "a major design change, which necessitates a change to the Type Certification basis referenced in the TCDS for the Product". A Non-Significant STC is any other STC.

It is important to note that these STC Procedures are an alternative and not a replacement for the Airworthiness Approval Note (AAN) Procedures.

2 Application

Application for issue of an STC to an Annex II Product may be made to the CAA by:

a) A UK applicant;

b) A non-UK applicant for an STC to be validated.

NOTE: This is conditional on the applicant being subject to the jurisdiction of an Authority, which has entered into, or is prepared to enter into an Arrangement with the UK.

Application must be made on the relevant CAA Form No STC01 (Appendix 1), to Applications and Approvals Department together with the appropriate fee.

3 Classification

At time of application, the applicant must propose the category of the STC with appropriate justification. This justification will be reviewed in accordance with the criteria defined in Part 21.101 at the discretion of the CAA.

4 Registration

When the application has been accepted, the Project will be issued with a CAA STC Project Number taken from the CAA STC Project Number register. The register for aircraft and engines/propellers is maintained by Applications and Approvals Department.

The STC Project Number will be used as the CAA charging number as well as the reference for the department file and all correspondence during the Project.

The STC Project Number will be in the form PNxxxxx and will not be the same as the STC Number.

5 Design Investigation

5.1 CAA Team

The CAA will identify a team having regard to the Product, the applicant, the complexity of the Project, and the anticipated length of the Project. The Team Leader will normally be from either Aircraft Certification Department or Engineering Department and will be responsible for the management of the STC Project.

The Team Leader will advise the applicant of the Team membership, which may comprise representatives from within the Airworthiness Division (including Survey Department) and Flight Operations Division.

5.2 Design Organisation Approval

The Applicant will be required to hold a Design Organisation Approval recognised by the CAA. The Team Leader will be responsible for ensuring that the terms of the applicant's Approval, as applicable are observed during the certification exercise. The Team will determine if the Terms of Approval are sufficient to cover the scope of the STC. If necessary the Applicant may be required to apply to the CAA to update the Terms of Approval in order to include the new STC.

5.3 Information Exchange

When the CAA is validating an STC from a non-UK applicant the Team Leader is responsible for ensuring appropriate information exchange links with the Authority of the State of Design.

The applicant will advise the Team Leader of any arrangement with the Type Certificate Holder. This information is requested on the Application Form.

5.4 Certification Basis

For a Non-Significant STC the Certification Basis is that referenced in the applicable CAA Type Certificate Data Sheet for the Product.

For a Significant STC the Certification Basis will be agreed between the Team and the Applicant.

5.5 Demonstration of Compliance

STC Definition Document

The applicant should provide a STC Definition Document (or equivalent documentation) to the Team. This document provides a summary of the change, including a description of the change and reference to supporting drawings, diagrams and schematics, as well as a reference to compliance and service documentation. An example of a template for such a document is at Appendix 2 together with guidance on how it should be completed.

Where the CAA STC is a validation of a Major change from a non-UK applicant an alternative summary document specified by the certificating Authority can be accepted as long as it provides the equivalent information.

Certification Plan

The Team Leader will request the applicant to submit a certification plan, which describes the means by which compliance with the requirements of the Certification Basis affected by the change will be demonstrated, including any tests, together with the projected time-scales. Appendix 3 provides guidance on the information which should be provided by the applicant.

The plan will be reviewed by the Team for acceptability. The Team will discuss means of compliance with the applicant as necessary to ensure mutual understanding. The applicant will be required to set up a process to allow the status of each item in the certification plan to be tracked and recorded throughout the programme.

Compliance Record

The applicant will provide certification reports to the Team, which will formally record compliance with each applicable requirement. Team Members will be allocated the task of reviewing and accepting the reports by the Team Leader, having regard to their speciality and experience. Following a review of their decisions, the applicable compliance sheet will be closed, with a reference to any supporting reports, raised in issue, and circulated by the applicant. CAA Management involvement will be necessary where the proposed demonstration of compliance is controversial or where the applicant and Team are unable to agree.

Closed compliance sheets will be entered in the Compliance Record Document. An index of certification reports will be maintained by the applicant. The index should be regularly updated to show the CAA approval status. Copies of the certification plan and the report index will be retained by the CAA.

Witnessing of Tests and Physical Inspections

The test programme will be reviewed by the Team Leader who will determine with the Team which tests are to be witnessed, and physical inspections made. Team Members will be allocated specific tests and inspections. The applicant will be advised of this information in order that the Team Members concerned may be advised of test/inspection dates in good time.

Flight Testing

The UK Air Navigation Order (ANO) 2005 (as amended) Article 8 specifies the circumstances under which an aircraft may fly. When an aircraft is modified its Certificate of Airworthiness or Permit to Fly is rendered invalid until such time as the modification is approved by the CAA (ANO 2005 (as amended) Article 10). It follows therefore that an aircraft, which has modifications embodied which are not approved by the CAA may not fly except under specific flight testing provisions granted by the CAA.

The normal mechanism for the authorisation of exploratory test flights is for the organisation that proposes to conduct the flying to obtain a "permit to fly for test purposes" approval. Where it is necessary to conduct flight trials to establish compliance with the approval basis, and by implication to provide the evidence necessary to approve the modification, the permit must be in force throughout the trials.

Where there is already evidence of satisfactory flight characteristics, such as prior certification by the State of Design (for STC validations), or in the case of a modification it can reasonably be concluded that there will be no detrimental effect, flight testing may not necessarily be required for approval of the design. If nevertheless it is considered necessary to fly the aircraft in order to confirm correct functioning or performance, that flight will normally be carried out after approval of the STC.

Certification Meetings

The Team Leader will review progress with the applicant on a regular basis. If meetings are required the applicant shall issue minutes. The minutes will be circulated to Team Members as appropriate.

Documentation and Manuals

The applicant will provide supplements to manuals or documents required by the applicable requirements for approval by the Team.

Accomplishment instructions (e.g. Service Bulletins) will be prepared by the applicant and distributed as approved data. Approval of the instructions will be granted by the Team or through the applicant's design approval privilege when held.

6 Responsibilities of the Applicant

It is the responsibility of the applicant to define and record all activities leading to the issue of the STC. The applicant must determine the requirements that are applicable, and obtain the agreement of the CAA to the approval basis. The applicant must be satisfied that compliance with all of the applicable requirements has been demonstrated and that evidence of compliance, including assumptions and methods used, is recorded and retained. It is the responsibility of the applicant to provide to the CAA the information needed to complete the approval.

Efficient progression of the approval will be heavily dependent upon the timely submission of information, that is both complete and of good quality. Where the CAA has to make requests for clarification, correction or additional data this will inevitably delay the process and increase the staff hours expended by the CAA, in turn leading to higher charges. Where incomplete or poor quality information is submitted, the CAA may suspend the approval process and require the applicant to re-submit using an Approved Organisation having greater expertise and ability to complete the task.

The applicant should advise the CAA at the time of application of the proposed programme timescale, and of the proposed means of compliance with the approval basis. In this respect applicants are requested to note that the CAA commonly has no advance notice of the applications it receives and has to manage its finite resources to meet the diverse demands of the many and various applicants. Efficient management of resources is only possible if the timescale for each approval is reasonable, and allows for the inevitable multi-tasking of CAA staff.

7 STC Issue

After the Team has been satisfied by the compliance demonstration, the applicant will submit the final issue of the STC Definition Document and a final Compliance Checklist with a Declaration of Compliance to the Team Leader. These will be held on the CAA file. The Team Leader will then sign a Final Statement of Compliance. The CAA STC will then be issued to the applicant (Appendix 4).

8 Post STC Activities

Amendments to STCs are only allowed by the STC holder. The change will need to be classified Major/ Minor, and if major will follow a similar procedure as for the initial STC. A Significant change to an STC will require a new STC. The principles laid out in Part 21 will be followed where possible. The involvement of the Team will depend on the level of change.

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Appendix 1 CAA Application Form

Civil Aviation Authority
United Kingdom

APPLICATION FOR SUPPLEMENTAL TYPE CERTIFICATE

This form should be completed and forwarded together with the appropriate fee, as notified in the Current CAA Airworthiness Scheme of Charges, to: Civil Aviation Authority, Airworthiness Division, Application and Approvals Department, Aviation House, Gatwick Airport South, West Sussex RH6 0YR.

<table>
<tr><td colspan="2">Applicant:

Address:

Post Code:</td><td>Tel No:

Fax No:

E-Mail:</td></tr>
<tr><td colspan="3">Aircraft/Product Type:

TCDS Ref:</td></tr>
<tr><td colspan="2">Location of aircraft for inspection:</td><td>Applicant Modification No:</td></tr>
<tr><td colspan="2">Proposed Classification:
Significant/Non-Significant

Justification:</td><td>Design Organisation:

CAA Approval Ref:

Production Organisation:

CAA Approval Ref:</td></tr>
<tr><td colspan="3">STC Title:</td></tr>
<tr><td colspan="3">Requested Date for STC Issue:</td></tr>
<tr><td colspan="2">Flight Manual Affected (delete as applicable):

Yes/No</td><td>Arrangement with TC Holder (delete as applicable):
Yes/No</td></tr>
<tr><td colspan="3">I hereby declare that the above particulars are true in every respect. I agree to pay any further charges in connection with this application, which may be notified by the CAA, including costs subsequently incurred by the CAA for work carried out on post-certification activities.I understand and accept that the STC, when issued, will be published in databases accessible to the public.</td></tr>
<tr><td>Signature:</td><td>Name:

Position:</td><td>Date:</td></tr>
</table>

Reserved for CAA use only			
£ Received by Date	ACP Number	Action Surveyor Regional Office	Project No. Date Initials

Appendix 2 STC Definition Document

<table>
<tr><td colspan="2" rowspan="2">Applicant</td><td colspan="2">Document Ref:</td></tr>
<tr><td>Issue:</td><td>Date:</td></tr>
<tr><td colspan="2">CAA Design Approval Ref:</td><td colspan="2">Page 1 of</td></tr>
<tr><td colspan="2" rowspan="3">CAA UK
SUPPLEMENTAL TYPE CERTIFICATE
DEFINITION DOCUMENT</td><td colspan="2">CAA Project Ref:</td></tr>
<tr><td>SIGNIFICANT</td><td>NON-SIGNIFICANT</td></tr>
<tr><td colspan="2">Delete as appropriate</td></tr>
<tr><td colspan="4">Product Modified:</td></tr>
<tr><td colspan="4">STC Title/Description:</td></tr>
<tr><td colspan="4">CAA Production Approval Ref:</td></tr>
<tr><td colspan="4">Certification Basis:</td></tr>
<tr><td colspan="4">Requirements Affected:</td></tr>
<tr><td colspan="4">Compliance Plan Ref:</td></tr>
<tr><td colspan="4">Compliance Record Ref:</td></tr>
<tr><td colspan="4">Drawing List:</td></tr>
<tr><td rowspan="7">Manuals Affected/
Supplement Ref:</td><td>Flight Manual</td><td colspan="2"></td></tr>
<tr><td>Airworthiness Limitations</td><td colspan="2"></td></tr>
<tr><td>Maintenance Manual</td><td colspan="2"></td></tr>
<tr><td>Maintenance Schedule</td><td colspan="2"></td></tr>
<tr><td>Electrical Load Analysis</td><td colspan="2"></td></tr>
<tr><td>MMEL</td><td colspan="2"></td></tr>
<tr><td>Weight & Balance Manual</td><td colspan="2"></td></tr>
<tr><td colspan="4">Accomplishment Instructions Ref:</td></tr>
</table>

Guidance Notes for Compiling STC Definition Document.

Applicant	Company name of applicant for STC.
Document Reference	Applicant internal reference number for STC Definition Document that could be used as referenced data on the STC when issued.
CAA Design Approval Reference	Applicant's Design Approval reference.
CAA Project Number	The CAA Project reference number will be supplied by CAA. This will be the internal CAA tracking number pending the granting of the CAA STC.
Significant /Non-Significant	Delete as appropriate. STCs are classified from a procedural point of view into Significant and Non-Significant. A Significant STC is a major design change that necessitates a change to the Certification Basis of the basic Product, as referenced in its Type Certificate Data Sheet. A Non-Significant STC is any other STC.
Product Modified	The Product changed by the STC. The full Type/Variant designation should be given.
STC Title/Description	Title of STC. This should include a brief description of the STC to clearly summarise the physical changes to the Product.
CAA Production Approval Reference	The applicant should identify the production organisation(s) that will receive approved data and assistance in order to permit production of airworthy parts eligible for installation as part of the STC.
Certification Basis	Reference should be included to a document presenting the Certification Basis of the Product being changed, generally the Type Certificate Data Sheet. The Certification Basis identifies the applicable standards against which the applicant must show the proposed change complies.
Requirements Affected	Reference is required to all those requirements of the Certification Basis, including environmental requirements i.e. noise and emissions, affected by the change and for which a compliance statement is required to be included in the Compliance Record. In addition, design requirements that must be complied with in order that operational requirements can be satisfied should be included e.g. JAA TGLs for BRNAV, EGPWS, RVSM and any specific design requirements relating to equipment required by operational rules such as JAR-OPS.
Compliance Plan Reference	Reference to the compliance plan should be included. The plan itself should provide at least the following for each compliance subject: • Affected Requirement (CS, BCAR etc.) and its amendment level; • Means of Compliance, e.g. calculation, test, design review, inspection etc. Any specific flight testing provisions required to be granted by CAA, reference BCAR A8-9, should be noted in the plan.

Compliance Record Reference	Reference to the compliance record (which itself should include reference to all compliance reports) should be included.
Drawing List	This must include all drawings introduced by the change. Where there is a significant number of drawings, reference to a Master Drawing List is acceptable, as long as this provides a ready reference to all the other drawings.
Manuals Affected	All manuals affected should be indicated by inclusion of a reference to the required supplement/amendment.
Accomplishment Instructions	Reference to the accomplishment instructions document provided to installers of the STC should be included.

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Appendix 3 Guidance for Compilation of Certification Documents

The following should be used as an aid when determining the content of the Certification document(s) required by the STC procedures. The applicant should agree the specific project documentation with the CAA.

Applicants may decide whether to compile one or more documents which contain this information. As the project progresses the document(s) will be maintained jointly by the applicant.

Applicant's Certification Personnel	Name and contact details of key personnel involved in programme, e.g. programme manager, technical and airworthiness staff, and design signatories with their specialisation accepted by CAA.
Description of Modification	This should include a system/configuration definition with associated drawings, diagrams, and schematics to summarise the physical change to the aircraft.
Liaison with Production	The applicant should identify the production organisation(s) that will receive approved data and assistance in order to permit production of airworthy parts eligible for installation as part of the STC. This should also include, as necessary, details of the parts approval status and a conformity inspection plan.
Operator Focal Point	Name and contact details of the operator's representative(s).
Aircraft and Location	Details of the aircraft and its location for inspection/certification purposes.
Foreign Aviation Authority	Details of any foreign aviation authority involved in the STC approval process.
Arrangement with Type Certificate Holder	Details of any arrangement entered into with the Type Certificate Holder in support of the STC application where applicable.
Certification Schedule	A schedule of certification activities that will be agreed between the CAA and the applicant and maintained by the applicant through the programme.
Certification Basis	The Certification Basis identifies the applicable standards to which the applicant must show compliance. It also includes the need for special conditions, exemptions, and equivalent safety findings, if any. An issues list should be included to highlight for resolution those special requirements and other areas that may be significant, even though they may not warrant a special condition, exemption, or equivalent safety finding. Reference should also be made to the applicable CAA design requirements for the issue of a Certificate of Airworthiness.

Operational Requirements	Identification of the design requirements that must be complied with in order that operational requirements can be satisfied. For example: JAA TGLs for BRNAV, EGPWS, RVSM and any specific design requirements relating to equipment required by operational rules such as JAR-OPS.
Environmental Requirements	The applicable noise and emissions requirements.
Compliance Matrix/ Check List	A table listing for each affected part of the aircraft: a) the compliance subject; b) the applicable requirement (BCAR etc.) and its amendment level; c) the method of compliance, e.g. calculation, test, design review, inspection etc.
Test Requirements	Details of the various tests identified in paragraph 12 above (e.g. laboratory, ground, flight etc.) together with planned test locations, approval of test facilities, and dates. This section should contain any requirements for the planning, preparation, and conduct of flight testing. The applicant should identify the need for any specific flight testing provisions to be granted by CAA.
Compliance Documents	A list of the compliance documents that will be produced including the document/ drawing reference number, title, applicable requirement, and proposed submittal date where applicable.
Manuals	Specification, or reference to a document specifying, changes to documents and placarding. Commonly this may include: a) Flight Manual; b) Maintenance Manual; c) Airworthiness Limitations; d) Maintenance Schedule; e) Electrical Load Analysis; f) MMEL; g) Weight and Balance Schedule; h) Type Certificate Data Sheet(s).
Instructions for Continued Airworthiness	A statement of, or reference to documents defining, any inspections or other actions required to maintain airworthiness in-service.

Appendix 4 Example Supplemental Type Certificate

United Kingdom
Civil Aviation Authority

SUPPLEMENTAL TYPE CERTIFICATE

[STC No]

Pursuant to the National Regulations for the time being in force and subject to the conditions and limitations specified below, the CAA-UK in accordance with its National Procedures, hereby certifies to:

[Applicant]

[Address of the Applicant[

[CAA design approval reference, if applicable]

that the change in the Type Design to the following product, as specified herein, meets the appropriate [applicable code] requirements.

Basic Product	Type Certificate Number:
	Type:
	Variant:

STC Title:

STC Definition Document:

Flight Manual Supplement: , or later approved revision.

Airworthiness Limitation Supplement(s):

Conditions and Limitations:

- Compatibility of this installation with previously installed equipment must be determined by the installer.
- Subject to compliance with the provisions in force at time of issue, this Certificate and associated data shall remain valid until surrendered, withdrawn or otherwise terminated.
- If transfer of this Certificate is requested, the Certificate will be reissued.

Date of application: ……..

Date of issue: ……..

Date of re-issue: …… Signed…….....
(Insert signatory's name)
For the United Kingdom CAA

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