AIRWORTHINESS NOTICES

ISSUED BY:
CIVIL AVIATION AUTHORITY OF SINGAPORE

Civil Aviation Authority of Singapore

Date: 16 November 2009

AIRWORTHINESS NOTICES
REVISION 23 DATED 16 NOVEMBER 2009

To: Holders of the CAAS Airworthiness Notices

1 This revision is to introduce medical supplies required on Singapore registered aircraft.

2 Please remove and destroy the following pages:

Notice No.	Issue	Date	Page(s)	Remarks
A0	22	1 Febuary 2008	1 to 4	-

3 Please insert the following pages:

Notice No.	Issue	Date	Page(s)	Remarks
A0	23	16 November 2009	1 to 4	Revised
C56	1	16 November 2009	1 to 5	Issue

4 Please annotate Revision 23 in the Record of Revisions.

Issued by
CIVIL AVIATION AUTHORITY OF SINGAPORE

AIRWORTHINESS NOTICES

RECORD OF REVISIONS

#A0 Issue No.	Date	Inserted by	#A0 Issue No.	Date	Inserted by
16	1 July 2003	CAAS			
17	1 April 2004	CAAS			
18	1 July 2004	CAAS			
19	1 July 2005	CAAS			
20	15 August 2006	CAAS			
21	1 June 2007	CAAS			
22	1 February 2008	CAAS			
23	**16 November 2009**	**CAAS**			

No. A0

Issue 23

16 November 2009

AIRWORTHINESS NOTICE

This Airworthiness Notice contains a list of the current Airworthiness Notices. This copy supersedes revision issue 22 dated 1 Febuary 2008.

Notice No	Issue	Date	Subject
A0	23	16 November 2009	Contents
A1	4	1 June 2007	Foreword
A2	-	-	Cancelled
A3	-	-	Cancelled
B1	-	-	Cancelled
B2	-	-	Cancelled
B3	3	1 July 2003	Aircraft Engines, Engine Modules, APUs and Propellers obtained from sources not under the Airworthiness Control of CAAS
B4	-	-	Cancelled
B5	4	1 July 2003	Airworthiness Flight Tests
B6	3	15 August 2006	Manufacture and Inspection of Aircraft Parts and Approval of Materials for the Repair or Overhaul of Aircraft
B7	-	-	Cancelled
B8	3	1 July 2003	Renewal of Certificates of Airworthiness
B9	-	-	Cancelled
B10	2	1 July 2003	Acceptance Standards for the Maintenance, Overhaul, Repair of Second-hand Imported Aircraft for which a Singapore Certificate of Airworthiness is sought

Notice No	Issue	Date	Subject
B11	18	1 July 2004	Recognition of the Republic of Singapore Air Force (RSAF) Qualified Senior Technicians' Experience as Aeronautical Engineering Experience
B12	20	1 June 2007	Aircraft Maintenance Examination Credits for Graduates of Aeronautical Engineering Diploma Programmes Conducted by Singapore Polytechnic and Ngee Ann Polytechnic
C1	-	-	Cancelled
C2	2	1 July 2003	Tyre Wear Limits
C3	-	-	Cancelled
C4	6	1 July 2003	Experience from Incidents
C5	4	1 July 2009	Suspected Unapproved Parts
C6	4	1 July 2003	Carriage of Emergency Locator Transmitter (ELT)
C7	-	-	Cancelled
C8	2	1 July 2003	Microbiological Contamination of Fuel Tanks of Turbine Engine Aircraft
C9	2	1 July 2003	Unprotected Starter Circuits in Aircraft not exceeding 5700kg (12500lb)
C10	3	1 July 2003	Mandatory Modifications and Inspections
C11	2	1 July 2003	Carbon Monoxide Contaminations in Aircraft
C12	2	1 July 2003	Maintenance of Cockpit and Cabin Combustion Heaters and their Associated Exhaust Systems
C13	2	1 July 2003	Internal Emergency Lighting Systems or Ultimate (scrap) Lives
C14	2	1 July 2003	Gas Turbine Engines Parts Subject to Retirement
C15	-	-	Cancelled
C16	-	-	Cancelled
C17	2	1 July 2003	Vertical Speed Indicators on Imported Aircraft
C18	-	-	Cancelled
C19	-	-	Cancelled

Notice No	Issue	Date	Subject
C20	3	1 July 2003	Flame Resistance Furnishing Materials
C21	3	1 July 2003	Fatigue Lives
C22	-	-	Cancelled
C23	-	-	Cancelled
C24	2	1 July 2003	Overhaul and Inspection Requirements for Variable Pitch Propellers
C25	2	1 July 2003	Power Supply Systems for Aircraft Radio Installations
C26	2	1 July 2003	Counter/pointer Altimeters
C27	2	1 July 2003	Emergency Power Supply for Electrically Operated Gyroscopic Bank and Pitch Indicators (Artificial Horizons)
C28	2	1 July 2003	Electrical Generation Systems – Aircraft not exceeding 5700kg MTWA
C29	2	1 July 2003	Fire Precautions – Aircraft Toilets
C30	2	1 July 2003	Automatic Direction Finding Equipment on Turbine Engined Aeroplanes and Helicopters
C31	2	1 July 2003	Communications Transmitters in the VHF Radio Telephony Band 118-136 MHz
C32	2	1 July 2003	Tyres and Wheels Fitted to Aircraft Certificated in the Transport Category
C33	-	-	Cancelled
C34	2	1 July 2003	Aircraft Equipment
C35	2	1 July 2003	Ground Operation of Aircraft Radar Equipment
C36	2	1 July 2003	Toilet Flush Motors
C37	4	1 July 2003	Floor Proximity Emergency Escape Path Marking
C38	3	1 July 2003	Aircraft Seats and Berths – Resistance to Fire
C39	2	1 July 2003	Cabin and Toilet Fire Protection
C40	4	1 July 2003	Access to and Opening of Type III and Type IV Emergency Exits

Notice No	Issue	Date	Subject
C41	2	1 July 2003	Electrical Generation Systems – Single Engine Aircraft
C42	2	1 July 2003	Acceptance of Aircraft Standard Parts by Users
C43	-	-	Cancelled
C44	2	1 July 2003	Tyre Bursts in Flight – Inflation Media
C45	2	1 July 2003	Improved Flammability Test Standards for Cabin Interior Materials
C46	2	1 July 2003	Minimum Space for Seated Passengers
C47	2	1 July 2003	Class C and D Cargo or Baggage Compartment – Fire Containment Capability
C48	2	1 July 2003	Portable Oxygen Equipment Pressure Relief
C49	2	1 July 2003	Control of Precision Cutting Tools
C50	-	-	Cancelled
C51	-	-	Cancelled
C52	3	11 December 2002	Enhanced Ground Proximity Warning System (EGPWS)
C53	-	-	Cancelled
C54	-	-	Cancelled
C55	1	1 February 2008	Additional Cabin Safety Requirements for Airbus A380 Aircraft
C56	1	16 November 2009	Medical Supplies Required on Singapore Registered Aircraft

No.A1

Issue 4

1 June 2007

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

FOREWORD

1 General

1.1 Airworthiness Notices are issued by the Civil Aviation Authority of Singapore (CAAS) to circulate information of an administrative or technical nature to all concerned with the airworthiness of civil aircraft.

1.2 Airworthiness Notices replace all Notices to Licensed Aircraft Engineers and to Owners of Civil Aircraft previously issued by the former Department of Civil Aviation.

2 Contents List

2.1 Notice A0 is the contents page which contains a list of all the current Notices. When a Notice becomes redundant it will be withdrawn and shown as "Cancelled" in Notice A0.

2.2 Notice A0 is issued with every issue of Notices and the changes would be marked by marginal lines. The issue number of Notice A0 would increase by 1.

3 Arrangement

3.1 Each Notice is identified by an alphabet and a number, followed by an issue number and an issue date.

3.2 When a procedure which has already been the subject of a Notice is changed, the particular Notice is re-issued under the same number but bearing a new issue number and issue date.

3.3 Material differences between issues are marked by marginal lines.

3.4 All Notices are concerned with matters affecting the airworthiness of civil aircraft. The type of information contained therein is categorised as follows:

(a) Part A - General Administration

(b) Part B - Procedures

(c) Part C - Matters directly involving airworthiness.

The Notice number will be prefixed with the relevant alphabet to denote the appropriate category.

4 **Publication**

4.1 The Notices are also available on the following CAAS website, under the heading "REGULATIONS & GUIDELINES":

http://www.caas.gov.sg/caas/en/index.html

No.B3

Issue 3

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

AIRCRAFT ENGINES, ENGINE MODULES, APUS AND PROPELLERS OBTAINED FROM SOURCES NOT UNDER THE AIRWORTHINESS CONTROL OF THE CAAS

1 Where aircraft engines, engine modules, APUs and propellers (hereafter called Powerplants) which have been overhauled, repaired or operated by organisations not under the airworthiness control of the CAAS (e.g. Government or foreign organisations) are obtained for use in aircraft for which a Singapore certificate of airworthiness is held or required, some form of acceptance by the CAAS is necessary so that paragraph 10 of the Air Navigation Order can be complied with. If the following facts (paragraph 1.1 to 1.3) can be established and the appropriate procedures of paragraphs 1.4 to 1.6 completed, the item may be regarded as having been operated, overhauled, repaired or modified in a manner, and with material of a type approved by the CAAS. Paragraphs 2.1 and 2.2 are appropriate to 'pool', 'lease', 'loan' or 'power-by-the-hour' powerplant in a similar way. The appropriate methods of signifying that items have been accepted under this Notice are prescribed in paragraph 3.

1.1 The powerplant shall be of a type approved by the CAAS, and the constructor shall, at the time of the original build, have been acceptable for the purpose to the CAAS.

1.2 The build standard shall be acceptable to the CAAS, i.e :

(a) A list of any modifications or repair schemes not approved by the original constructor shall be provided to the CAAS, which will determine whether any further investigation is required.

(b) Where military types are similar to a civil equivalent and have been modified to comply with civil requirements, this shall have been done in conjunction with the constructor in each particular case, unless agreed otherwise with the CAAS.

(c) All applicable Airworthiness Directives shall have been accomplished, including Airworthiness Directives of the State of Design.

(d) The last overhaul and any subsequent repairs shall have been undertaken to a specification and by an organisation or person, acceptable to the CAAS. Where an appropriate arrangement exists between the CAAS and the responsible authority of a foreign country, overhaul and repair organisations appropriately authorised by that authority would be acceptable to the CAAS.

1.3 In all cases, it shall be established, by the methods of (a) or (b) below, that the powerplant has not become unserviceable as a result of operational abuse, inadequate maintenance or unsuitable storage. Log books alone must not be regarded as sufficient evidence of serviceability because they do not always provide a complete record of defects and work carried out.

(a) It may be possible to make this judgement from the knowledge of the previous users. Where an appropriate arrangement exists between the CAAS and the responsible authority of a foreign country, a statement certifying serviceability issued by an organisation appropriately authorised by that authority will be acceptable. Failing this, reference shall be made to the CAAS, which will make a decision taking into account, such information as may be available from the responsible authority, the constructor and the previous operator.

(b) Where adequate assurance cannot be obtained under the methods of (a), the item shall be dismantled sufficiently (taking into account any recommendations issued by the constructor) to enable a judgement to be reached based on the revealed condition. If necessary, rectification action shall be taken before the item is regarded as complying with this paragraph 1.3. If it cannot be established that the engine powerplant are accurate and complete, all life limited parts must be scrapped. In addition, reference must be made to the CAAS for a decision on whether any other parts should be scrapped in the absence of satisfactory records.

NOTE: It will usually be difficult to establish serviceability of any item which has been used for type testing, or outside the disciplines of aviation regulations (e.g. in boats, hovercraft, power stations).

1.4 Where an assembly is broken down for use as individual parts, a statement of acceptability, in which the source of supply is indicated, shall be included in the release documents. For example, where an engine has been broken down into spares, the identity of the engine from which the part was taken should be referred to in the certification on the following lines - "Cylinder head removed from Gypsy Major 10 MK 2-2 engine, Serial No. 12345, checked for serviceability and modification standard, and the following work completed ...". Such a certification can be given by any organisation or person who can sign a statement in accordance with paragraph 3 of this Notice. In addition, the holder of an aircraft maintenance engineer's licence endorsed in Category "C" for the type of engine, may certify such spare parts as his licence permits him to dismantle, assemble and incorporate in engines.

1.5 Civil identification plates shall be fitted, where applicable, and log books or their equivalent, as appropriate, shall be issued. Original or certified true copies of any necessary documents (e.g. modification standard, test results) arising from construction or previous overhaul shall be provided with the release documents.

1.6 A statement of any limitations (e.g. overhaul periods, time used of any retirement or ultimate □ scrap □ lives) shall be provided with the release documents.

2 Powerplants which fall into the categories defined in 2(a) and 2(b) are treated under different rules (see 2.1 and 2.2) which replace those in paragraph 1.

(a) 'Pool' powerplants:
engines interchanged between certain participating airlines on a temporary (get-you-home) basis limited to a maximum of 200 hours.

(b) 'Lease', 'Loan' or 'Power-by-the-hour' engines:
engines which are supplied to operators under various agreements for long-term periods, usually from the manufacturer or his agent, but which are not necessarily newly overhauled when supplied.

2.1 **Pool Powerplants**

2.1.1 The use of pool powerplants, for the limited purpose and period covered by the definition, is permitted provided:

(a) The conditions relating to airworthiness, which must apply for a pooling agreement to be entered into, are laid down in advance by the operator, agreed by CAAS and lodged permanently in some suitable record of procedures.

(b) The conditions require consideration not only of the local history of the engine but of the source of engine overhaul and repair where this is other than by the pool partner.

(c) Applicable mandatory directives, instructions and notices are met.

(d) The Singapore operator obtains from the overseas operator a signed statement certifying the powerplant is airworthy when released on loan, declaring any restrictions in cycles or hours, etc., relating to inspection, replacement, or overhaul as necessary to maintain the airworthiness of the item during the period of loan. He must also, with the Certificate of Release to Service for the installation of the engine, complete the statement as required by 3.3 below.

2.2 **Lease/Loan/power-by-the-hour engines**

2.2.1 Where a powerplant is obtained from the original manufacturer or a CAAS approved overhaul organisation for long term loan or 'power-by-the-hour' lease and has been operated by a non-Singapore operator since the last time the engine was available to the manufacturer/overhauler for an assessment similar to that detailed in paragraph 1.3(b), it will be acceptable for the serviceability of the powerplant to be confirmed as follows :

(a) The manufacturer/overhauler or his authorised representative must issue certification of serviceability, having been satisfied at least that:

(i) The previous operator has declared the powerplant to be serviceable at the time of removal, or has stated known defects.

(ii) Any outstanding defected have been rectified.

(iii) All defects which were recorded during the term of the previous lease appear to have been rectified satisfactorily.

(iv) The powerplant's performance is satisfactory (This may be by reference to the previous operator's logged data where this is suitable).

(v) The powerplant has been stored satisfactorily and has not become deficient since removal from the aircraft due to the removal of any components.

(vi) The status of all life-limited components in the engine is clearly defined.

(vii) Inspection of the powerplant by the manufacturer or his authorised representative to a published schedule has been carried out to the extent necessary to confirm and certify that the powerplant is serviceable at the time of despatch.

(viii) All applicable Airworthiness Directives of the State of Design have been accomplished.

3 Statement(s) in accordance with 3.1(a); or paragraphs 3.1(b) and 3.2 (accompanied by a Certificate of Release to Service for the actual stripping, rectification and rebuilding carried out) or 3.3, as appropriate, shall be entered in the applicable engine or propeller log book, to enable Certificates of Release to Service to be issued when required by paragraph 10 of the ANO.

3.1 (a) "Part … S/N … has been accepted by the CAAS in accordance with Airworthiness Notice No. B3, paragraphs 1.1, 1.2 and 1.3(a)".

(b) "In respect of Part … S/N … compliance has been shown with Airworthiness Notice No. B3, paragraphs 1.1 and 1.2. The part will be accepted by the CAAS when compliance with paragraph 1.3(b) has been established." The statement shall be signed by a CAAS Airworthiness Officer.

3.2 "Part ... S/N ... has been examined in accordance with Airworthiness Notice No.B3, paragraph 1.3(b), and (no evidence of operational abuse, inadequate maintenance or unsuitable storage has been revealed)*, (appropriate action has been taken to restore serviceability)*."

This statement shall be signed either by an organisation accepted by the CAAS for the construction or overhaul, or by a licensed aircraft maintenance engineer accepted by the CAAS for the overhaul, of the item concerned.

3.3 "Part ... S/N ... has been accepted under procedures complying with Airworthiness Notice No. B3, paragraph 2.1* or 2.2*.

This statement shall be signed by the person issuing the Certificate of Release to Service for the installation of the item concerned.

4 Cancellation

4.1 This Notice cancels Airworthiness Notice B3, Issue 2, dated 1 July 1989, which should be destroyed.

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*Delete whichever is not applicable

No.B5

Issue 4

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

AIRWORTHINESS FLIGHT TESTS

1 The Singapore Airworthiness Requirements (Section 5 Chapter 5.3 paragraph 3) require flight tests to be undertaken in the following circumstances:

(a) Prior to the issue of a Singapore certificate of airworthiness.

(b) Annually at certificate of airworthiness renewal or at such other intervals as may be agreed by the CAAS to determine whether the handling characteristics, functioning and performance of an aircraft continue to comply with the requirements that were acceptable to the Director-General of Civil Aviation when the aircraft was issued with a Singapore certificate of airworthiness.

(c) On completion of a modification or other work likely to affect the handling characteristics, functioning or performance of an aircraft.

(d) In lieu of an annual flight test, a programme for aircraft performance and engine condition monitoring must be approved.

2 Flight test schedules shall be prepared in conjunction with the CAAS and must be acceptable to the Director-General of Civil Aviation. The flight test schedules shall, except where otherwise agreed, include tests as outlined in the SAR Section 5 Chapter 5.3 paragraph 3.3 and paragraph 3.4.

3 A copy of flight test reports in an acceptable format shall be submitted to the Airworthiness/Flight Operations Division of CAAS on completion of all airworthiness flight tests.

4 The qualifications and experience of flying staff and other persons engaged in flight tests, together with the facilities and equipment provided for the tests shall be acceptable to the Director-General of Civil Aviation.

No.B6

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

MANUFACTURE AND INSPECTION OF AIRCRAFT PARTS AND APPROVAL OF MATERIALS FOR THE REPAIR OF OVERHAUL OF AIRCRAFT

1 The attention of all concerned is drawn to the fact that cases have occurred where:

(a) defective parts have been replaced by parts manufactured without reference to drawings, the defective parts being used as a pattern; or

(b) components, for which no certificate of compliance could be produced, have been embodied in civil aircraft. In some cases parts had been obtained from stocks which were surplus to the requirements of the Services, or from various sources other than the manufacturer.

2 In circumstances such as those referred to in paragraph 1(a) there is considerable risk of the new part being made to incorrect dimensions and/or of incorrect materials.

3 In every case where it is necessary to manufacture any detail or component of an aircraft for which a certificate of airworthiness has been issued or is to be issued or renewed, such replacements must be manufactured, inspected and installed to approved drawings.

4 Certification of any repair or replacement under the requirements of the Air Navigation Order and Section 4 Chapter 4.4 of the Singapore Airworthiness Requirements should not be made unless either:

(a) the replacement parts have been approved by the manufacturers of the aircraft; or

(b) the parts have been manufactured and inspected to standard approved drawings (approved repair schemes issued by certain manufacturers coming under this heading); or

(c) the repair has been approved as a modification subsequent to the issue of a certificate of airworthiness.

5 The existence of an inspection stamp is not in itself sufficient evidence of approval of materials, details or components; approved certificates are also required, and these documents should be held available for examination when an aircraft is inspected for the issue or renewal of a certificate of airworthiness.

No.B8

Issue 3

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

RENEWAL OF CERTIFICATES OF AIRWORTHINESS

1 Certificates of airworthiness will be renewed on application form CAAS(AW)29 provided that the procedures prescribed by the following are adhered to.

2 Renewal application form must be forwarded direct to the Airworthiness/Flight Operations Division of CAAS with cheque for the appropriate fee made payable to the "Civil Aviation Authority of Singapore" one month prior to expiry of the certificate.

3 **Flight Test**

The aircraft should be flight tested in accordance with the relevant airworthiness flight test schedule approximately one month prior to expiry of the certificate, and a flight test report completed in accordance with the requirements of the schedule submitted two weeks prior to the certificate of airworthiness expiry. This report should be checked, including the climb performance against flight manual requirements and all defects investigated and corrected prior to submission.

If a programme for aircraft performance and engine condition monitoring has been approved by CAAS, the relevant data should be submitted.

4 Other documents to be submitted with flight test report are :

(a) certificate of airworthiness;

(b) flight manual;

(c) aircraft log book, engine log books and propeller log books (if applicable);

(d) copies of log book entries in duplicate for the aircraft, engines and propellers;

(e) weight and centre of gravity schedule in duplicate whenever the aircraft hasbeen re-weighed or a revised schedule is raised without weighing; and

(f) a copy of the insurance certificate or cover note.

No.B10

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

ACCEPTANCE STANDARDS FOR THE MAINTENANCE, OVERHAUL AND REPAIR OF SECOND-HAND IMPORTED AIRCRAFT FOR WHICH A SINGAPORE CERTIFICATE OF AIRWORTHINESS IS SOUGHT

1 It is noted that, in the past, difficulty has been experienced in establishing whether compliance is shown with the CAAS requirements in respect of the maintenance, overhaul and repair of second-hand aircraft imported into Singapore. Examples of difficulties are as follows:

(a) Repairs having been embodied without adequate records to establish compliance with an approved scheme or manual acceptable to either the CAAS or other airworthiness authority.

(b) Modifications having been embodied without adequate records to indicate either the source of approval or the organization responsible for embodiment of the modification.

(c) Doubt as to the extent of compliance with the CAAS maintenance schedule requirements, particularly those relating to major inspections or overhaul work which are intended to ensure the structural integrity of the aircraft and those relating to overhaul periods of components and accessories when compared with the overhaul periods which have previously been applied.

2 Prospective purchasers of second-hand aircraft from sources outside Singapore are advised that, in future, before a certificate of airworthiness is issued in respect of an imported second-hand aircraft, the CAAS will require to be satisfied that:

(a) both the approval and embodiment of repairs and modification comply with corresponding Singapore Airworthiness Requirements, or that, if this cannot be established, satisfactory supporting evidence is available from an acceptable source such as the original manufacturer, other airworthiness authority, or a suitably approved design organisation in Singapore;

(b) the aircraft has been inspected, its condition has been established and reports have been supplied to the CAAS;

(c) all airworthiness directives or mandatory modifications and inspections have been complied with; and

(d) a check to the manufacturer's recommended maintenance programme, or to the standard of an approved maintenance schedule for the type has been certified.

No.B11

Issue 18

1 July 2004

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

RECOGNITION OF THE REPUBLIC OF SINGAPORE AIR FORCE (RSAF) QUALIFIED SENIOR TECHNICIANS' EXPERIENCE AS AERONAUTICAL ENGINEERING EXPERIENCE

1 General

1.1 SAR Section 7, Chapter 7.3, paragraph 2 (Experience Requirements), sub-paragraph 2.1 (a) requires a minimum of 4 years of aeronautical engineering experience[1] for the grant of an AME licence in any category.

1.2 This Airworthiness Notice provides recognition of the work experience of ex-RSAF Qualified Senior Technicians (QSTs), who have specialised in trades relevant to civil aircraft maintenance, for a partial credit towards this requirement.

2 Effectivity

2.1 This Airworthiness Notice comes into effect immediately.

3 Credit to be Granted

3.1 The CAAS may grant a 2-year credit in aeronautical engineering experience based on RSAF's attestation (by means of a Certificate of Competence) that the QST has served at least 4 years as a certifying technician specialising in the trades relevant to civil aircraft maintenance as stipulated in paragraph 5 below.

3.2 In addition, this 2-year credit grant will be accorded only if the QST joins a civil aircraft maintenance organisation within 1½ years after leaving the RSAF.

3.3 This credit shall not be used in conjunction with any other credits provided for under the Note of SAR Section 7, Chapter 7.3, paragraph 2 (Experience Requirements), sub-paragraph 2.1 (a).

[1] Aeronautical engineering experience is defined as the recent experience gained in the maintenance or overhaul of complete aircraft or major components and accessories of aircraft, engines, electrical, instrument and radio equipment.

4 Certificate of Competence

4.1 The Certificate of Competence is controlled and provided by the RSAF only to individual QSTs who qualify under the criteria stated in paragraph 3.1.

4.2 A copy of this certificate must be submitted to the CAAS:

(a) when applying to sit for AME basic examinations (which may require the candidate to show at least 2 years of aeronautical engineering experience); or

(b) when applying for the grant of an AME licence.

4.3 The original Certificate of Competence must be presented to the CAAS for verification during the interview for the grant of an AME licence.

4.4 A sample copy of the Certificate of Competence is available in **Appendix 1.**

5 Relevant Trades

5.1 For the purpose of controlling the issuance of the Certificate of Competence, the RSAF shall consider the following specialisation trades as 'relevant trades':

(a) Airframe (Fixed wing);

(b) Airframe (Rotary wing);

(c) Engine (Fixed or rotary wing aircraft engine);

(d) Electrical and Instruments; and

(e) Radar and Communications (Air Navigation and Communications only).

No. B11 Appendix 1

Issue 18

1 July 2004

SAMPLE OF CERTIFICATE OF COMPETENCE

RSAF-AAIS CAREER TRANSITION SCHEME

Certificate of Competence

NAME & RANK
NRIC

The above-mentioned serviceman has served in the Republic of Singapore Air Force (RSAF) as an AAA Senior Technician since dd/mmm/yyyy.

During his tenure in the RSAF, he has satisfied the RSAF's training requirements on aircraft maintenance and has been authorised to carry out maintenance and repair on the BBB aircraft / systems type. He has a total of xx years of RSAF aviation experience since his initial authorisation.

Rank & name's authorisation on RSAF aircraft / system type would be recognised for a period of 1½ years from dd/mmm/yyyy when he leaves the organisation.

This certificate is issued under the authority of Air Manpower Department.

XXX XXXX XXXX
COL XXXX XXXX
Head Air Manpower
Dd/mmm/yyyy

Notes: (These notes are not included in the actual certificate)

i) AAA – The possible entries under this field are:
Airframe Fixed Wing Senior Technician
Airframe Rotary Wing Senior Technician
Engine Senior Technician
Aircraft Communication and Navigation System Senior Technician
Electrical Instrument Senior Technician

ii) BBB – The possible entries are:
F16, F5, A4, C-130, E-2C, CH-47, UH-1H, FENNEC, UAV, Super Puma and AH-64.

No. B12

Issue 20

1 June 2007

AIRWORTHINESS NOTICE

AIRCRAFT MAINTENANCE EXAMINATION CREDITS FOR GRADUATES OF AERONAUTICAL ENGINEERING DIPLOMA PROGRAMMES CONDUCTED BY SINGAPORE POLYTECHNIC AND NGEE ANN POLYTECHNIC

1 General

1.1 This Airworthiness Notice serves to inform persons intending to obtain an AME licence that credits towards CAAS SAR Section 7 basic examination papers may be obtained by satisfactorily completing an aeronautical engineering diploma programme offered by Singapore Polytechnic or Ngee Ann Polytechnic.

2 Effectivity

2.1 This Airworthiness Notice comes into effect on 1 June 2007.

3 Credits

3.1 The credits that may be obtained through the respective polytechnics' programmes are as follows:

a) Singapore Polytechnic's Diploma in Aeronautical Engineering (DARE)

A11 : Auxiliary Airframe Systems
A12 : Structures and Repairs
A14 : Hydraulic and Pneumatic Power Systems
A16 : Air-Conditioning & Pressurisation Systems
A17 : Avionic Systems
B12 : Aerodynamics and Mechanical Control
B13 : Electrical and Instrument Systems
C11 : Piston Engine Theory & Construction
C14 : Turbine Engine Theory and Construction
C15 : Turbine Engine Systems
H11 : Human Factors and Error Management

b) Singapore Polytechnic's Diploma in Aerospace Electronics (DASE)

E11 : Electrical Systems
F11 : Maintenance Practices and Aerodynamics
F12 : Electrical Fundamentals
F13 : Servomechanisms and Electronics

F14 : Digital Techniques
I11 : Instrument Systems
I12 : Inertial Navigation & Reference Systems
R11 : Radio Fundamentals
H11 : Human Factors and Error Management

c) Ngee Ann Polytechnic's Diploma in Aerospace Technology

A11 : Auxiliary Airframe Systems
A12 : Structures and Repairs
A14 : Hydraulic and Pneumatic Power Systems
A16 : Air-Conditioning & Pressurisation Systems
A17 : Avionic Systems
B11 : Maintenance Practices and Materials
B12 : Aerodynamics and Mechanical Control
B13 : Electrical and Instrument Systems
C14 : Turbine Engine Theory and Construction
C15 : Turbine Engine Systems
H11 : Human Factors and Error Management

d) Ngee Ann Polytechnic's Diploma in Electronics and Telecommunication Engineering (Avionics)

F12 : Electrical Fundamentals
F13 : Servomechanisms and Electronics
F14 : Digital Techniques
R11: Radio Fundamentals
H11: Human Factors and Error Management

4 Certificate of Recognition

4.1 Students who have successfully obtained the relevant diploma and obtained acceptable grades in the polytechnic modules correlated to the above SAR Section 7 subjects may obtain a Letter of Recognition from their respective polytechnic upon graduation.

Note: Information pertaining to the correlation of modules to SAR 7 subject should be available from the polytechnic that is conducting the course.

4.2 The Letter of Recognition will list the credits granted towards one or more SAR Section 7 basic papers listed in paragraph 3 above.

4.3 A copy of this letter must be submitted to CAAS if the student wishes to be considered for exemption against the appropriate SAR Section 7 AME basic examination subject (s).

No.C2

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

TYRE WEAR LIMITATIONS

1 Introduction

1.1 This Notice provides general guidance on the subject of tyre wear limitations for operators of all public transport aeroplanes of more than 5 700 kg maximum weight for which a limiting tyre tread depth is not available.

2 Discussion

2.1 Accidents and incidents, resulting from both loss of braking friction and loss of directional control on wet runways, continue to occur. While the scheduled accelerate stop and landing distances provide some allowance for deterioration in friction, it has been established that this allowance is not sufficient to maintain the required level of safety if tyres which are more than 80% worn are used in wet runway operations.

2.2 As it is not possible fully to allow for this by increasing the scheduled distances (because of the frequency of incidents caused by loss of directional control, even on the most favourable wheel arrangements), the CAAS favours the retention of current scheduled distances, together with a recommended minimum tread depth applicable to all aircraft tyres.

3 Recommendation

3.1 In the absence of evidence of the safety of a lower limit for a particular aircraft/ tyre/operation combination, it is recommended that a tyre be withdrawn from service when it is worn to such an extent that its wet runway performance would be seriously impaired. This may be defined as when:

(a) it is worn such that any groove has a depth of less than 2mm of tread for more than one quarter of the tread circumference; or

(b) at any place on the circumference the tread pattern is worn to a depth of less than 2mm across the whole width of the tread in contact with the runway.

Note : This is not a rigid definition and equivalence may be provided if, for example, tyre wear is such that whilst one groove is less than 2mm all the others are 3mm or more.

No.C4

Issue 6

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

EXPERIENCE FROM INCIDENTS

1 From time to time incidents occur, usually in aircraft operations, which, in the opinion of the CAAS, reflect the need for a general awareness of possible hazard resulting from practices which may have a wide general application. The purpose of this Notice is to advise all concerned, particularly design and engineering staff engaged in aircraft construction or operation, of such incidents from experience which have come to the notice of the CAAS, and where necessary to prescribe action to be taken.

2 New incidents will be advised in Appendices to this Notice, and the List of Appendices will be updated with each such issue.

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3 Cancellation

3.1 This issue of Airworthiness Notice No. C4 cancels pages 1 and 2, Issue 5, dated 7 September 2001, which should be destroyed.

No.C4 Appendix 1

Issue 2

1 July 2003

SOFT METAL SHIMS

1 An incident involving a transport aircraft resulted from the failure of a power control bracket fitting to the elevator.

2 A subsequent investigation 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 effect of these was quickly lost after initial tightening due to setting or extrusion of the soft metal shims.

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

C4 Appendix 2

Issue 2

1 July 2003

CROWDED BALL RACES

1 An incident occurred as a result of a control shaft becoming completely jammed.

2 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.

3 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.

4 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.

No.C4 Appendix 3

Issue 2

1 July 2003

OXYGEN FIRE RISK

1 Serious fire damage 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 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 construction.

3 Precautions should be taken to ensure that an oxygen leak would 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.

No.C4 Appendix 4

Issue 2

1 July 2003

FLUTTER OF FLYING CONTROL SURFACES

1 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 to mass balance and rigidity characteristics of flying control surfaces.

2 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 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.

4 The cumulative effects 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 CAAS Airworthiness Section should be consulted.

5 The balance of control surfaces should be checked after repair or 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.

6 Another cause 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.

No.C4 Appendix 5

Issue 2

1 July 2003

FLUIDS USED IN AIRCRAFT

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

2 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 legible condition.

(b) Where it is critical that the fluid to be used is to a particular specification, the marking may either indicate the specification 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 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 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.

4 Additionally hazards apply when servicing fluids are carried on board the aircraft and used to replenish systems when transiting overseas stations. Where foreign handling agents are used, language problems may compound potential problems. Operator's 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.

No.C4 Appendix 6

Issue 2

1 July 2003

INSPECTION IN RELATION TO SPILLAGE OR COLLECTION OF FLUID

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 corrective action may be taken.

2 In some instances the fact that fluids had been present may not have been appreciated because the affected areas had been cleaned out 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 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.

4 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.

No.C4 Appendix 7

Issue 2

1 July 2003

FOREIGN OBJECTS AND LOOSE ARTCLES - DANGER OF JAMMING

1 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 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.

2 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 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.

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 chasis.
- ✈ Hydraulic fluid top-up cans and meal trays fouling primary control runs.
- ✈ A spare control rod left in a fin by the constructor, 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 taxy checks due to a coat hanger in a footwell.
- ✈ An investigation of an accident involving a jammed elevator, found numerous foreign objects which potentially may have restricted control system movement.

No.C4 Appendix 8

Issue 2

1 July 2003

BRAKE AND ANTI - SKID SYSTEMS

1 Instances have occurred in which wheel brake systems incorporating anti-skid 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.

2 Experience has shown that dormant faults, which reduce the maximum energy absorption capability for 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 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 If functional checks carried out in accordance with the relevant maintenance manuals would not achieve the objectives stated in 2(a) and (b), the aircraft constructor should be consulted in order to agree to suitable amendments to the manuals to include tests which will verify the functional integrity of the system.

4 Additionally, operators having maintenance schedules approved by the CAAS 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 2(a) and (b), and that any necessary cross references to the maintenance manual are amended or added.

5 In the event of difficulty in obtaining agreement with constructors, the Airworthiness Section should be consulted.

No.C4 Appendix 9

Issue 2

1 July 2003

AUTO-PILOTS ON LIGHT AIRCRAFT

1 The aileron controls of a light aircraft 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.

2 The type of auto-pilot involved in the incidents 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 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 pilots of all light aircraft should make a similar check fitted with auto-pilots in which slipping clutches are incorporated.

4 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.

5 At all times the manufacturers' recommendations for operating and maintaining the auto-pilot must be adhered to.

No.C4 Appendix 10

Issue 2

1 July 2003

INSPECTION OF CRITICAL PARTS OF HELICOPTER GEARBOXES

1 A fatal accident to a helicopter was caused by break-up of the main gearbox. The break-up was caused by fatigue failure of a planetary gear which was initiated by craze cracking as a result of overheating.

2 There was no evidence of the overheating having occurred since the previous inspection of the gearbox, at which, however, copper dust contamination was found, and the planetary gear spacer washers were found to be worn below the minimum allowable thickness and were replaced. Although it is presumed that they may have been present, no signs of overheating or craze cracking of the planetary gears were found during the visual inspection made at the time.

3 The importance of determining the condition of highly stressed critical parts, particularly where unusual wear or failure of an adjacent part has occurred, is emphasised. Crack detection techniques and visual examination using high magnification, may reveal damage not discernible by the naked eye, and should be used in such cases.

No.C4 Appendix 11

Issue 2

1 July 2003

UNAUTHORISED ALTERATION OF PARTS

1 Fatal accidents to civil aircraft have occurred after the unauthorised alteration of parts in such a way as to enable their incorrect assembly and functioning. No part which could affect the safety of an aircraft may be altered other than in accordance with drawings or instructions from the constructor or an appropriately approved organization.

2 In the assembly of all parts, 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 a part, works in the correct sense and throughout the correct range.

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

No.C4 Appendix 12

Issue 2

1 July 2003

MAINTENANCE OF RADIO NAVIGATION EQUIPMENT COURSE AND ALARM SIGNAL CURRENT LIMITS

1 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.

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

4 Any adjustments 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.

5 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.

6 It is good practice, which the CAAS 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.

No.C4 Appendix 13

Issue 2

1 July 2003

BONDING OF STROBE LIGHTS

1 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, has been issued by the FAA.

2 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, 4 and 5.

3 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 ohm 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 scheduled airframe maintenance inspection.

4 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.

5 Where the form of bonding described in paragraph 4 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.

6 The recommendations of this Notice are applicable to strobe lights which are fitted either during the initial build of the aircraft, or by subsequent modification action.

No.C4 Appendix 14

Issue 2

1 July 2003

SECURITY OF RE-FUELLING POINT CAPS

1 An incident has occurred in which overwing fuel leakage occurred during flight, and an adjacent engine was shut down to minimize fire risk.

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

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.

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

5 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 non-compliance.

No.C4 Appendix 15

Issue 2

1 July 2003

REWORK OF PRINTED CIRCUIT BOARDS

1 Investigation of a number of incidents, involving the malfunction of radio and electronic equipment, established that areas of re-working and repairs of printed circuit boards had been undertaken in a manner which did not conform to the manufacturer's recommended procedures, showed a lack of technical skill in their execution and provided evidence of the use of inappropriate repair apparatus.

2 The purpose of this Appendix is both to bring these facts to the attention of organisations holding CAAS approval for the repair, modification and overhaul of radio and electronic equipment, and to re-emphasise the fundamental principles which apply when this class of work is undertaken. Organisations should review their current commitments and should, where necessary, take steps to establish compliance as follows:

(a) All persons actually engaged in such tasks should have received training appropriate to the complexity of the work involved.

(b) Adequate apparatus should be readily available in an environment suitable for the class of work. Where the complexity of the work requires the provision of specialised test equipment, the personnel involved should have received prior training in the use of that equipment.

(c) No repair work should be undertaken except in accordance with methods described in the relevant aircraft or equipment manufacturer's manuals, or in accordance with such alternative methods as are approved by the Director General of Civil Aviation.

(d) When undertaking further repairs, consideration must be given to the limitations imposed by previous repairs, particularly the possibility of inducing unacceptable reductions in the strength of laminate adhesives.

(e) All repaired boards must be subjected to complete stringent visual examination and performance testing. This examination and testing must include all areas and operational functions of the board and must not be confined only to the section.

(f) Appropriate technical records of all work undertaken must be compiled, certified and preserved in accordance with current requirements.

No.C4 Appendix 16

Issue 2

1 July 2003

EMERGENCY ESCAPE PROVISIONS - DOORS AND ESCAPE CHUTES

1 During an emergency evacuation following a collision on the ground, considerable difficulty was experienced in opening two of the aircraft doors and in deploying the associated inflatable escape chutes. Subsequent investigation showed that the difficulty was caused by inorrect stowage of the chutes and their release aprons, and, in the case of one door, by the fitment of an incorrect part. Enquiries have revealed that similar difficulties have also been experienced on various types of aircraft.

2 In addition to routine inspection, it is normal practice to remove inflatable chutes from aircraft at intervals of approximately 18 months and to inflate and check them. However, it is now known that this procedure does not give an indication of any deterioration of the installation, which could result in an inability to open the door or to deploy and inflate the chute. Such deterioration has been shown to be the more common cause of failure in the past. It is considered, therefore, that rather than the removal of chutes from the aircraft, they should be tested by opening the door with the chutes in the "armed" condition, and checking that they deploy and inflate correctly. It is appreciated that this alone will not guarantee correct future operation of all chutes on any particular aircraft, but it will provide a running check on the adequacy of chute and door operation.

3 For all aircraft fitted with inflatable escape chutes which are automatically deployed by the opening of doors, each chute/door combination on the aircraft shall be tested by the automatic release and inflation of the chute at intervals not exceeding 18 months. The testing should be continued until a satisfactory standard of reliability is achieved, after which progressive reduction in the testing, on a sampling basis could be applied, in consultation with the CAAS. In order not to lose valuable experience, it is desirable that the release should be made by cabin staff.

4 Where release and inflation tests, on a sampling basis, are already being performed as part of an agreed maintenance reliability programme, the programme of tests may continue, provided that on each aircraft type the sample is such that 10 or 10% whichever is the greater, of all the exits in the fleet at which automatically deployed inflatable chutes are installed, will have been tested within an elapsed period of not more than 2 years. The sampling may continue to be random but must be such as to ensure a reasonably uniform distribution of the exits on that aircraft type.

5 In addition to any prescribed mandatory defect reporting, a record should be kept of failure of doors to open or chutes to deploy and inflate, and should be made available to the CAAS on request.

6 Operators shall forward to the CAAS amendments to their approved maintenance schedules such as will take account of the tests required under paragraph 3 of this Notice.

No.C4 Appendix 17

Issue 2

1 July 2003

SELF-LOCKING FASTENERS

1 Past incidents on helicopters have highlighted a continuing hazard where self-locking fasteners on control system linkages have become detached, allowing control linkages to separate. Similar instances have been recorded on fixed-wing aircraft.

2 Maintenance personnel are reminded that careful attention must be given to the security and tightness of all self-locking fasteners on control system linkages, and to such fasteners used to secure components which are frequently removed.

3 In every case the manufacturer's 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. Where no guidance is available from the manufacturer, it is recommended that the advice not to re-use certain fasteners, should be followed.

No.C4 Appendix 18

Issue 2

1 July 2003

GROUND HANDLING OF TRANSPORT AIRCRAFT

1 In recent years 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.

2 Aircraft constructors specify suitable ground handling equipment, compatible with the aircraft type, designed to avoid overloading e.g. employing shear pins which fail at pre-determined 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 Operators, especially those of the older types of aircraft, should ensure that the correct ground handling equipment is always employed that it is adequately and regularly maintained, and that particular care is taken when using large powerful tractors. Also operators should check with the constructor that their ground handling procedures are compatible with the aircraft design.

No. C4 Appendix 19

Issue 2

1 July 2003

FLAP SYSTEMS ON GENERAL AVIATION AIRCRAFT

1 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.

2 Other incidents have been reported in which asymmetric flap retractions have resulted solely from mechanism failures of the flap drive system, e.g. operating cables or flexible drive assemblies.

3 It is recommended that, during functional checks of the flap operating system, 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 is being amended to require a check based on these recommendations.

4 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 mechanism should be checked for any evidence of static overloading.

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

No. C4 Appendix 21

Issue 2

1 July 2003

ELECTRICAL POWER SUPPLIES – LIGHT AIRCRAFT, CARE AND MAINTENANCE

1 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.

2 It would appear that not everybody is sufficiently aware that a single fault, of 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 alternations and result in the aircraft becoming electrically "dead".

(b) On 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; leaving the electrical supplies 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 affect both generators, possibly to such an extent as to result in the loss of output from them both,

3 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.

4 It is useful to remember that should both generators fail and difficulty be experienced in resetting, it may be possible to reset one of them by reducing the electrical load to a minimum. Having reset one, it is advisable not to attempt to reset the other since this may cause permanent loss of the output of both.

5 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.

6 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 account of these recommendations.

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

8 Whilst the CAAS considers that to require mandatory modification action is not justified and 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 system fail.

No.C4 Appendix 22

Issue 3

1 July 2003

PAINTING OF AIRCRAFT

1 Incidents have been reported of damage to aircraft structure and equipment as a result of the use of unsuitable materials and techniques during paint stripping and re-painting operations.

2 Damage and potential hazards can arise from such reasons as:

(a) Use of incorrect stripping agents resulting in damage to non-metallic structural materials, sealants and transparencies.

(b) Ingress of stripping agents affecting internal protective treatments.

(c) Contamination of systems such as pivot/static and fuel venting.

(d) Restriction of movement between adjacent parts because of paint build-up.

(e) Weight of finish affecting control surface balance (see Appendix 4 to this Notice).

(f) Removal of lubricant as a result of the washing action of cleaning agents.

(g) Incomplete removal of masking and blanking material after painting.

(h) Aircraft weight and centre of gravity may be significantly affected by a strip and re-paint.

Painting of aircraft shall be performed by a authorised persons using approved or recommended data or instructions.

No. C4 Appendix 23

Issue 3

1 July 2003

ALTIMETERS IN GENERAL AVIATION AIRCRAFT

1 An incident occurred in flight in which the altimeter pressure setting scale became detached from the altimeter pointer when the pilot was attempting to set up the appropriate QNH. This resulted in a large indicated altimeter error.

2 Subsequent investigation 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 the instrument bezel. If such play exists, forward or rearward pressure on the knob may disengage the barometric adjustment scale from the altimeter pointer.

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; Kollsmann Alticoder II; Narco AR 800 Series; Bendix 3252103 Series, and United Instrument Altimeters.

4 The FAA have issued Airworthiness Directive 86-05-02 which is applicable to a range of part numbers of United Instrument 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. The UK CAA has raised an Additional Airworthiness Directive (006-02-87) which requires that those instruments listed in paragraph 3 above comply with the requirements of paragraph 5 of this Notice.

5 It is strongly advised that before 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 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.

No.C4 Appendix 24

Issue 2

1 July 2003

TYRE MAINTENANCE AND RELIABILITY

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 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 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 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.

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

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

No.C4 Appendix 25

Issue 2

1 July 2003

AMBIGIOUS INFORMATION

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 has led to confusion in the minds of the staff concerned.

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 meeting.

3 Any person who finds seeming ambiguities or errors in approved documents of any sort (maintenance schedules, flight manuals, etc) is asked to inform the CAAS so that any uncertainties which could affect airworthiness can be correct.

No. C4 Appendix 26

Issue 2

1 July 2003

LOCK-BOLT FAILIURES

1 INTRODUCTION

1.1 This appendix supersedes Airworthiness Notice No.C4 Appendix 26 Issue 1 dated 1 Mar 1982.

2 BACKGROUND

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

2.3 When auto-setting $^{1}/_{4}$ inch diameter lock-bolts (USA 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 inch diameter lock-bolts removed form 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 hardness above the upper limit of the USA Procurement Specification (NAS 1413).

3 AIRWORTHINESS CONSIDERATIONS

3.1 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.

No. C4 Appendix 27

Issue 2

1 July 2003

STOWAGE AND ACCESSIBILITY OF LIFEJACKETS

1 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.

2 Attention of operators and manufacturers is drawn to the need for careful interpretation of the requirements of 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 Interpretation of the requirement for ease of accessibility will in most installation 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 two handed operation, in the shortest possible time. The method for removing the valise from the stowage pouch should, therefore not 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.

No. C4 Appendix 28

Issue 2

1 July 2003

THE USE AND INTERPRETATION OF UNFAMILAR UNITS

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

2 The use of SI Units (Systeme International) within Singapore was dealt by the Singapore Metrication Board.

3 The names of the various units, the symbols used for them, and the methods to be used for presentation of those symbols have been previously published by the Singapore Metrication Board.

4 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 can exist. Where this is the case, potentially ambiguous notation should be explained and illustrated by examples, where appropriate.

5 Where the users of such documents are in any doubt , they should make careful check using reference documents such as BSI 1991: Part 1: 1976 obtainable from the British Standards Institute.

6 In recent case, a degree of uncertainty evidently arose when an area was expressed using the symbol "mm^2" to expressed 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").

7 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 of 2 inches, clearly occupies four times the area of 4 in^2. 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 millimetre (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 50mm square, which is 50 times greater.

8 This Notice is issued for information and action by all concerned. Reference 0 should also be made to Appendix No. 25 of this Notice.

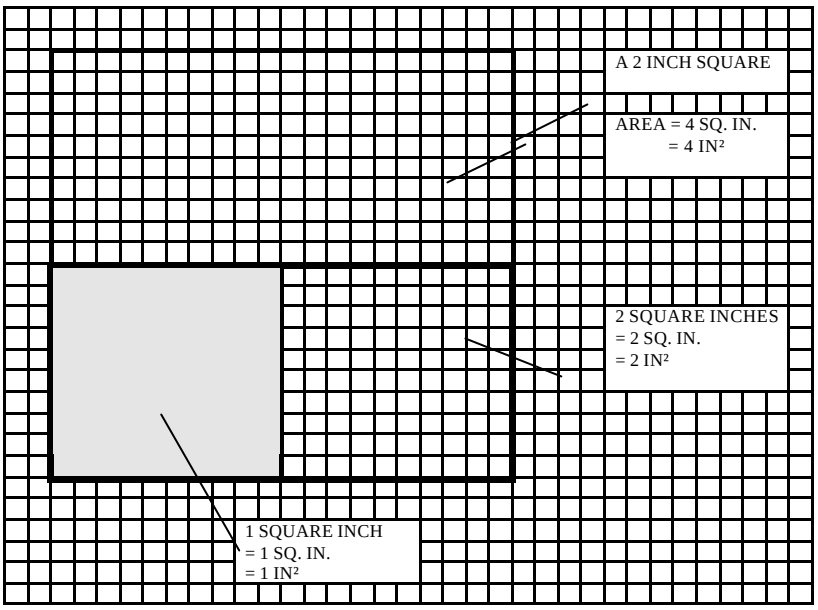

Figure 1

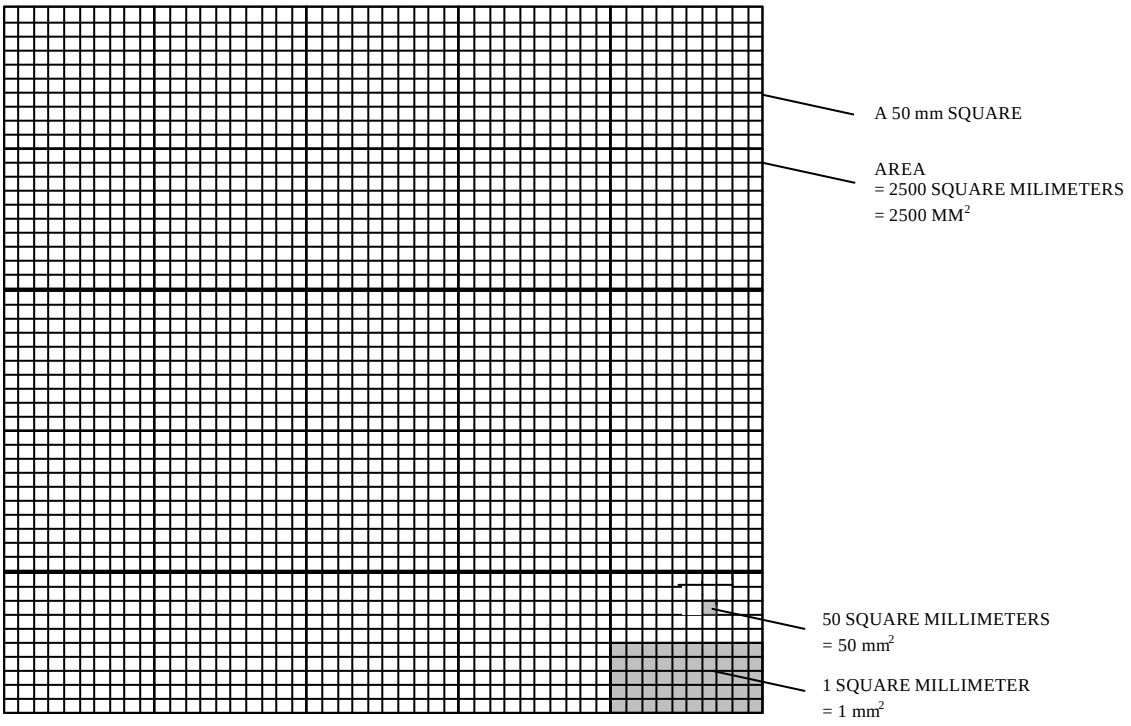

Figure 2

No. C4 Appendix 29

Issue 3

1 July 2003

HARZARDS OF DAMAGE CAUSED BY ARC BURNS

1 An engine's titanium alloy fan blade has failed in fatigue that had propagated from an area of local blending on the blade lending 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 the aerodynamic loads, there were consecutive separations in-flight of the nose-cowl assembly of the fan containment casing which then damaged the airframe and another engine.

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 check.

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

4 The accidental occurrence of electrical arcs produces localised melting and rapid subsequent cooling of materials, thereby causing 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).

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 discolouration 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).

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.

7 In order to minimise this hazard and prevent future occurrences:

(a) minimise the possibility of arc burns by proper maintenance of all electrical equipment used in the vicinity of aircraft/ engine components;

(b) 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;

(c) 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 manufacturer, or reject the part.

No. C4 Appendix 31

Issue 3

1 July 2003

AIR INTAKE FILTERS

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 Investigation suggests that the maintenance applied to the air intake filters on piston-engined light aircraft may not always be adequate. The maintenance schedules concern themselves with the cleanliness and condition of air intake filters but under the definition of 'inspect' imply this can be done in situ and as viewed.

3 In practice for a typical air intake filter installation, the following are apparent:

4 When completing scheduled maintenance inspections, engineers and pilots who may accomplish 50-hour checks on Private Category aircraft 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.

5 In the absence of specific cleaning instructions, British Civil Aircraft Inspection Procedures Leaflet EL/1-2 gives some acceptable basic procedures.

No. C4 Appendix 32

Issue 3

1 July 2003

ELECTRICAL CABLE FAILURE

1 In a well-documented occurrence, damage to the insulation of electrical cables, caused by defective circuit identification printing, was 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 on the damaged area and severe electrical arcing occurred which was of sufficient intensity to rupture the damaged cables and also others in close proximity.

2 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 components, degraded electrical cables being an example.

(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 nay 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 CAAS 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 G 230 Test 16. Continuous testing is not required provided an adequate sample is tested whenever any machine setting is altered, including changes of alphanumeric 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 will be able to advise on suitable test and inspection methods.

3 Personnel engaged in servicing of aircraft are reminded that the discovery of a potentially hazardous failure condition during maintenance of fault finding may well justify the raising of a Mandatory Defect Report. In the context of this Appendix, any unexplained degradation of cable insulation would warrant such a report. Physical evidence should be retained for investigation.

No. C4 Appendix 33

Issue 3

1 July 2003

HYDRAULIC FLUID CONTAMINATION

1 INTRODUCTION

1.1 This appendix supersedes Airworthiness Notice No.C4 Appendix No.33 Issue 3 dated 1 Mar 1988 which was originally issued to warn helicopter operators of the affects 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 manufacturer's 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 residue 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 producerust-like corrosion. Such corrosion is virtually impossible to stop and component overhaul and thorough system decontamination is usually necessary to restore the system to 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 or ground power supply sources are free from 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 may, even in the absence of chlorine contamination, result in a built-up of acidity, or the formation of gelatinous deposits which can clog filter elements and small passageways. Therefore, hydraulic fluid in aircraft systems 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.

No .C4 Appendix 35

Issue 2

1 July 2003

PRIMARY STRUCTURAL FASTENERS MADE IN H-11 STEEL

1 INTRODUCTION

1.1 This appendix supersedes Airworthiness Notice No.C4 Appendix No.35 Issue 1 Mar 1998 which was issued following an abnormally high failure rate of H-11 steel bolts.

2 BACKGROUND

2.1 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 1400 Mpa (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 structure and H-11 is also offered as a material in some standard ranges of fasteners.

3 AIRWORTHINESS CONSIDERATIONS

3.1 Aircraft constructors are asked to review their current and projected designs and take any necessary action to avoid the use of H-11 fasteners whenever 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 ^{o}C (250 ^{o}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 one on an attrition basis. The aircraft constructor 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 any manufacturer's SB on the subject
(c) correct torque tightening (without over-torque) of such fasteners on re-installation

No. C4 Appendix 36

Issue 2

1 July 2003

PROCTECTION OF LIFERAFTS AND FLOTATION BAGS FROM DAMAGE, AFTER DEPLOYMENT, BY SHARP PROJECTIONS OF AN AIRFRAME

1 Investigation into incidents which had 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-angle corner can cause an inflated liferaft or flotation bags to be punctured and consequently deflated to a point of being useless.

2 It is recommended that all projections likely to cause damage in a zone delineated by boundaries which are approximately 1.22m (4 ft) above and 0.61m (2 ft) 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 production becomes effective.

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

4 Whilst the boundaries specified in paragraph 2 are intended as a guide, the total area which should be considered should also be taken 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.

5 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.

6 Particular care should also be taken during routine maintenance to ensure that additional hazards are not introduced by, for example, 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.

No. C4 Appendix 37

Issue 3

1 July 2003

SINGLE LOCK AIRFRAME SEAT AND FURNISHING ATTACHMENTS

1 Investigations into an aircraft accident revealed that some of the passengers seats had detached at the floor attachment points, resulting in injury and fatality among passengers

2 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.

3 Normally the seat leg fitting and collar has an interconnected secondary locking device. On the seats in question, the seat leg fitting was of an early design which did not have the secondary lock device.

4 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 detaching the seats.

5 All aircraft should gave their seats and other items of furnishing (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 to 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 which requires a positive physical action to operate it before the primary claw locking collar can be moved.

6 Similarly, all future designs for furnishing should use fittings similar to those described in paragraph 5 above.

No. C4 Appendix 38

Issue 2

1 July 2003

MOLYBDEUM DISULLPHIDE LUBRICANTS – EFEECT ON TURBINE ENGINES

1 There have been a number 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.

2 Molybdenum disulphide is a very effective anti-seize lubricant available as either a paste of a dry film and is widely used in aircraft and engine assembly. However, at temperatures of 300 ^{o}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 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 Because of this, a number of engine manufacturers have banned the use of molybdenum disulphide in its paste form and have further limited the use of molybdenum disulphide in dry film form on turbine engines.

4 Personnel involved in turbine engine maintenance work are, therefore, reminded that they should make particular reference to the manufacturers' publications to ensure that the use of molybdenum disulphide lubricants is permitted, and f so, to determine in what specific form and on which particular components it may be used.

No. C4 Appendix 40

Issue 2

1 July 2003

EFFECTS OF CHLORINE BASED MATERIALS ON STAINLESS STEEL AND TITANIUM

1 Premature failure of stainless steel pipes have 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 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 Chloride based materials break down the heat (temperature above 150 ^{o}C) to produce corrosive salts which will attack stainless steel and titanium components resulting in premature failure.

3 It is also 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.

4 Operators and maintenance organisations are reminded of the need to refer to the approved publications and use only the equipment and materials specified therein.

No.C5

Issue 4

1 July 2009

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

SUSPECTED UNAPPROVED PARTS

1 Introduction

1.1 CAAS has been concerned about the possibility of unapproved parts being used on aircraft by Maintenance Organisation. Evidence indicates that these counterfeit or fraudulent parts were mainly originated from foreign sources.

1.2 In addition to manufacturing and marketing unapproved parts, there were also issues on falsification of release documentation in the aviation industries.

1.3 Installing unapproved parts onto aircraft has serious airworthiness implications. To illustrate just how serious, the following two examples are quoted involving aircraft which are available in the international market place:

a) A helicopter main rotor blade complete with release documentation was traced as having been scrapped by the manufacturer during the manufacturing process.

b) An engine mount described as fitted new to an aircraft in 1979 was traced as having been factory installed in 1966.

2 Unapproved Parts

2.1 For the purpose of this notice an unapproved part is a part or material intended for installation to a type certificate product/ aircraft, which has been neither manufactured according to an approved procedure, nor conforms to an approved type design; or which fails to conform to declared specifications or accepted industry standards (i.e. standard parts).

2.2 Unapproved parts include, but are not limited to:

a) Parts specified in the illustrated part catalogues (IPC) of a type certificate aircraft, but which have been manufactured, reclaimed or reworked and then marked by an authorized source and provided with documents which indicate falsely that the part are genuine and conform to the approved type design, or meet a particular industry standard and are offered for use as conforming with an aircraft manufacturer's authorized IPC.

b) Parts shipped directly to users by manufacturers, suppliers or distributors who do not themselves hold appropriate production approvals for the parts, and have not been authorized to make direct shipments to users or stockists, by the type certificate

holder, who alone has the production approval, e.g. production overruns. This is a particular phenomenon in the United States.

c) Parts which have not been maintained overhaul or repair in accordance with requirements of approved airworthiness data and statutory requirements, or that have been maintained, overhauled or repaired by persons not authorized to perform and certify these functions.

3 Parts originating from surplus United States military stock

3.1 The United States Department of Defense (DOD) has a programme called "BREAKOUT". Under this programme the DOD uses manufacturer approved drawing, obtained under the terms of production contracts with the original equipment manufacturer, and seek bid from anyone who wishes to make the parts.

3.2 The suppliers of the "BREAKOUT parts may not have the stringent quality controls that are required by the aircraft/component type certificate holder to satisfy FAA requirements. For example, periodic conformity inspections and destructive tests to assure the continued quality of the product may not have been undertaken.

3.3 The US government may also substitute military specification in lieu of original approved material and process specifications; thereby developing parts that do not necessarily conform to the FAA approved civil type design.

4 Additional Information

4.1 The US FAA has issued an advisory circular AC No.21-29B providing information and guidance to the aviation community for detecting and reporting suspected unapproved aircraft parts and procedures for referral of such reports to the appropriate FAA office.

4.2 Because of the increase activity being undertaken in United States against suspected unapproved parts, it is likely that the vendors of these parts will direct their activities towards other parts of the world, because of the reduce risk of detection.

5 Compliance

5.1 Aerospace industry users are reminded that it is possible to confuse a distributor's certification with an original manufacturer's certification. Therefore, more attention should be given when assessing incoming documentation in relation to the terms of the original order. Appendix 1 to Sub-part D of SAR-145 of the Singapore Airworthiness Requirements gives a list of documents that accompany parts obtained from other than CAAS approved sources and this should be referred to as necessary.

5.2 CAAS stresses that CAAS approved distributor must operate in a responsible manner and supply satisfactory parts. Any evidence of unapproved parts must be immediately reported to the Authority (CAAS), Operator and the OEM.

6 **Reporting Requirements**

6.2 In the event, an unapproved part is identified, the person, maintenance organization or operator who is responsible shall make a report base on the CAAS form AW/133 listed in Appendix 1, to furnish the information required as reflected.

6.3 A copy of the completed CAAS AW/133 for unapproved part reporting shall be sent to the address listed below:

Director Airworthiness & Flight Operations
Civil Aviation Authority of Singapore
Airworthiness and Flight Operations Division
Singapore Changi Airport
P.O Box 1, Singapore 918141

6.4 If the reporter is not willing or able to complete the CAAS AW/133, they may alternatively write in to the above address.

6.5 For the sake of making known the suspected unapproved parts to the public and to discourage these fraudulent activities, the information pertaining to the list of suspected unapproved part identified and reporting form can be found in our CAAS website.

http//www.caas.gov.sg

No.C6

Issue 4

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

CARRIAGE OF EMERGENCY LOCATOR TRANSMITTER (ELT)

1 Introduction

1.1 Up to now, only operators of General Aviation aircraft are required to carry automatic emergency locator transmitter (ELT) on all flights. Commercial aircraft usually carry the survival ELT although some also have the automatic types installed.

1.2 The International Civil Aviation Organisation (ICAO) is now introducing a requirement for all aircraft flying overland or overwater to carry an automatically operated emergency locator transmitter (ELT) that operates simultaneously on 406 and 121.5 MHz. This requirement is planned to take effect on 1 January 2002.

1.3 This Notice spells out the ELT requirements for Singapore registered aircraft. This is in addition to the equipment required by the 5th Schedule of the Air Navigation Order.

2 Requirements

2.1 CAAS requires operators of all aircraft in Singapore to fit their aircraft with an automatically operated emergency locator transmitter (ELT) as soon as possible but no later than 31 December 2001. The Director-General of Civil Aviation will monitor the operators' implementation plan and may require an accelerated schedule of implementation if deemed necessary.

2.2 The ELT shall operate on 121.5 MHz, and also on 406 MHz on or after 1 January 2002. All ELT equipment shall be of a type approved by the Director-General of Civil Aviation.

2.3 Specification for the 121.5 MHz component of emergency locator transmitters (ELT) for search and rescue; and information on technical characteristics and operational performance of 121.5 MHz ELT is contained in RTCA Document DO-183 and European Organisation for Civil Aviation Electronics (EUROCAE) Document ED.62.

2.4 Specifications for the 406 MHz component of emergency locator transmitter (ELT) for search and rescue; and information on technical characteristics and operational performance of 406 MHz ELTs are contained in RTCA Document Do-204 and European Organisation for Civil Aviation Electronics (EUROCAE) Document ED.62. Transmission characteristics for emergency locator transmitters operating on 406 MHz are contained in ITU/R M633/1.

No.C8

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

MICROBIOLOGICAL CONTAMINATION OF FUEL TANKS OF TURBINE ENGINED AIRCRAFT

1 Introduction

1.1 Reports have been received that aircraft regularly operating in climatic conditions such as those prevailing between latitudes 30^{o} North and 30^{o} South have been contaminated in the fuel tanks by a 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.

1.2 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.

2 Effects of Contamination

2.1 The problems associated with microbiological growths have been known for some years and research into their behavior 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 which adheres to the tank surfaces, the fungus is able to absorb water later introduced with fuel or condensing following a cold soak.

2.2 Where fungus has formed there is a probability that corrosion will occur. Corrosion has been found where fungus has 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.

2.3 The fungus itself, if dislodged by fuel during refueling can obstruct fuel filters.

3 Inspection

3.1 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 operation under these conditions, maintenance schedules should be amended to include visual internal tank checks at periods prescribed by the aircraft constructor.

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 prolonged periods the fuel in the tanks should be treated with a biocide (see paragraph 4).

3.2 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.

3.3 Whenever fuel filters are checked they should be closely examined for the presence of slimes of any colour.

3.4 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 refueling and, if the aircraft has been standing for any length of time, again before the next flight. Fuel quality control checks should be rigorously applied.

4 Treatment

4.1 If fungus is discovered, the fuel system should be cleaned as soon as possible by a method approved by the aircraft constructor 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 of the aircraft for a long period.

4.2 It is strongly recommended that when aircraft operate in an area where fungal growth can be encountered, of where there is any possibility of temperature in the fuel tanks frequently rising above 25^{o}C, a fungicide additive should be used in the fuel as approved by the aircraft constructor and the engine manufacturer. The frequency of treatment and the dilutions prescribed by the aircraft constructor and the engine manufacturer must be adhered to. Introduction of an unapproved fungicide or inhibitor may jeopardise the safe operation of the aircraft.

No.C9

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

UNPROTECTED STARTER CIRCUITS IN AIRCRAFT NOT EXCEEDING 5700 KG (12500lb)

1 Minor fires have occurred in light aircraft due to starter motors burning out and electric cables becoming over-heated as a result of starter relay contacts jamming, a defect which may not be apparent prior to take-off.

2 In the past, there was a requirement for the provision of a battery master switch which although not eliminating a defect of this nature, would enable a pilot to isolate the battery and thereby reduce the risk of a serious fire.

3 Development of aircraft electrical systems has subsequently reduced the value of a battery master switch and led to the provision of alternative forms of protection.

4 The CAAS recommends that the wiring of all aircraft up to and including a MTWA of 5700kg (12500lb) be checked (if necessary, in conjunction with an engineer licensed in Category E - Electrical Installations) to ascertain whether failure of relay contacts to open on release of the cockpit starter switch may result in overheating of electrical cables and the starter motor.

5 Where such a hazard is found to exist, one of the following methods of protection is acceptable:

(a) Provision of a battery master switch or relay. This alternative alone is acceptable on simple aircraft which are able to continue safe flight and effect a landing without electrical power. A battery master switch should not be provided on aircraft with third brush generator systems unless special precautions are taken.

(b) Provision of a manually operated starter isolation switch in series with the starter relay contacts.

(c) Provision of two starter relays in series.

(d) Provision of a warning light, or lights, to indicate to the pilot that take-off should not be attempted and that electrical power should be disconnected as the starter circuit is still energised.

(e) Any alternative method of protection, isolation or warning agreed by the CAAS.

No.C10

Issue 3

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

MANDATORY MODIFICATIONS AND INSPECTIONS

1 Introduction

1.1 Paragraph 7(9) of the Air Navigation Order provides that a Certificate of Airworthiness in respect of aircraft registered in Singapore will cease to be in force until a modification or inspection, being a modification or inspection required by the Director-General of Civil Aviation, is completed.

1.2 This Notice contains information concerning classification and notification of mandatory modifications and inspections.

2 Classification

2.1 For the purpose of Paragraph 7(9) a modification or inspection required by the Director-General of Civil Aviation is one:

(a) which has been classified as mandatory or notified through an Airworthiness Directive issued by the Director-General of Civil Aviation; or

(b) which has been notified through the Airworthiness Directives issued by the country of design or manufacturer of the aircraft, engines or equipment, unless the Director-General of Civil Aviation notifies otherwise; or

(c) which has been classified as mandatory in the service instructions (e.g. service bulletins) of the manufacturer of the aircraft, engines or equipment, unless the Director-General of Civil Aviation notifies otherwise.

3 Notification of Mandatory Requirements

3.1 It is important that owners and operators of aircraft on the Singapore register arrange to receive copies of Airworthiness Directives from the country of design or manufacturer of the aircraft, engines and equipment which they have in their ownership or care.

3.2 Manufacturers of aircraft, engines and equipment usually have advance information on impending airworthiness directive actions, which in turn usually refer to their service instructions, therefore owners, operators and organisations undertaking maintenance or overhaul of aircraft, engines and equipment should ensure their names and addresses are known to the manufacturers of the aircraft, engines and equipment which they have in their ownership or care.

3.3 When the owners, operators and organisations undertaking maintenance or overhaul of aircraft, engines and equipment come across airworthiness directives issued by a country other than the country of design or manufacture, they should consult CAAS on the applicability of these Airworthiness Directives.

No.C11

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

CARBON MONOXIDE CONTAMINATIONS IN AIRCRAFT

1 All concerned are warned of the possibility of dangerous carbon monoxide concentrations in aircraft. All aircraft types may be affected, but this Notice 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 colorless, odourless and tasteless.

2 There are two main sources of contamination:

(a) 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: 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.

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

3 The other possible sources of contamination:

(a) 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.

(b) Exhaust from other aircraft during ground holding and taxying: the obvious precaution in this case is that ground holding and taxying should be carried out cleared of the exhaust area of preceding aircraft.

4 The CAAS should be contacted in cases where the presence of carbon monoxide is suspected and a test for concentration is considered desirable.

5 Cancellation

5.1 This Notice cancels Airworthiness Notice No.C11, Issue 1, dated 1 August 1973, which should be destroyed.

No.C12

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

MAINTENANCE OF COCKPIT AND CABIN COMBUSTION HEATERS AND THEIR ASSOCIATED EXHAUST SYSTEMS

1 Introduction

1.1 Investigations of a fatal accident to a large transport aircraft had revealed that the flight crew might have been suffering from carbon monoxide poisoning brought about by the gas escaping from combustion heaters of their associated exhaust systems.

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.

1.2 Fitment of oversize nozzles to combustion heaters will increase the concentrations of carbon monoxide in exhaust gases and may cause operating difficulties with the heater. Therefore it is imperative that the only nozzles of the type quoted by the manufacturer are fitted and that servicing, overhaul and inspection standards of combustion heaters and their associated exhaust systems are maintained at a high level.

1.3 This Notice has been raised to provide realistic inspection requirement by introducing heater hours as an alternative criterion. However, the aircraft operator is allowed some flexibility by permitting aircraft hours to be used to establish inspection intervals in place of heater hours.

2 Servicing and Overhaul

2.1 The requirements of this paragraph 2 are applicable to all aircraft whether maintained to an approved maintenance schedule or not.

2.2 Except where otherwise agreed by the CAAS, servicing, overhaul and inspection of combustion heaters and their associated exhaust systems shall be in accordance with the instructions contained in the appropriate manuals produced by the aircraft constructor and the equipment manufacturer. If the instructions in the aircraft constructor's manual differ from those in the equipment manufacturer's manual, those of the aircraft constructor shall be assumed to be overriding.

No.C13

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

INTERNAL EMERGENCY LIGHTING SYSTEMS

1 Applicability

1.1 This Notice is applicable to all aircraft required by the Air Navigation Order, Schedule 5, Scale G, to be equipped with an emergency lighting system and which are currently equipped with systems which are dependent upon the operation of acceleration sensitive "g" switches for their automatic function.

2 Introduction

2.1 Investigations following an accident which occurred at night have shown that certain deficiencies exist on the aircraft type concerned and on several of the older aircraft types in which the emergency lighting is provided in a similar manner by individual lights with self contained "g" switches.

2.2 On aircraft so equipped, a situation can exist where, in emergency conditions, the alighting acceleration may be below the level required to switch on the emergency lights automatically. Thus when the power is isolated by the battery master switch, to minimise potential electrical ignition sources, all compartment illumination will be lost until the individual emergency lights are switched on manually.

2.3 The purpose of this Notice is to publish requirement for the modification of aircraft so equipped to ensure that sufficient illumination continues to be available in the passenger compartments under such emergency conditions.

3 Requirement

3.1 All aircraft to which this Notice is applicable shall be modified so as to ensure that there is sufficient illumination within each passenger compartment to facilitate the evacuation of the aircraft, in an emergency. This illumination must be available regardless of the position of the normal lighting, acceleration sensitive, and battery master switches.

3.2 Provisions made in compliance with this Notice shall not invalidate compliance with Notice No. C27.

4 Interpretation

4.1 In many instances compliance with paragraph 3.1 could be achieved by the introduction of a modification which would supply the existing "dim" or "standby" lighting circuits directly from the aircraft batteries in such a manner that, once in use, the "dim" or "standby" lighting is retained even when the battery master switch is selected to "isolate". Any crew action required to switch on or arm such lighting would have to be part of the routine pre take-off procedures and not require any additional crew action in an emergency situation.

For such a system it is recommended that an indicator be installed to advise the crew that the system has been selected 'ON'.

Note: The purpose of this indicator is to limit the possibility of the lighting system being inadvertently left on, on the ground, and hence discharge the main aircraft batteries.

4.2 To cater for the more severe crash, where significant damage is likely to be experienced and where the integrity of the main batteries and the "dim" or "standby" lighting circuits cannot be relied upon, the existing emergency lighting system would have to be retained.

4.3 For some aircraft types it may be more practical to consider the installation of self-powered emergency lights which, when armed, come into operation automatically on the interruption of the electrical supply to the passenger compartment lighting.

4.4 The current requirements for the emergency lighting system are contained in the appropriate sections of the relevant documents on airworthiness requirements of the country of manufacture of a particular aircraft type. Whilst compliance with these requirements is desirable, it is not the purpose of this Notice to require either a system or its illumination level in excess of that accepted at the date of original type certification of the affected aircraft.

No.C14

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

GAS TURBINE ENGINE PARTS SUBJECT TO RETIREMENT OR ULTIMATE (SCRAP) LIVES

1 The design of gas turbine engines in service is such that certain critical parts, notably compressor and turbine discs, experience cyclic variations of stress due to mechanical and thermal effect which are of sufficient magnitude to result in fatigue damage. The failure of these parts, which under operating conditions may possess more energy than can be absorbed by the surrounding engine structure, can result in damage to the aircraft. It is therefore necessary to limit the life of all critical parts in order to prevent fatigue damage developing into complete failure. As fatigue damage is not detectable by current inspection techniques until cracking has begun, and because crack propagation to the point of failure can be unacceptably rapid, it is necessary to determine a safe life for each critical part by extensive testing.

2 These safe lives, also referred to as retirement lives, ultimate lives, scrap lives and low cycle fatigue (LCF) lives, are mandatory limits which must never be exceeded. For the benefit of operators and engine overhaul agencies, manufacturer also publish this information variously in service bulletins, service memoranda, notices to operators, maintenance manuals, etc. The lives published are accepted by the CAAS and are mandatory and all amendments thereto must first be approved. It may be possible to extend the published lives as a result of further testing and this is normally indicated in the publications as an aid to spares provisioning.

3 The Inspection and Test Certificate of an engine issued by a manufacturer or overhaul agency must include reference to a certified statement in which is recorded the life consumed by each of the life-limited parts fitted in the engine up to the time of release. It may be preferable to include this statement in the engine log book but this will be governed by the system adopted by the operator.

4 Operators are responsible for ensuring the parts fitted to the engines being operated do not exceed the published lives. Therefore it is necessary to maintain accurate up to date records of the life consumed by each engine and this may involve recording flying hours, number of landings, 'touch and go' landings and take-offs, air re-starts etc., dependent upon each constructor's definition of a unit of life. In order to preserve continuity of the records, an up to date statement of the life consumed since last release must accompany each engine when dispatched by an operator to an overhaul agency for repair, modification and partial or complete overhaul.

5 When a new type of turbine-engined aircraft is first introduced into service the operator is responsible for determining a 'typical flight cycle', described in engine terms, applicable to its operation. This should be done by sufficient monitoring of service flights, and as necessary training flights, to provide an adequate knowledge of actual engine flight profiles. If these appear to be in any way more severe than those assumed by the engine constructor, the operator shall inform the engine manufacturer and the CAAS amended approved lives will be published if necessary.

6 Additionally, operators shall monitor a sufficient number of flights at successive intervals of approximately six months (this period may be extended in agreement with the CAAS as increased experience permits) during the subsequent life of the aircraft to determine that the current assumptions are not being invalidated by intended or unintended changes to operating techniques, changes of service routes or operational roles, etc. If there is any reason to believe that the flight cyclic fatigue usage may be more adverse than currently assumed, the operator shall inform the engine constructor and the CAAS with a view to revision of the approved lives.

Note:

(a) As differences between winter and summer operation and differences in the installed position of engines in the aircraft may make significant difference to the usage experienced, these factors should be taken into account in the monitoring programmes. Also because autothrottle and autoland systems can affect the envelope of engine speeds used, it is important that any changes to the characteristics of such systems are assessed.

(b) engine manufacturer is required to publish, in the engine manuals, information concerning the engine flight profile assumed for the establishment of safe lives.

7 Where an operator finds the programme described in paragraph 6 impractical, sufficiently pessimistic assumptions will need to be made in determining, for his particular operation, the safe lives of affected parts, in order to provide for any possible variations of operation likely to occur.

8 Operators must comply with any instructions given by the engine manufacturer’s manual. The operator must inform the engine manufacturer of any conditions of their operation which may be at variance with his instructions.

No.C17

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

VERTICAL SPEED INDICATORS ON IMPORTED AIRCRAFT

1 Introduction

1.1 An incident to a 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 the United States TSO specification C8b are fitted with stops to prevent such occurrence. It is not known whether other instruments, particularly those likely to be installed in imported aircraft of less than 5 700 kg maximum weight are similarly equipped.

2 Action

2.1 Before issue or renewal of the certificate of 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

4.1 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.

No.C20

Issue 3

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

FLAME RESISTANT FURNISHING MATERIALS

1 It is important to ensure that the materials used when carrying out repairs or modifications to aircraft cabin furnishings have suitable flame resistant properties, which should be at least equal to those of the material used in the original design as accepted for certification. Suitable methods for flame resistance testing of aircraft furnishing materials are described in Singapore Airworthiness Requirements Chapter 3.8.

2 **Requirements for Maintenance of Fire Resistance**

2.1 Continuance of the flame resistance properties of furnishing materials may depend upon their use in service and the methods used in their cleaning. Experience has shown that:

(a) the proprietary flame retardant processes often applied to furnishing materials during or after manufacture, in order to provide the necessary flame resistant properties, may be destroyed or seriously impaired where the incorrect dry cleaning, laundering or proprietary finishing processes which enhance durability and minimise soiling, are used;

(b) the application of one flame retardant process on top of another, of a different type may have the effect of inhibiting the properties of both processes;

(c) during service, seat covers become contaminated with perspiration which leaves a deposit of body salts, etc., these deposits may accumulate, impairing the flame resistance properties of the materials;

(d) disinfectants, etc., are often sprayed from aerosol containers in aircraft cabins. The accumulation of these agents may also affect the long term flame resistant properties of the furnishing materials.

2.2 Operators and maintenance organisations are reminded, therefore, that they must have adequate control over the cleaning of aircraft furnishing materials. For this, the need to have a knowledge of the material type, the recommended cleaning or proprietary finishing processing methods, the effects of time in service on the flame resistance properties, the flame retardant processes applied, if any, and the method of re-application of such a process, is necessary. It is not acceptable to place reliance on unsubstantiated claims concerning the continuance of flame resistant properties of a material after durability or additional flame retarded processes have been applied. Where such processes have been applied, there is a need to prove the continued acceptability of a particular material or process in service, and therefore, further flame resistance tests must be conducted in accordance with requirements identified in paragraph 1 of this Notice and where applicable, Airworthiness Notice No. C38.

3 Cancellation

3.1 This Notice cancels Airworthiness Notice No. C20, Issue 2, dated 1 March 1988, which should be destroyed.

No.C21

Issue 3

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

FATIGUE LIVES

1 For fatigue reasons the major components (e.g. wings and centre-sections) of certain types of aircraft have lives restricted to a specific number of flying hours, flights or landings. These restrictions have, in the main, been confined to large transport type aircraft but more recently it has been found necessary to introduce similar restriction on certain smaller types of aircraft, some of which are operated in the private category.

2 The "lifing" of components is intended to prevent structural failure under the action of repeated air and ground loads experienced in service, the lives being based on the results of test carried out by the manufacturer of the aircraft. If the specified fatigue life of a critical component is exceeded, the possibility arises of a catastrophic structural failure. Where fatigue lives have been imposed full details have been published by individual manufacturers in their service bulletins and compliance with such information is required by the CAAS. Structural life limitations are determined for likely average utilisation of a type of aircraft. Any operations which depart substantially from the typical require assessment of the structural life limitations for those specified operations and may require alterations in the safe fatigue lives. Examples of operations in this category are low level flights in a maritime surveillance, or geographical survey role (particularly using pressurised aircraft), or long endurance operations.

3 For the purpose of establishing structural life limitations a landing is defined as an occasion when the main undercarriage wheels make contact with the airfield surface and lift is significantly destroyed. A flight is associated with each landing and therefore the total number of flights pressurised and unpressurised is equal to the total number of landings. A pressurised flight is one in which the aircraft's pressurisation system is operated at a pressure differential of 14 KN/M^2 (2 psi) or above.

4 Because of the transfer of components from one aircraft to another, it has in some instances been impossible to establish the remaining safe life of individual components. For this reason it is necessary to ensure that when a component in this category is installed in an aircraft, a record is kept with the aircraft documents showing, as applicable, the hours flown and number of flights or landings already sustained by the component at the time of installation. In the case of pressurised flights the applicable pressure differential may be significant. Certificates of release to service may not be signed until the signatory is satisfied that the required history of the component has been established.

5 Failure to comply with the above procedure may, due to the absence of evidence showing that the components in question have any remaining safe life, result in owners or operators being required to replace such components prematurely.

Note : In addition to recording operating hours of engines, APUs and propellers, the CAAS requires on most engines, APUs and propellers that a record be kept of the cycles completed. Cycles are defined by the manufacturers of each engine, APU and propeller.

No.C24

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

MAINTENANCE REQUIREMENTS FOR VARIABLE PITCH PROPELLERS

1 Introduction

1.1 For most propeller types the propeller manufacturer will publish overhaul periods and any necessary maintenance inspection instructions which will be applied by the operator at the periods specified unless varied by the Approved Maintenance Schedule.

1.2 It has been recognized though that there are a few proper types where the manufacturer has not published overhaul lives in terms of hours or calendar period. In order to ensure that these propellers are being maintained in a satisfactory condition, the inspection of this Notice are required to be applied at the periods stated.

1.3 A situation also exits where, for a low utilization operation, the calendar period can be reached when a propeller has run only a small percentage of its operating hours limit. Under these circumstances, wear would not be expected to be a problem while degradation of seals and corrosion are more likely to exist. This Notice introduces an alternative maintenance policy which, subject to intermediate inspections, as specified in the appendix, will monitor the condition of a propeller such that it can be operated beyond its calendar period to achieve its operating hourly limit.

1.4 Any overriding mandatory requirements in respect of particular propellers, issued either by the Airworthiness Authority of the country of manufacture of a propeller, or by the CAAS will take precedence over this Notice. For the purpose of compliance with an AD which specifies requirements as a function of overhaul, the bare blade inspection required by paragraph 4.2.2 shall be deemed as an overhaul.

2 Applicability

2.1 The requirements of this Notice are applicable to variable pitch propellers, variable pitch propellers which have been locked and to ground adjustable propellers.

3 Compliance

3.1 The maintenance policy defined in either paragraph 3.1(a) or (b) or (c) must be applied to all variable pitch and ground adjustable propellers.

(a) Overhaul at the operating hours or calendar period recommended by the manufacturer, whichever occurs first, unless varied by the Approved Maintenance Schedule.

(b) The hub/blade and bare blade inspections specified in paragraphs 4.2.1 and 4.2.2 of this Notice must be applied when:

(i) No calendar or operating hour overhaul intervals are recommended by the manufacturer, or

(ii) Only operating hour overhaul intervals are recommended by the manufacturer with no associated calendar recommendation.

(c) For a propeller fitted to an aircraft which has a low utilization, and for which the manufacturer has specified overhaul periods in terms of operating hours and calendar periods, the calendar life limitation only may be exceeded subject to compliance with the hub/blade and bare blade inspections specified in paragraphs 4.2.1 and 4.2.2 of this Notice.

3.2 The periods of operation or elapsed calendar time prescribed in the appendix to this Notice shall be calculated from the date of the initial installation of the propeller on an aircraft following manufacture or complete overhaul of the propeller and may be preceded by a period of storage of up to 2 years which has been carried out in accordance with the manufacturer's recommendations.

3.3 The applicability and compliance requirements of this Notice are summarized in the appendix to this Notice Tables 1 and 2.

4 Propeller Inspections

4.1 The inspection of propellers required by Tables 1, 2 or 3 must be undertaken by an organisation approved by the CAAS for the purpose. However, with the exception of aircraft used for commercial air transport, the inspections required by Table 2 may, subject to prior approval of CAAS, to be undertaken by an aircraft maintenance engineer licensed in Category C for the type of engine to which the propeller is fitted.

4.2 The inspections and re-work shall be carried out in accordance with the manufacturer's instructions and as a minimum shall include:

4.2.1 Hub/blade inspection

(a) Dismantling of the propeller sufficiently to gain access to the blade root bearing assemblies.

(b) Thorough cleaning of the blade root assemblies.

(c) Examination for pitting, fretting, corrosion, cracking and other damage of the hub, bearings, blade roots and housing, together with replacement if any disturbed seals. All of the blade surfaces shall be examined for damage, delamination (where applicable), and the presence of corrosion, removing the paint finish as necessary. In cases where de-icer boots or overshoes are installed on the blades, a detailed examination for corrosion around their edges shall be carried out, and if any evidence is found, the boots/overshoes shall be removed to permit a full inspection of the masked areas. Any corrosion shall be removed and the blades re-protected. In cases where de-icer boots/overshoes are removed, replacement parts shall be installed using the facilities prescribed and under conditions and procedures specified, in the relevant manufacturer's Overhaul Manual.

(d) Checking the track of the propeller after refitting, then functioning throughout its operational range by means of an engine run to verify correct performance, and to establish that any vibration is within acceptance limits.

4.2.2 Bare blade inspection

In addition to the hub/blade inspection ref 4.2.1:

(a) Remove of all de-icing boots or overshoes and fairings

(b) Removal of all paint and erosion protection

(c) Removal of all blade root bushings and plugs

(d) Inspection of the complete blade surface for the pressure of corrosion. Any corrosion shall be removed and the blades re-protected and prepared for the re-installation of the blade fittings

(e) Full dimensional inspection of all blades

5 Record of accomplishment

5.1 A comprehensive record of the inspection and work done in accordance with paragraph 4 of this Notice shall be retained and an entry, making a cross reference to this document, shall be inserted in the Propeller Log Book.

6 Cancellation

6.1 This Notice cancels Airworthiness Notice C24, Issue 1, dated 1 October 1986 should be destroyed.

No. C24 Appendix 1

Issue 2

1 July 2003

Propellers shall be maintained in accordance with either (a) or (b) of the appropriate following Table:

Table 1 - Propellers fitted to Commercial Air Transport, Public Transport, Aerial Work and Private Category Aircraft; MTWA above 5700kg

(a)	Overhaul Period	Whichever occurs first of operating hours or calendar period as published by the propeller manufacturer unless varied by the Approved Maintenance Schedule
(b)	Overhaul Period	Operating hours as published by the propeller manufacturer or on condition where no life has been published subject to (i) and (ii) below
	(i) Hub/blade inspection period	Inspect at 3 years since new or overhaul or period inspection (ii) below; repeat at 1 year intervals
	(ii) Bare blade inspection period	Not to exceed 6 years since new, overhaul or last bare blade inspection.

Table 2 – Propellers fitted to Commercial Air Transport, Public Transport, Aerial Work and Private Category Aircraft; MTWA below 5700kg

(a)	Overhaul Period	Whichever occurs first of operating hours or calendar period as published by the propeller manufacturer unless varied by the Approved Maintenance Schedule
(b)	Overhaul Period	Operating hours as published by the propeller manufacturer or on condition where no life has been published subject to (i) and (ii) below
	(i) Hub/blade inspection period	Inspect at 3 years since new or overhaul or inspection (ii) below (but may be phased to next annual check or Certificate of Airworthiness Renewal provided period does not exceed 4 years)
	(ii) Bare blade inspection period	Not to exceed 6 years since new, overhaul or last bare blade inspection.

Note : Hub/blade inspections and bare blade inspections are to be in accordance with the procedures of paragraph 4 of this Notice.

No.C25

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

POWER SUPPLY SYSTEMS FOR AIRCRAFT RADIO INSTALLATIONS

1 Introduction

1.1 This Notice draws attention to the dangers of operation of aircraft in which the entire radio installation was supplied via a single electrical feeder circuit, and states that certificates of airworthiness will not be issued or renewed in respect of aircraft in the transport category and of multi-engined aircraft in any category certificated with such systems.

2 Requirement

2.1 The electrical feeder arrangements shall be such that:

(a) where more than one radio system is installed, no likely single failure (e.g. fuse or a relay) will result in the loss of all radio systems;

Note: It is strongly recommended that such a failure should only result in the loss of one radio system.

(b) where duplicate radio systems, or radio systems which can duplicate a function, are installed, no likely single failure (e.g. a fuse or a relay) will result in the loss of both systems.

3 Interpretation

3.1 In examining electrical feeder arrangements to establish compliance with paragraph 2, the examination for likely single failures should include:

(a) the mechanical and electrical aspects of the supply circuit, including the return path of the electrical supply;

(b) the location within the electrical circuit of fuses, circuit breakers and power switching relays, their physical location in the aircraft and the manner in which they are interconnected;

(c) panels for integrated control of radio systems, audio integration systems, and dimmer control equipment for electronic displays.

No.C26

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

COUNTER/POINTER ALTIMETERS

1 The United Kingdom Altimeter Committee in 1965 concluded the best altitude presentation was provided by the counter/pointer type instrument. The CAAS is satisfied that subsequent experience has supported this conclusion.

2 In the case of turbojet engined aircraft, in which hazardous misreading of altimeters is more likely to occur, it is desirable to eliminate reliance on the less satisfactory types of presentation. Therefore, subject to the proviso of paragraph 3, all turbojet engined aircraft of over 5 700 kg MTWA must have as a minimum one of the following :

(a) One approved counter/pointer type instrument visible to both crew members, in addition to their normally positioned altimeters.

(b) One approved counter/pointer type instrument in the Captain's normal altimeter position, in addition to the existing altimeters at other crew stations.

3 The CAAS, whilst preferring the arrangement described in paragraph 2, will continue to accept drum/pointer altimeters where these are standard equipment on existing aircraft and aircraft under construction type certificated before 1 August 1973.

No.C27

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

EMERGENCY POWER SUPPLY FOR ELECTRICALLY OPERATED GYROSCOPIC BANK AND PITCH INDICATORS (ARTIFICIAL HORIZONS)

1 Introduction

1.1 Studies of those aircraft accidents and incidents in the past which have involved total loss, or interruption, of generated electrical supplies on public transport aircraft, indicate that a major factor in the ability of the crew to maintain safe flight is the continuation of presentation to the pilot of reliable aircraft attitude information. Some accidents since 1968 have been attributed to failure of power supplies resulting in the loss of horizon information for flight in 'blind' conditions. Incidents have also occurred which could have been catastrophic if the crew had been totally dependent on horizon instrument, rather than visual, information.

1.2 All public transport aircraft operated on the Singapore register the safety of which depends on electrical services, are equipped with some form of standby or emergency electrical power supply. On many aircraft these emergency supplies are provided by batteries of sufficient capacity to maintain supplies for flight time sufficient to reach an airfield and make a landing. However, on a number of aircraft types the adequacy and duration of these supplies is critically dependent on crew response time in recognising the emergency, and in completing particular drills to isolate the battery supply to prevent it from being discharged into loads on the main electrical system. It is considered that the ability of the crew to cope with a major interruption of electrical supplies would be improved if they had knowledge that continuity of horizon information was not totally dependent on their prompt and correct execution of emergency drills.

1.3 The purpose of this Notice is to publish requirements for certain classes of aircraft to ensure that continuity of horizon information is maintained.

1.4 Aircraft types with air driven gyroscopic bank and pitch indicators are exempted from the requirements of this Notice.

2 Requirement

2.1 Compliance with paragraph 2.2 and 2.3 of this Notice, or with the CAAS approved alternative providing an equivalent level of safety, is required for :

(a) aircraft certificated in the transport category for the carriage of more than 19 persons over the age of three years; and

(b) aircraft of MTWA exceeding 5 700 kg.

2.2 Where it cannot be shown that in the event of a total failure of the main electrical generating system, an adequate supply will be available automatically to a suitable bank and pitch indicator for a minimum period of 30 minutes, assuming that no special crew action is taken for 10 minutes, then a separate emergency supply, independent of the aircraft electrical generating system, which will automatically supply such an instrument, and its associated lighting, for a minimum period of 30 minutes, shall be provided.

2.3 Where the emergency supply is provided by a separate battery it is permissible for this battery to be (trickle) charged from the main electrical generating system, provided that the installation is such that the battery cannot discharge back into the main system.

2.4 The instrument supplied in accordance with paragraph 2.2 shall be :

(a) the third instrument (standby horizon) where this is provided; or failing such provision,

(b) the bank and pitch indicator fitted to the Captain's flight instrument panel.

2.5 Where the third instrument is fitted it shall:

(a) operate independently of any other attitude indicating system,

(b) be so located on the instrument panel that it will be visible to, and usable by, both pilots from their normal positions;

(c) be compatible in presentation with main attitude indicating system;

(d) be fitted with a failure warning device. Alternatively a means of indicating that the power supply to the instrument is operating correctly shall be provided.

2.6 Where the instrument on the Captain's flight instrument panel is utilized:

(a) the circuitry to the instrument shall be modified, as necessary, so that transfer to the emergency source of supply is automatically effected in the event of failure of the main supply;

(b) the requirements of paragraph 2.5 (d) shall be met.

3 Additional Information

3.1 Under conditions of widespread adverse weather, or heavy traffic density at airports, a period of 30 minutes may be a less than desirable time for flight to a suitable airfield and landing, and clearly this period by itself is inadequate for long range aircraft.

3.2 The basis of Singapore certification of all long range, and of certain short/medium range, aircraft types is that after a period of interruption of electrical supplies it will be possible for the crew to re-establish sufficient normal, or emergency, generated power to support all necessary essential services, including the instrument covered by this Notice, for the remainder of the flight. The prescribed period of 30 minutes is considered to be adequate to allow for appropriate crew action for this class of aircraft.

3.3 For those shorter range aircraft that are totally dependent on battery power to support all essential services to the completion of the flight, a period of 30 minutes assuming a crew delay of 10 minutes, is the mandatory minimum endurance of the emergency supply for the horizon instrument prescribed in this Notice. It is, however, strongly recommended that in circumstances where the crew do take prompt and correct actions in response to warning indications of the interruption of all generated electrical power, the aircraft installation should include adequate battery capacity to provide a 60 minutes supply for both the subject instrument and the other services essential to complete the flight and make a landing.

No.C28

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

ELECTRICAL GENERATION SYSTEMS - AIRCRAFT NOT EXCEEDING 5 700 KG MTWA

1 Introduction

1.1 Investigation into accidents and incidents involving total loss of generated electrical power to aircraft, the MTWA of which does not exceed 5700 kg, have shown certain inadequacies in the failure warnings and indications provided. Experience has shown that the loss of generated electrical power can remain undetected for a significant period of time, resulting in the serious depletion of the available battery capacity and reduced duration of supplies to essential services under these conditions.

1.2 The purpose of this Notice is to publish requirements for certain aircraft to ensure that a clear and unmistakable warning of loss of generated electrical power is given, and to preserve or provide sufficient electrical energy to operate essential services for an adequate period of time in the event of such a loss occurring.

2 Requirement

2.1 For all multi-engined aircraft, the MTWA of which does not exceed 5700 kg, compliance with paragraphs 2.2, 2.3, 2.4 and 2.5 of this Notice, or with a CAAS approved alternative providing an equivalent level of airworthiness, is required.

2.1.1 Where it can be shown that an aircraft is fitted with such limited electrical and radio equipment, or is certificated to operate under such limited conditions (e.g. VMC day only) that the loss of generated electrical power would not significantly prejudice safe flight, the CAAS will, on application, waive the requirements of this Notice where it is satisfied that compliance would not be justified in the circumstances of a particular case.

2.2 Clear visual warning shall be provided, within the pilot's normal line of sight, to give indication of either

(a) reduction of the generating system voltage to a level where the battery commences to support any part of the main electrical load of the aircraft; or

(b) loss of the output of each engine driven generator at the main distribution point or busbars.

2.3 The battery capacity shall be such that in the event of a complete loss of generated electrical power, adequate power will be available for a period of not less than 30 minutes following the failure, to support those services essential to the continued safe flight and landing of the aircraft, (see paragraph 3.1). This includes an assumed period of not less than 10 minutes from operation of the warning specified in paragraph 2.2, for completion of the appropriate drills. This delay may be reduced to not less than five minutes if the warning system is provided with "attention getting" characteristics (e.g. a flashing light). For the purpose of calculations it shall be assumed that the electrical load conditions at the time of failure warning are those appropriate to normal cruising flight at night (see paragraph 3).

2.4 Where all gyroscopic attitude reference instruments, i.e. bank and pitch indicator and turn and slip indicators, are dependent on electrical power for their operation, at least one of these instruments shall continue to operate without crew action for the prescribed 30 minute period.

Notes: (a) For certain aircraft types a turn and slip indicator may not be acceptable as the sole remaining attitude reference instrument.

(b) Certain aircraft are equipped with both electrically operated and air driven attitude reference instruments. In such cases the air driven instruments will be accepted as providing the emergency attitude information provided that the requirements of paragraph 2.4.1 are met.

2.4.1 The instruments with which the requirement of paragraph 2.4 will be met shall be clearly designated, and

(a) shall be so located on the instrument panel that it will be visible to, and usable by, the pilot from his normal position;

(b) shall be provided with means of indicating that the power supply to the instrument is operating correctly.

2.5 Precise drills covering crew action in the event of electrical general system failures and malfunctions shall be included in the appropriate aircraft manuals, together with a statement of battery endurance under specified load conditions.

3 Additional Information

3.1 When ascertaining that the installed aircraft battery capacity is adequate for compliance with paragraph 2.3, the following loads should be taken into account :

(a) Attitude information (where applicable in accordance with paragraph 2.4).

(b) Essential Radio Communication.

Note: For the purpose of calculations it will normally be accepted that intermittent use of single VHF communication equipment satisfies this requirement. Utilisation on the basis of a total 15 minutes reception plus 3 minutes transmission in the 30 minute period would be an acceptable interpretation.

(c) Essential cockpit lighting.

(d) Pitot head heater (applicable only to those aircraft certificated for flight in icing conditions)

(e) Any other services essential for the continued safe flight and landing of the particular aircraft.

(f) Those services which cannot readily be shed when carrying out the drills required under paragraph 2.5

3.1.1 In order to ensure that the essential services, taken into account in accordance with paragraph 3.1, will function adequately for the prescribed period, the calculation of the duration of battery supply should normally be based on the following assumptions:

(a) Only 75% of the "name plate" rating of the battery is available (this is to take into consideration loss of capacity with age, and a realistic state of charge).

(b) The voltage/time discharge characteristic of the battery, appropriate to the load of the listed services, is not extended beyond a battery terminal voltage of 21.5 volts on a 24 volt system, pro rata for 12 volt systems, (this is to ensure that the voltage available throughout the prescribed period is adequate for satisfactory operation of the services).

Note: Only where compliance with this Notice cannot be shown within the criteria of paragraphs 3.1 and 3.1.1, will consideration have to be given to the fitment of additional, or larger capacity, batteries to particular aircraft.

3.2 Applications for the approval of modifications necessary to ensure compliance with the requirements of this Notice should be made in the manner specified in the Singapore Airworthiness Requirements, Section 4, Chapter 4.7. Owners and operators are recommended to contact the constructor concerned or the main agent for information regarding suitable modifications.

No.C29

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

FIRE PRECAUTIONS - AIRCRAFT TOILETS

1 **Applicability**

1.1 This Notice is applicable to all aircraft over 5 700 kg MTWA operating in the transport category (passenger).

2 **Purpose**

2.1 The purpose of this Notice is to publish requirements aimed at reducing the probability of persons smoking in toilet compartments and at minimising the potential fire hazard caused by persistent smokers.

3 **Requirements**

3.1 Inspection

3.1.1 The following inspection shall be carried out at 1000 hourly intervals, or at such other intervals as may be agreed with the CAAS on the basis of available date :

(a) All receptacles shall be inspected to ascertain that all entry flaps or doors till operate, fit, seal and latch correctly.

(b) Any defects revealed by the inspection of (a) are corrected.

3.1.2 This inspection shall be included in the maintenance schedule using the normal procedures.

Note: Compliance with FAA Airworthiness Directive 74-08-09 Amendment 39-1818 paragraph (d) will ensure compliance with paragraph 3.1.

3.2 Prohibition of smoking in toilet compartments

3.2.1 Smoking shall not be permitted in toilet compartments.

3.2.2 “No smoking” placards and ash trays are required both inside and outside the compartments.

3.2.3 “No smoking” placards shall be displayed so as to be prominent to, and the ash trays shall be obviously and conveniently placed for, those about to enter and those within these compartments.

No.C30

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

AUTOMATIC DIRECTION FINDING EQUIPMENT ON TURBINE ENGINED AEROPLANES AND HELICOPTERS

1 Introduction

1.1 It has been found that beneficial reduction in crew workload can be obtained by replacing ADF equipment employing continuously variable tuning with equipment that is incrementally tuned.

1.2 The purpose of this Notice is to publish requirements of incrementally tuned ADF equipment.

2 Requirement

2.1 ADF installations in aeroplanes and helicopters specified in (a), (b) and (c) shall be of a type where the channel frequency can be incrementally selected in discrete steps and displayed as a row of numerals. Equipment employing a continuously variable control for the 1 kHz selector only will also be accepted as meeting the requirement.

(a) Turbojet engined aeroplanes certificated in the transport category for the carriage of more than 19 persons over the age of three years

(b) Turbojet engined aeroplanes the MTWA which exceeds 15 900 kg

(c) Turbine engined helicopters certificated in the transport category

No.C31

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

COMMUNICATIONS TRANSMITTERS IN THE VHF RADIO TELEPHONY BAND 118-136 MHz

1 Introduction

1.1 ICAO Annex 10, Vol. 1, Part 1, paragraph 4.7.1.1, introduced by amendment 52 dated 23 May 1974, states:

"Where 25 kHz channel spacing is introduced, the radio frequency of operation shall not vary more than plus or minus 0.003 per cent from the assigned frequency for new transmitters installed after 1 January 1974, and for all transmitters after 1 January 1981".

2 Requirement

2.1 All VHF transmissions for Singapore registered aircraft shall comply with the frequency tolerance limits of $\pm$ 0.003 per cent prescribed by ICAO.

3 Implementation

3.1 New installations of VHF communications equipment in aircraft will be approved only if the equipment manufacturer's specification for the equipment shows the transmitter frequency tolerance to be within the limits prescribed in paragraph 2.

3.2 Approval of existing installations of equipment agreed prior to 1 July 1982 will remain valid provided the actual transmissions conform to the required new tolerance.

3.3 The CAAS will continue to monitor aircraft transmissions and to inform any operator whose equipment is observed as failing to comply with paragraph 2.

No.C32

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

TYRES AND WHEELS FITTED TO AIRCRAFT CERTIFICATED IN THE TRANSPORT CATEGORY

1 Introduction

1.1 CAAS Airworthiness Notice No. C4, Appendix 24, and Airworthiness Notice No. C2 contain information in respect of tyre maintenance, reliability and wear limitations.

1.2 Tyre failures on large transport aircraft, particularly wide-body types, have resulted in serious incidents and accidents. The principal problem is that when one tyre fails, its axle companion becomes overloaded, and sometimes fails almost immediately.

1.3 In some cases extensive damage, including fire, has resulted from tyre and wheel degradation and there has been an attendant reduction in braking performance.

2 Requirements

2.1 The following standards, or their approved equivalent, is used as the acceptable level for approval of new designs of tyres and wheels intended for fitment to Singapore registered aircraft:

(a) Tyres - TSO C62c, except for paragraph (d) i.e. tyre designs approved prior to 31 December 1980 may continue to be manufactured.

(b) Wheels - TSO C62c (but omitting the roll-on-rim test of paragraph 4.1 (c) (3), other than for new designs of wheel intended for aircraft certificated to BCAR Section D, FAR 25 or JAR 25, for which the roll-on-rim test of paragraph 4.1 (c) (3) is effective from 31 December 1982).

2.2 In addition, all Singapore registered aircraft must be equipped only with high speed mainwheel tyres (rated above 160 mph) complying with standards equivalent to TSO C62c and FAR 25.733 as at Amendment 25-49. These tyres shall be maintained in service at inflation pressure levels which, at each operating load, will preserve the appropriate load reserve factor of FAR 25.733 as at Amendment 25-49, and the aircraft shall be fitted with wheels which are declared by the aircraft constructor to be compatible with these tyre inflation pressure levels.

No.C34

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

AIRCRAFT EQUIPMENT

1 The attention of all concerned is drawn to the fact that local legislation lists additional equipment which must be installed according to the circumstances in which an aircraft is to be flown.

2 It is the responsibility of the operator to ensure that the appropriate equipment is installed in relation to the type of flight to be undertaken, and the existence of a valid certificate of airworthiness does not necessarily mean that such mandatory equipment, as laid down for particular purposes in the local legislation, is installed.

No.C35

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

GROUND OPERATION OF AIRCRAFT RADAR EQUIPMENT

1 The requirements of this Notice shall apply to all radar equipment with a nominal peak power output rating in excess of 25 kW.

2 During all ground operation, including testing and maintenance of aircraft radar equipment, the operator or person in charge of such equipment shall ensure the following:

2.1 The equipment is not energised in its normal mode (antenna rotating and radar transmitter operative) unless the sector area scanned by the radar beam is clear of the following objects to a distance of 40 metres from the antenna:

(a) aircraft being refuelled or defuelled;

(b) fuel tankers, fuel tanks or fuel storage areas;

(c) persons or cargo;

(d) any other aircraft or aircraft hangar.

Note: For each radar installation the sector area should be defined in terms of readily distinguishable dimensions preferably related to some feature of the aircraft and should appear in the aircraft maintenance manual.

2.2 The equipment is not energised with the antenna stationary when the radar transmitter is operative and the antenna directed towards any of the objects specified in paragraph 2.1 unless the distance separating them from the antenna is in excess of 70 metres.

2.3 The distance specified in paragraphs 2.1 and 2.2 may be reduced by 75 per cent when a CAAS approved beam attenuating device is used between the antenna and any object specified in paragraph 2.1.

2.4 The equipment is not energised in any radiating mode of operation when the aircraft in which the equipment is fitted is in a hangar or other enclosure unless a suitable microwave energy absorbing shield is fitted over the antenna.

2.5 The equipment is not operated in any aircraft during fuelling operations.

Note: During all testing of aircraft radar equipment the beam should, whenever possible, be directed with maximum upward tilt toward a clear area.

No.C36

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

TOILET FLUSH MOTORS

1 Introduction

One fatal accident and other incidents have occurred in recent years involving toilet fires, the exact cause of which could not be determined. Investigations of these incidents have not been able to rule out the possibility that fires may have been started by toilet flush motor failures which caused dangerous overheating. These findings, when considered with evidence from toilet flush motors which have failed and suffered damage due to overheating, has led the CAAS to publish the requirements of this Notice, for the retrospective modification of those aircraft fitted with electric flush motors which do not already have suitable overheat protection.

2 Requirement

2.1 All aircraft above 5700 kg MTWA certified in the Transport or Private Categories and which have electric toilet flush motor systems installed, is required to comply with paragraph 2.2 or 2.3 of this Notice, or with a CAAS approved alternative providing an equivalent level of airworthiness.

2.2 Unless it can be shown that :

(a) any failure of the control circuit or its associated components which causes the motor to run continuously will not create an overheat condition such as to create a smoke or fire hazard, and

(b) failures within the motor or pump which would result in such an overheat condition will cause the supply circuit protection to operate, then compliance with paragraph 2.3 of this Notice is required.

2.3 Electric toilet flush motors must be fitted with a suitable thermal protection device to prevent them overheating such as to create a smoke or fire hazard, due to failures of the control circuit, control circuit components, motor or pump.

3 **Additional Information**

3.1 The following should be taken into consideration when establishing compliance with this Notice :

(a) Failures of any automatic control systems, e.g. automatic timer systems, which may cause the motor pump to run continuously.

(b) Short circuit failures of motor windings to each other or to the motor case.

(c) Open circuit of one phase on multi-phase motors.

(d) Motor or pump bearing failures.

(e) Motor or pump seizures.

(f) The proximity of flammable materials or fluids to the motor.

(g) The proximity of other aircraft installations to the motor.

3.2 Owners and operators are recommended to contact the constructor or main agent for information regarding the implementation of the intent of this Notice and regarding the corresponding modifications which may be required.

No.C37

Issue 4

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

FLOOR PROXIMITY EMERGENCY ESCAPE PATH MARKING

1 Applicability

1.1 This Airworthiness Notice is applicable to aeroplanes over 5 700 kg MTWA certificated in the Transport Category (Passenger) and required by the Air Navigation Order, Schedule 5, Scale G to be equipped with an emergency lighting system.

2 Introduction

2.1 Generally, internal emergency lighting systems, to facilitate the rapid evacuation of passengers in an emergency situation during conditions of darkness, are located in the overhead area. This not only optimises the protection of the lighting units and associated wiring but also makes the most economic use of available illumination in meeting the required minimum lighting levels. In a post-crash fire (where the fire enters the occupied compartments) overhead emergency lighting may soon become obscured by buoyant smoke and the lighting system may then be effectively lost.

2.2 The FAA, in response to a Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee recommendation, conducted a series of tests to evaluate practical ways of assisting passengers in finding exits under conditions of deteriorating visibility. Their report DOT/FAA/CT-83/31 showed that while there was no particular optimum solution, floor proximity lighting, combined with conspicuous markers, could provide the necessary cues to escaping passengers in search of the emergency exits in these conditions.

2.3 The FAA amended FAR Part 25 (amendment 25-58) to require on future aircraft types, the provision of emergency evacuation guidance for passengers when all sources of illumination more than 4 feet above the cabin aisle floor are totally obscured by smoke. The UK CAA and other European authorities have also adopted these standards in their countries.

2.4 For those aircraft already certified and in service on the Singapore register, the CAAS, by this Notice, requires, in a manner similar to that defined in FAR 121.310 (Amendment 121-183), that by 1 July 1987 these aircraft be equipped with means to identify the emergency escape path along the aisle of the cabin floor after leaving the seat and readily identify the location of each emergency exit using visible features which are not more than 4 feet above the cabin floor.

3 **Compliance**

3.1 With effect from 1 July 1987 all aeroplanes defined in paragraph 1 above must comply with the requirements of this Notice.

4 **Requirements**

4.1 In addition to meeting the existing emergency lighting requirements of JAR 25.812, BCAR Chapter D4-3 or Airworthiness Notice No. C13, as applicable, each affected aeroplane must be provided with visible illuminated floor proximity emergency escape path marking which meets the requirements of FAR 25.812(e) at Amendment 25-58.

5 **Interpretation**

5.1 The following guidance information is provided with the objective of ensuring a consistent and uniform interpretation of the floor proximity emergency escape path marking system requirements.

5.2 The markings and illumination provided should enable the passenger to visually identify the escape path along the cabin aisle floor.

NOTE: It is not necessary to provide visual guidance to enable passengers to move from their seat to the cabin aisle.

5.3 The illumination should be of sufficient intensity to enable the passenger to identify features bounding the cabin aisle.

5.4 Where exits are to be found in one direction only, the system should not tend to lead the passenger toward the end of the cabin where there are no exits.

5.5 The escape path marking, coupled with exit marking, should be so arranged that a passenger will not tend to proceed along the cabin aisle past any available exits. It is recommended that conspicuous markers be placed at the point of access from the cabin aisle to the exit.

5.6 **Exit Identification**

5.6.1 The exit should be positively identifiable to enable a passenger to proceed to it without hesitation in conditions where the exit is either open or closed. All exits likely to be available for use in an emergency should, therefore, have exit identifiers.

5.6.2 Exit identifiers of floor level exits need to be located so that they can be seen directly when adjacent to the last aisle marker, or in the case of a flood-lit system, within the flood-lit zone, and viewed on the vertical centre line of the aisle at a height no more than 4 feet above the cabin floor level. Additional cues to a passenger may, however, be provided as an alternative such as horizontally mounted exit identifiers located on an aft or forward bulkhead in the vestibule leading to an exit and within direct line of sight of a passenger when approaching the vestibules from the aisle.

5.6.3 Exit identifiers should, wherever practicable, be located at such a distance from the floor that they will not be obscured by any strewn hand baggage likely to be present in an emergency evacuation. It is, therefore, recommended that exit identifiers be located between 18 inches and 4 feet above the cabin floor level.

5.6.4 Where exit identifiers are mounted on cabin sidewalls and located close to passenger seats, they should be visible from the aisle with the seat next to the identifier occupied. This takes account of a passenger seated next to an exit being incapacitated. (A passenger slumped forward or sideways should also be considered).

5.7 Escape Path Markings along Cabin Aisle Floor

5.7.1 Where single point incandescent type or electroluminescent strip type floor track markers are employed, the CAAS recommends a distance between markers no greater than 20 inches (thus permitting a maximum distance between markers of 40 inches under typical Minimum Equipment List (MEL) conditions).

NOTE: Where incandescent lights are installed on the side of seats the distance between lights should not exceed 40 inches.

5.7.2 Floor track cabin aisle markers should be clearly visible when viewed from the aisle centre line at a height of 4 feet above the cabin floor.

5.7.3 At each end of a passenger cabin it is recommended that there are red/orange floor track cabin aisle markers (either, at least two closely spaced incandescent markers or, a short length of electroluminescent strip) to highlight clearly the ends of the aisle.

5.8 Escape Path 'Flood Lighting' of Cabin Aisle

5.8.1 Where a 'flood lighting' system is employed the maximum distance between light sources is to be agreed with the CAAS and this will be dependent upon the intensity and distribution of light available.

5.9 Aisle Cues for Overwing Exits

5.9.1 Floor track marking system aisle cues for overwing exits are recommended to comprise three, with a minimum of two, closely spaced red/orange markers or a suitable length of red/orange strip-lighting, adjacent to the access route to overwing exits.

5.9.2 Where access to an overwing exit is achieved by a dual access route, the aisle cues should be located at the entrance to both access routes or be located so as not to bias one route when compared with the other.

5.9.3 Escape path 'flood lighting' systems do not normally provide adequate aisle cues for overwing exits and should be complemented by the provision of some discrete cues so located that they can be seen by a passenger at a maximum height of 4 feet above the cabin floor when moving down the aisle (strobe lights are not considered to be effective cues, especially when smoke is present).

5.10 Cross Aisle Escape Path Marking

A similar level of floor proximity escape path marking illumination should be provided in cross aisles on multi-aisle aircraft to that provided for the cabin main aisles.

5.11 **The 25 Percent Rule**

5.11.1 Each escape path marking system is required to meet existing FAR/JAR 25.812 requirements. In particular, FAR/JAR 25.812 (l) (i) requires that not more than 25% of the escape path marking system lights are rendered inoperative after any single transverse vertical separation.

5.11.2 For systems in which the lights are controlled by remote transmitters there must be sufficient transmitters installed to ensure that the FAR/JAR 25.812 (l) (i) requirement can be met even though, in a crash, there may be a considerable distance between the two vertically separated parts of the fuselage.

6 **Evaluations**

6.1 The means provided in showing compliance with the requirement of paragraph 4 shall be the subject of an evaluation by the CAAS. In addition, all concepts not already approved shall be the subject of a demonstration to determine both the strengths and weaknesses of a particular system.

6.2 Engineering evaluations and demonstration tests should be conducted in conditions of darkness either at night or where conditions have been simulated by preventing daylight from entering through windows or through exits whether open or closed.

6.3 Where it is intended that an aircraft's MEL is to permit continued operation of the aircraft with some elements of the system unserviceable, the test demonstration should be conducted with the system configured so as to simulate the relevant MEL standard.

6.4 A demonstration should clearly show, to the satisfaction of the CAAS, that test subjects, on leaving their seat in any part of the passenger compartment and entering the cabin aisle, can, using the visible signs and markings, immediately determine in which direction(s) exits are to be found using visual references only.

6.5 The demonstration is intended to establish that there are adequate visual references that will provide the necessary orientation of the passengers. It is not necessary to assess the passenger evacuation rate under these conditions. Obstructions created by loose cabin baggage etc., need not, therefore, be simulated, except in so far as baggage might interfere with an illumination system.

6.6 In assessing the effectiveness of all visual cues, the existing emergency lighting system that provides illumination from locations more than 4 feet above the cabin aisle floor, must be switched off. It is not intended that the test should be performed in conditions of smoke but simply taking into account its blanketing effect. Therefore, care needs to be taken to ensure that, in the absence of an overlaying smoke, the floor proximity system is prevented from illuminating and hence reflected light from parts of the cabin above the 4 foot level.

6.7 Test subjects should not have detailed knowledge of the aircraft other than that obtainable from a study of the normal passenger safety leaflet. The total number of test subjects is not critical but they should be adults and should include both males and females over 60 years of age.

6.8 The precise details of any demonstration should be discussed and agreed with the CAAS but should include consideration of the following:

In each demonstration, the test subject acting alone and without any assistance should be able:

(a) to leave the seat or seat row and enter the cabin aisle;

(b) standing or stooping in the aisle and making use of the visual reference to the floor proximity marking system, to identify and locate the first exit or pair of exits either forward or aft (where appropriate);

(c) to proceed to the particular exit(s), without significant hesitation or evidence of confusion, making all exit identifications by reference only to visible features not more than 4 feet above the cabin floor.

After each test, the test subject should indicate to the observers the means by which the exit was located.

6.9 A sufficient number of tests should be performed to ensure that at least one exit of each type in the passenger cabin has been identified with the exit both open and closed using the associated marking systems (safety precautions should be taken particularly for any demonstration involving open exits).

7 Cancellation

7.1 The Notice cancels Airworthiness Notice No. C37, Issue 3, dated 1 October 1990, which should be destroyed.

No.C38

Issue 3

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

AIRCRAFT SEATS AND BERTHS - RESISTANCE TO FIRE

1 Applicability

1.1 This Airworthiness Notice is applicable to all seats and berths (except seats located within the flight deck) installed in Singapore registered aircraft (aeroplanes and rotorcraft) over 5700 kg MTWA, certificated in the Transport Category (passenger).

1.2 For the purpose of this Notice the term berths is taken to include such items as:

(a) berth and stretcher mattresses;

(b) couch cushion assemblies;

(c) other similar upholstery assemblies.

2 Introduction

2.1 Research into post-crash fire survivability has demonstrated that the overall flammability of seat upholstery materials is an important, and in many cases a dominant, factor in the rate at which a fire spreads through a cabin. Present day seat cushions are typically constructed of flame-resistant polyurethane foam over which there is an upholstery covering. Fire tests have clearly demonstrated that by encapsulating the seat cushion with a fire blocking layer, the onset of ignition of the foam core can be delayed and thereby survival time within the fuselage can be extended.

2.2.1 For those aircraft defined in paragraph 1 already in service or to be introduced into service, the CAAS intends, by this Notice, to require, in a similar manner to that defined in FAR 121.312(b) (Amendment 121-184)), that such aircraft must be equipped with seats and berths (except seats located within the flight deck) which comply with the requirements of paragraph 4.1 below.

3 Compliance

3.1 With effect from 1 July 1987 all affected seats fitted to aircraft defined in paragraph 1 above, must comply with the requirements of this Notice.

3.2 With immediate effect all aircraft seats and berths newly manufactured and which are intended for use on aircraft defined in paragraph 1 above must also comply with the requirements of this Notice.

4 Requirements

4.1 In addition to meeting the existing flammability requirements of the Singapore Airworthiness Requirements, each seat cushion (squab and back support), except those fitted to seats located within the flight deck, and berths, shall meet the requirements of FAR Part 25, Appendix F, Part II (at amendment No. 25-59).

5 Cancellation

5.1 This Notice cancels Airworthiness Notice No. C38, Issue 1, dated 1 October 1988, which should be destroyed.

No.C39

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

CABIN AND TOILET FIRE PROTECTION

1 Applicability

1.1 This Airworthiness Notice is applicable to all Singapore registered aircraft (aeroplanes and rotorcraft) over 5700 kg MTWA, certificated in the transport category (passenger) for 20 or more passengers.

2 Introduction

2.1 The CAAS has issued Airworthiness Notice No. C29 which was aimed at reducing the probability of persons smoking in toilet compartments and at minimising the potential fire hazard caused by persistent smokers.

2.2 Recent inspections of aircraft toilet compartments have concluded that in-service deterioration of the mechanical integrity of waste receptacles could well negate their fire containment capabilities.

2.3 The CAAS believes that fire containment alone is insufficient and that the provision of smoke/fore detection and improved fire fighting capability is necessary.

2.4 The purpose of this Notice is, therefore, to publish requirements for the provision of:

(a) smoke detection in each toilet compartment;

(b) a minimum number of passenger-cabin-mounted Halon 1211 (BCF) fire extinguishers;

(c) an increase in the minimum number of handheld fire extinguishers in the passenger cabin.

2.5 This Notice is complementary to Airworthiness Notice No. C29 Fire Precautions – Aircraft Toilets and takes into account Far Part 121.308 and 121.309 (Amendment 121 – 185).

3 Compliance

3.1 With effect from 1 October 1987 all aircraft defined in paragraph 1 must comply with the requirement of paragraph 4.1 of this Notice.

3.2 With effect from 1 December 1986 all aircraft defined in paragraph 1 above must comply with the requirements of paragraphs 4.2 and 4.3 of this Notice.

3.3 With effect from 1 May 1987 all aircraft defined in paragraph 1 above must comply with the requirement of paragraph 4.4 of this Notice.

4 Requirements

4.1 Each toilet compartment shall be equipped with a smoke detection system, which provides a warning light and/or aural warning in the passenger cabin, so located as to be readily seen or heard by a flight attendant performing his normal duties throughout the flight, and/ or a warning light in the flight deck.

4.2 In addition to the extinguishers provided for use in the flight deck, accessible cargo compartments and upper and lower deck galleys, there shall be at least the following number of approved handheld fire extinguishers strategically located throughout the passenger compartment:

Passenger Seating Capacity	*No. of Extinguishers*
Up to 60	2
61 – 200	3
201 – 300	4
301 – 400	5
401 – 500	6
501 – 600	7
601 or more	8

4.3 At least half, but not less than two, of the required handheld fire extinguishers installed in the passenger cabin shall contain HALON 1211 (bromochlorodifluomethane BCF) or its equivalent as the fire extinguishing agent.

4.4 Each toilet shall be equipped with a built-in fire extinguishers for each disposal receptacle for towels, paper or waste located within the toilet compartment. The built-in fire extinguisher must be designed to discharge automatically into each disposal receptacle upon occurrence of a fire in the receptacle.

5 Additional information

5.1 It is recommended that, whenever possible, the use of access and/or built-in distribution spray systems should be provided so as to ensure that an effective distribution of extinguishant from a handheld fire extinguisher into toilet compartment waste receptacles and adjacent regions.

No.C40

Issue 4

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

ACCESS TO AND OPENING OF TYPE III AND TYPE IV EMERGENCY EXITS

1 Applicability

1.1 This Airworthiness Notice is applicable to all Singapore registered aeroplanes over 5700 kg MTWA, certificated in the transport category (passenger) to carry 20 or more passengers and equipped with Type III emergency exits and/or Type IV emergency exits or their equivalent. Exits considered to be equivalent to Type IV exits are referred to as Type IV exits in this Notice.

1.2 For the purpose of this Notice, exits which are smaller in size than Type III emergency exits (including elliptical exits) shall be deemed to be Type IV emergency exits, even though they are not formally classified as such.

2 Introduction

2.1 From a review of accidents, where rapid evacuation of the aeroplane was a critical factor governing passenger survival, Issue 1 of this Notice stated that it appeared that mid-cabin Type III emergency exits, although only rated for a relatively small number of passengers, could in certain circumstances, become a major escape route.

2.2 The purpose of this issue is to specify the requirements for face-to-face seating configurations.

2.3 The access of Type III and Type IV emergency exits are governed by FAR 25.813(c) or its equivalent. However, no specific dimensions are quoted for the minimum width of access to such exits from between adjacent seat rows. Tests have demonstrated that in practice, with typical economy class seats, seat pitches down to approximately 30 inches have little or no effect on the rate of exit egress. The major constraint on the location of seats relative to such exits is the need to ensure that the seats do not impede the removal and disposal of the exit hatches.

2.4 This Notice has been issued to ensure effective opening, handling and disposal of the hatch and to define the additional minimum access requirements for Type III and Type IV emergency exits.

2.5 To realise the full potential of improved exit access, it is also essential that passengers seated adjacent to the exits are readily able to determine the correct method of opening and disposal of exits in an emergency. Whilst such information is provided in the cabin safety leaflet, operating instructions, comparable to those contained in such leaflets, are required by this Notice to be repeated on the backs of all seats on the seat row immediately forward of the exits, except as referred to in paragraph 5.6.

2.6 To encourage a smooth passenger flow through the relatively small Type III and Type IV emergency exits, it is important that passengers are encouraged to approach the exit from the cabin aisle via an access route which is sensibly normal to the exit. Alternative routes such as can be created by climbing over seat backs which have been pushed forward should be discouraged. To achieve, where possible, an orderly approach to the exit from the aisle, the CAAS has decided that the seat backs of those seat rows immediately forward and aft of the exit access route from the aisle shall be restricted in both recline and break forward not only to maintain the minimum access width but also to maintain the seat back in an essentially upright attitude.

2.7 Whilst the revised seating arrangements required by this Notice should minimise the likelihood of passengers either kneeling or standing on seats to reach the exit, it is nevertheless considered necessary to ensure that the seat design is not such that, for instance, a person's foot may be trapped.

3 Compliance

3.1 With effect from 1 December 1986 all aeroplanes defined in paragraph 1 above with Type III emergency exits having all forward facing or all aft facing seats adjacent to these exits shall comply with the requirements of this Notice.

3.2 With effect from 1 March 1988 all aeroplanes defined in paragraph 1 above with Type IV emergency exits having all forward facing or all aft facing seats adjacent to these exits shall comply with the requirements of this Notice.

3.3 With effect from 1 October 1990 all aeroplanes defined in paragraph 1 above having fall-to-face seats forming the access route to Type III and Type IV emergency exits shall comply with the requirements of this Notice.

4 Requirements

4.1 To facilitate rapid opening, each Type III and Type IV emergency exit, in addition to meeting the current requirements of FAR 25.813(c) or its equivalent, shall have access space meeting the requirements specified in either paragraph 4.1.1 or 4.1.2 for Type III exits or either paragraph 4.1.3 or 4.1.4 for Type IV exits where convectional seating arrangements are installed, and in addition paragraph 4.1.5 when face-to-face seating is installed.

4.1.1 Where all forward facing or all aft facing seats are arranged such that there is a single access route between seat rows from the aisle to a Type III exit, the access shall be of sufficient width and be located fore and aft so that no part of any seat which is beneath the exit extends beyond the exit centre line, and the access width between seat rows vertically projected shall not be less than half the exit hatch width including any trim, or 10 inches, whichever is the greater (see Figure 1).

Note: The outboard armrest must not protrude across the exit aperture nor impede the removal of the exit hatch.

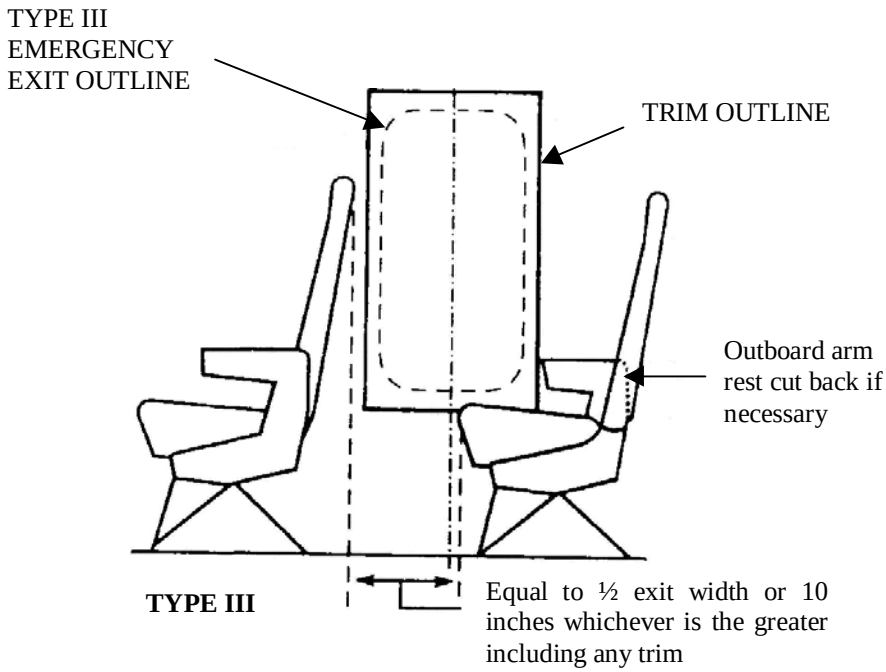

Figure 1 Minimum Access Space Required By Paragraph 4.1.1

4.1.2 Seats may only be located beyond the centre line of a Type III exit provided there is a space immediately adjacent to the exit which projects inboard from the exit a distance no less than the width of a passenger seat and the seats are so arranged as to provide two access routes between seat rows from the cabin aisle to the exit.

Note: Where more than one access route from the cabin aisle to a Type III exit is provided, the minimum access width referred to in paragraph 4.1.1 need not apply (see paragraph 5.4 of this Notice).

4.1.3 Where all forward facing or all aft facing seats are arranged such that there is a single access route from the aisle to a Type IV emergency exit then the projected exit aperture shall not be obstructed from the exit inboard for a distance equal to one passenger seat to the aisle (see Figure 2 and paragraph 5.4 of this Notice).

Notes: (a) Some incursion into the projection area of the emergency exit hatch, including its trim, may be acceptable so long as it can be shown that the incursion does not impair the rapid removal of the exit hatch.

(b) The outboard armrest must not protrude across the exit aperture nor impede the removal of the exit hatch.

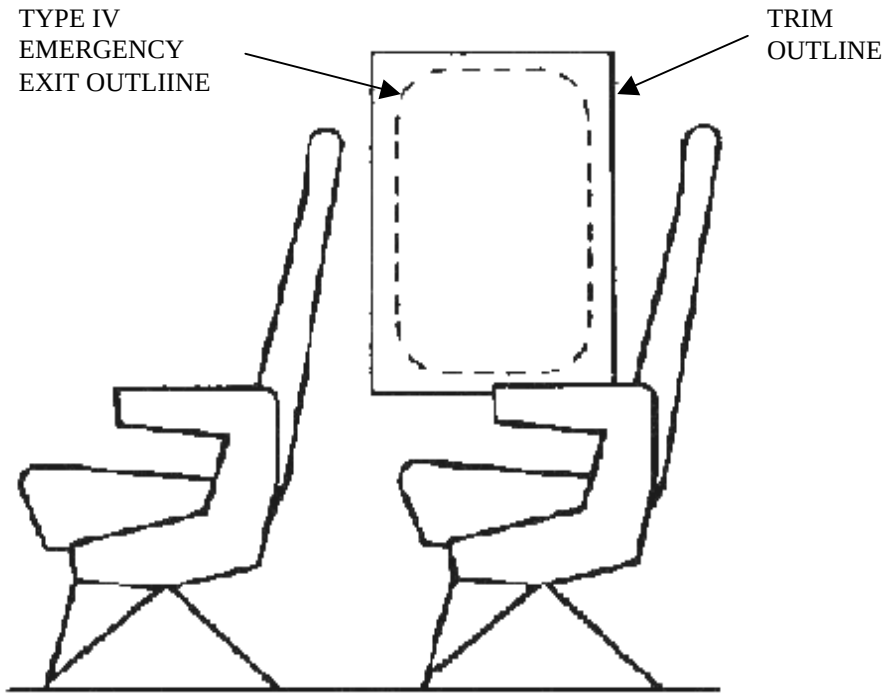

Figure 2 Minimum Access Required By Paragraph 4.1.3

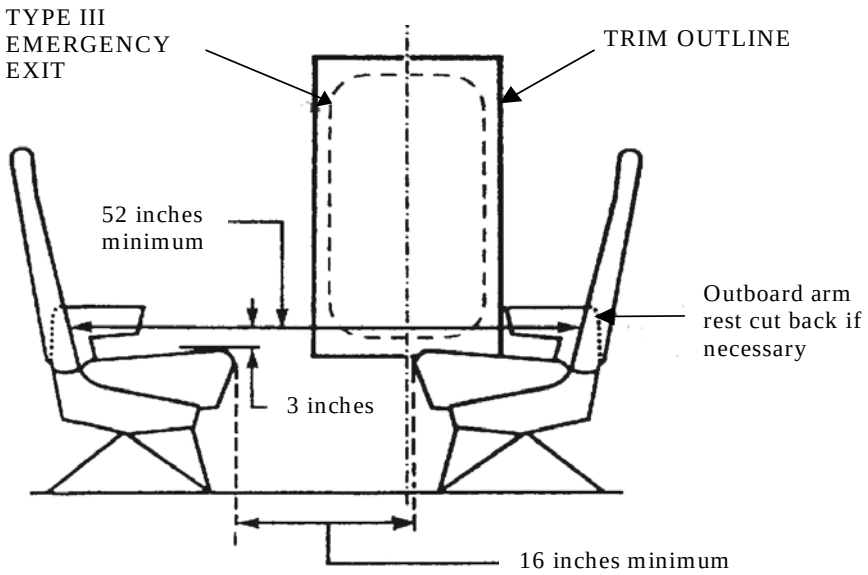

Figure 3Minimum Access Required By Paragraph 4.1.5

4.1.4 Seats may only be located in line with a Type IV exit such that the seat back is within the projected exit aperture provided there is a space immediately adjacent to the exit. Such a space shall project inboard from the exit a distance no less than the width of a passenger seat and be so arranged as to provide two access routes between seat rows from the cabin aisle to the exit (see paragraph 5.4 of this Notice).

4.1.5 Where face-to-face seating is provided adjacent to the emergency exit, the minimum permitted distance between any parts of the seat rows shall be 16 inches vertically projected and the minimum permitted distance between the plane of the seat backs on either side of the access route shall be 52 inches measured on the mid-lines of each seat place at a height of 3 inches above the seat cushions (see Figure 3 and paragraph 5.6 of this Notice).

4.2 Instruction placards, clearly indicating the method of opening and disposal of each Type III and Type IV emergency exit (additional to existing opening instructions at the exit) shall be located in a prominent position in front of, and clearly visible to, the occupant of each seat which forms the access route from the cabin aisle to the exit (see paragraphs 5.6 and 5.9 of this Notice).

4.3 The seat back of each seat which forms the boundary of the access route to each Type III and Type IV emergency exit shall be restricted in its movement (break forward and recline, where fitted) so as to maintain the minimum access to the exit required by paragraph 4.1, and ensure that the seat back is in an essentially upright position (i.e. fully forward or fully back, but not exceeding 35° from the vertical), without overlapping the projected opening of the exit.

4.3.1 The seat back shall be capable of maintaining the essentially upright position under loads of up to 300 lbf which should be applied horizontally, in each direction of travel, at the top of the seat back structure at the most adverse position relative to its support structure. The seat back, when under load should remain upright within $\pm$35° of the vertical and any permanent deformation should not significantly impede access to the exit.

Note: The seat backs of aisle seats need not be maintained in the essentially upright position where this would facilitate improved access to the escape routes, provided that the minimum access to the exit required by paragraph 4.1 is maintained.

4.4 The interior surface of each exit shall be free of any significant projection that might inhibit or otherwise delay the exit opening. The past practice of mounting stub armrests on the exit shall be discontinued.

4.5 The seat pan and lower back rest suspension of all seats bounding the access route(s) from the cabin aisle to the emergency exit shall be free of any gaps which might entrap a foot or other part of a person standing or kneeling on the seat (see paragraph 5.8 of this Notice).

5 Additional Information

5.1 When measuring the minimum access width between seat rows leading to Type III emergency exits, seat pans (if able to tip up) are to be down and seat backs must be in the upright (take-off and landing) position.

5.2 No alleviation to these requirements will be granted on the basis of deformable soft furnishings, except that for Type III emergency exits only some projection of the seat cushion above the sill height may be permitted provided that this projection does not impede the rapid opening of the exit. Such configurations will be the subject of individual evaluation.

5.3 Where a particular emergency exit is larger than the defined measurements of FAR or its equivalent, it is permissible when establishing compliance with paragraph 4.3 to assume the required minimum exit size and the maximum step-up and step-down limitations of FAR or its equivalent provided that this required minimum exit size, when superimposed on the actual emergency exit, falls within the boundary of the actual emergency exit aperture. If this results in a vertical overlap between seat squab and lower sill it shall be shown that the resulting interference will not restrict the removal and disposal of the exit hatch.

5.4 For seating configurations where there is a dual access route to a Type III exit, or a single or dual access route to a Type IV exit from the cabin aisle, a vertically projected access width of a least 6 inches should be provided. Small reductions in this access may be considered where there is evidence to demonstrate that the features of the specific configuration can achieve equivalent ease of access in, and egress rate through, the exit.

5.5 It is a requirement that fold-up meal tables are correctly stowed for take-off and landing. If however, having increased the seat pitch, particular seat back meal tables are no longer used, they should either be removed from the seat, or their function inhibited to ensure that they cannot inadvertently obstruct the access to the exit. Where tables are retained for use at seats adjacent to the access route, the latches shall be sufficiently reliable and adequately protected against inadvertent release.

5.6 For the more conventional forward facing seating layout, the instruction placards, indicating the correct method of opening and disposal of the exit hatch, should be fixed at approximately eye level to the seated occupant on each seat immediately forward of the access route either on the upper seat back itself or on the outer face of the stowed meal table (where fitted). Where face-to-face seating makes such a location ineffective, placards, again at approximately eye level to the seated occupant, mounted on either side of the exit and visible to the occupants of the affected seat rows would be acceptable. Where such seating is not symmetrical about the exit centre line it may be necessary to locate an additional placard on the exit itself, to ensure good visibility to the seated passengers. Wherever possible, a pictorial instruction placard, comparable with that contained in the cabin safety leaflet, should be used (see paragraph 5.9 of this Notice).

5.7 Where break forward facilities are provided on seat backs in seat rows bounding access routes, it is recommended that, wherever practicable, this feature should be retained but limited in travel only to an extent necessary to ensure compliance with paragraph 4.3 of this Notice.

5.8 The assessment of potential entrapment should be made both with and without the seat cushions in place. Ideally the seat upholstery and seat suspension should be free of any gaps into which it would be possible to place a foot, hand or arm in such a way as to delay or hamper free movement of passengers to the exit. Where gaps are unavoidable, their location and shape should be evaluated subjectively to assess the likely hazard. Any gap of greater than one inch into which a hand or foot may enter is considered to be unacceptable.

5.9 All modifications to seats, or to their installation, necessary to achieve compliance with the requirements of this Notice, must be approved by the Authority. The instruction placards required by paragraph 4.2 together with the associated cabin safety leaflet must also be submitted to the Authority for agreement.

6 **Cancellation**

6.1 This Notice cancels Airworthiness Notice No. C40, Issue 3, dated 1 October 1990, which should be destroyed.

No.C41

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

ELECTRICAL GENERATION SYSTEMS – SINGLE-ENGINED AIRCRAFT

1 Applicability

1.1 When Airworthiness Notice C28 was introduced, it was considered inappropriate to impose the whole or part of those requirements on single-engined aircraft. However, systems which were once fitted only in the more complicated twin-engined general aviation aircraft have now been developed and fitted to single-engined aircraft. Thus, greater reliance is being placed on the integrity of the electrical power supplies for such aircraft.

1.2 Recent investigations into accidents and incidents involving loss of electrical power on single-engined aircraft have shown that the standards for warning of failures of generated power have not kept pace with such system developments and inadequacies are all too often apparent.

1.3 The purpose of this Notice is to publish a requirement that clear and unmistakable warning of the loss of generated electrical power shall be provided on single-engined aircraft as detailed in paragraph 2.1.1, by the introduction, where necessary, of retrospective modifications.

2 Requirements

2.1 For all single-engined aircraft fitted with systems or equipment as defined in paragraph 2.1.1 of this Notice, compliance with paragraphs 2.2 and 2.3, or with a CAAS approved alternative providing an equivalent level of airworthiness, is required.

2.1.1 Compliance with this Notice will be required on single-engined aircraft equipped with electrically-operated systems or equipment the loss of which could prejudice continued safe flight and landing. Such systems or equipment include:

(a) electrically-powered mandatory flight instruments where no acceptable alternatives are provided;

(b) electronic ignition;

(c) electrically-operated landing gear;

(d) a minimum radio fit;

(e) any other system which could prejudice continued safe flight and landing.

2.2 A clear and unmistakable red visual warning shall be provided, within the pilot's normal scan of vision, to give indication of the reduction of the voltage at the aircraft bus-bar to a level where the battery commences to support all or part of the electrical load of the aircraft.

2.3 Guidance shall be given in the appropriate aircraft manual(s) on any actions to be taken by the pilot should the warning operate. See also paragraph 3.2.

3 Additional information

3.1 The recommended voltage levels for operating the warning required under paragraph 2.2 of this Notice are 25 volts to 25.5 volts for a nominal 24 volt dc system and 12.5 volts to 13 volts for a nominal 12 volt dc system.

3.2 The battery duration should be sufficient to make a safe landing and should not be less than 30 minutes, subject to the prompt completion of any drills. This duration need only be a reasonable estimate and not necessarily calculated by a detailed electrical load analysis. However, when making this estimate, only 75% of the battery name plate capacity should be considered as available because of loss of battery efficiency during service.

3.3 Owners and operators are recommended to contact the aircraft constructor or main agent for information regarding suitable means of compliance with this Notice.

No.C42

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

ACCEPTANCE OF AIRCRAFT STANDARD PARTS BY USERS

1 Introduction

1.1 This Airworthiness Notice is issued for information and guidance for users to cover procurement of aircraft standard parts and should be read in conjunction with the appropriate Chapters in the Singapore Airworthiness Requirements.

1.2 For the purpose of this Notice the following definitions apply:-

(a) **Aircraft Standard Parts** are items intended for incorporation into an aircraft, its engines, propellers, or equipment, being items made to National Specifications (AN, MS, etc) and called up by the design organisation as such.

(b) **The User** is the person or organisation incorporating the aircraft standard part into an aircraft, its engines, propellers, or equipment.

(c) **A Design Organisation** is an organisation approved or recognised by the CAAS as competent to design complete aircraft, engines, propellers, equipment, or modifications to such parts.

2 User Responsibilities

2.1 The user of aircraft standard parts is responsible for ensuring that the parts are serviceable and confirm to the standard determined by the appropriate Design Organisation as being suitable for the intended application. In order to discharge this responsibility, the user must when obtaining aircraft standard parts from suppliers ensure that his purchase order contains accurate definitions of the aircraft standard parts to be met by the supplier in satisfying the order.

2.2 No aircraft standard parts certification given by manufacturers and distributors can relieve the user of his responsibility for ensuring that purchased aircraft standard parts are to the required build standard and are of acceptable manufacturing origin.

2.3 The following paragraphs give guidance on acceptable means by which these basic responsibilities may be met.

3 Determination of Quality Control and Certification Requirements

3.1 When an aircraft standard part, as defined in this Notice, is manufactured to a National Specification it should be identified by a description and part number provided either by the Design Organisation directly responsible for the part or by the Design Organisation responsible for the application of the aircraft part.

3.2 The supplier should give some form of certification of conformance of the standard parts with the applicable specification and quoting identifying part numbers.

3.3 Compliance with the requirement for the user to be satisfied, to an extent appropriate to the application, that aircraft standard parts are genuine and serviceable at the time of use will always require some degree of inspection or test.

4 Purchase Order Requirements

4.1 Purchase orders placed on suppliers of aircraft standard parts should specify the following:

(a) The full description and identify of the parts to be supplied; including part numbers and/or specifications, any special finishes and features.

(b) That a certification be made by the supplier, if it is the manufacturer, when despatching the aircraft standard parts that the parts supplied comply in all respects with the description.

(c) In the case where the supplier is a distributor, that a certification from the manufacturer, when despatching the aircraft standard parts that the parts supplied comply in all respects with the description.

5 Verification Procedures

5.1 The user must institute adequate receipt procedures to confirm that aircraft standard parts and their accompanying documentation comply with the terms of the Purchase Order.

5.2 Documentation checks should include verification that part numbers, type numbers, and standards are correct, that the parts were obtained from the sources quoted with correct certification.

No.C44

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

TYRE BURSTS IN FLIGHT - INFLATION MEDIA

1 Applicability

1.1 This Airworthiness Notice is applicable to all Singapore registered aeroplanes over 5700 kg MTWA.

2 Introduction

2.1 The majority of in-flight tyre bursts have been attributed to the tyre carcass being weakened by foreign object damage, scuffing, etc., such that a rapid release of pressure takes place. Such failures are usually experienced when the gear has been retracted for some time and the effects of brake heat transfer, internal tyre temperature and differential pressure are combined.

2.2 A fatal accident involving cabin decompression and fire has highlighted another mode of tyre failure in flight where a tyre may fail explosively without any significant prior degradation. A tyre inflated with air and subjected to excessive heating, possibly caused by a dragging brake, can experience a chemical reaction resulting in release of volatile gases. Such a chemical reaction in the presence of the oxygen in the contained air may result in a tyre explosion in a landing gear bay and/or an in-flight fire since it appears that the protection normally afforded by conventional pressure relief devices in the wheel would be incapable of responding adequately to the rapid increases in temperature and gas pressure associated with auto-ignition.

2.3 Laboratory material and tyre burst testing indicates that the risk of auto-ignition can be reduced by using an inert gas for tyre inflation and servicing.

2.4 Other potential benefits may accrue from the use of nitrogen as it will tend to reduce wheel corrosion, tyre fatigue and the risk of fire when fusible plugs melt due to brake overheating.

3 Compliance

3.1 With immediate effect all braked wheels of retractable landing gear units on aeroplanes defined in paragraph 1 will be required to have tyres inflated with nitrogen, or other suitable inert gas, and maintained such as to limit the oxygen content of the compressed gases to not greater than 5% by volume.

3.2 To ensure compliance with this requirement suitable inflation and servicing procedures must be adopted in consultation with the airframe constructor. At airfields where suitable inert gases are not normally available it is acceptable to use air for inflation or servicing provided

that a suitable entry is made in the technical log and that the tyre is reinflated or serviced in accordance with the agreed procedure at the earliest opportunity or within 25 flight hours, whichever is the sooner.

4 Additional Information

4.1 In addition to compliance with the requirement of paragraph 3 above, tyre and wheel assemblies should be maintained such that greases, solvents, powders and rubber dust are excluded as far as practicable from within the inflation volume.

No.C45

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

IMPROVED FLAMMABILITY TEST STANDARDS FOR CABIN INTERIOR MATERIALS

1 Applicability

1.1 This Airworthiness Notice is applicable to all Singapore registered aeroplanes over 5700 kg MTWA, certificated in the transport category (passenger) to carry 20 or more passengers.

2 Introduction

2.1 Analysis of aircraft accidents in which cabin fire has been a major factor has indicated that currently approved cabin interior materials should meet more severe flammability test standards to reduce the risk of an uncontrolled in-flight cabin fire and extend the survival time in a ground fire emergency.

2.2 The FAR amendments 25-61, 25-66, 121-189 and 121-198 introduced new flammability test standards for cabin sidewalls, stowages, partitions, galleys, etc. These new test standards set a limit for the heat release rate from these cabin materials when exposed to a source of radiant heat using the Ohio State University (OSU) rate of heat release apparatus, as well as a limit for the specific optical smoke density of these cabin materials.

2.3 Under the provision of this Notice aircraft already in service may continue without incorporating materials which comply with the new flammability test standards until such a time as the cabin interior is substantially renewed. If the cabin interior renewals are not accomplished as anticipated, the CAAS may consider it necessary to specify dates by which all affected aircraft shall be in compliance.

3 Compliance

3.1 All aeroplanes defined in paragraph 1 above and manufactured on or after 20 August 1988, but prior to 20 August 1990, shall comply with the requirements of paragraph 4.1 of this Notice.

3.2 With effect from 1 July 1989, but prior to 20 August 1990, all aeroplanes defined in paragraph 1 above, which are the subject of a substantially complete cabin interior renewal, shall comply with the requirements of paragraph 4.1 of this Notice.

3.3 With effect from 20 August 1990, all aeroplanes defined in paragraph 1 above, which are either newly manufactured or are the subject of a substantially complete cabin interior renewal, shall comply with the requirements of paragraph 4.2 of this Notice.

4 Requirements

4.1 In addition to meeting the existing flammability test standards contained in the Singapore Airworthiness Requirements, Chapter 3.8, paragraph 2.1 cabin interior ceiling and wall panels (other than lighting lenses), partitions, and the outer surfaces of galleys, large cabinets and stowage compartments (other than underseat stowage compartments and compartments for stowing small items such as magazines and maps), shall satisfy the test standards of Part IV OF Appendix F of FAR Part 25, except that the total heat release over the first two minutes of sample exposure shall not exceed 100 kilowatt-minutes per square metre, and the peak heat release rate shall not exceed 100 kilowatts per square metre.

4.2 In addition to meeting the existing flammability test standards contained in the Singapore Airworthiness Requirements, Chapter 3.8 paragraph 2.1 cabin interior ceiling and wall panels (other than lighting lenses), partitions, and the outer surfaces of galleys, large cabinets and stowage compartments (other than underseat stowage compartments and compartments for stowing small items such as magazines and maps), shall satisfy the test standards of Parts IV and V of Appendix F of FAR Part 25.

5 Additional Information

5.1 For the purpose of this Notice, the term "substantially complete cabin interior renewal" has been used to cover the renewal of all sidewall panels, ceiling panels and/or overhead stowages, whether this is done at one refurbishment or progressively over a period of time as part of a planned cabin interior renewal programme.

5.2 The requirements of this Notice are not applicable to individual cabin interior components which are refurbished or have to be replaced due to unserviceability, e.g. individual sidewall or ceiling panels or overhead stowage doors. However, where these components are newly manufactured the CAAS strongly recommends that they should meet the appropriate requirements of this Notice.

5.3 The requirements of this Notice are not normally applicable to the internal structures of galleys and overhead stowages, floor panels and floor coverings, transparent or translucent components such as lenses used in interior lights, illuminated signs and window anti-scratch panels, and other small cabin items such as door and window mouldings, curtains, window shades, seat trays, arm rests and parts of the passenger service units. However, these requirements would be applicable to large surface panels of passenger service units.

5.4 If there is any uncertainty as to the applicability of this Notice the CAAS should be consulted for clarification.

6 Cancellation

This Notice cancels Airworthiness Notice No.C45, Issue 1, dated 1 July 1989, which should be destroyed.

No.C46

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

MINIMUM SPACE F0R SEATED PASSENGERS

1 Applicability

1.1 This Airworthiness Notice is applicable to all Singapore registered aeroplanes over 5 700 kg MTWA, certificated in the transport category (passenger) and configured to carry 20 or more passengers.

2 Introduction

2.1 The cabin interior layout of each aircraft on the Singapore register has to be approved by the CAAS. Seat layout approval takes into account head, trunk and leg strike areas of the seat in front, the ability to occupy the seat and, if necessary, to quickly vacate the seat and enter the aisle in an emergency.

2.2 The United Kingdom Civil Aviation Authority has re-assessed the minimum acceptable seating standards and has determined that the critical dimension for the seated occupant is the buttock-knee length. Additionally, affecting the ease with which the occupant can stand up and move from the seat to the main cabin aisle, is the minimum distance and the vertically projected distance between the seat and any seat or fixed structure immediately ahead of the occupant.

2.3 Use of these three dimensions as the criteria for the determination of the acceptability of any seating configuration is considered to provide a realistic minimum standard which can be uniformly adopted whether the seating being considered is placed adjacent to seats of the same or different types, or other typical aeroplane interior structures. These requirements are not intended to supersede or replace existing occupant protection criteria (FAR 25.785 or equivalent).

3 Compliance

3.1 With effect from 1 October 1990 all aeroplanes defined in paragraph 1 above shall comply with the requirements of this Notice.

4 Requirements

4.1 The minimum distance between the back support cushion of a seat and the back of the seat or other fixed structure in front, shall be 26 inches. (Figure 1, Dimension A.)

4.2 The minimum distance between a seat and the seat or other fixed structure in front, shall be 7 inches. (Figure 1, Dimension B).

4.3 The minimum vertically projected distance between seat rows or between a seat and any fixed structure forward of the seat, shall be 3 inches. (Figure 1, Dimension C).

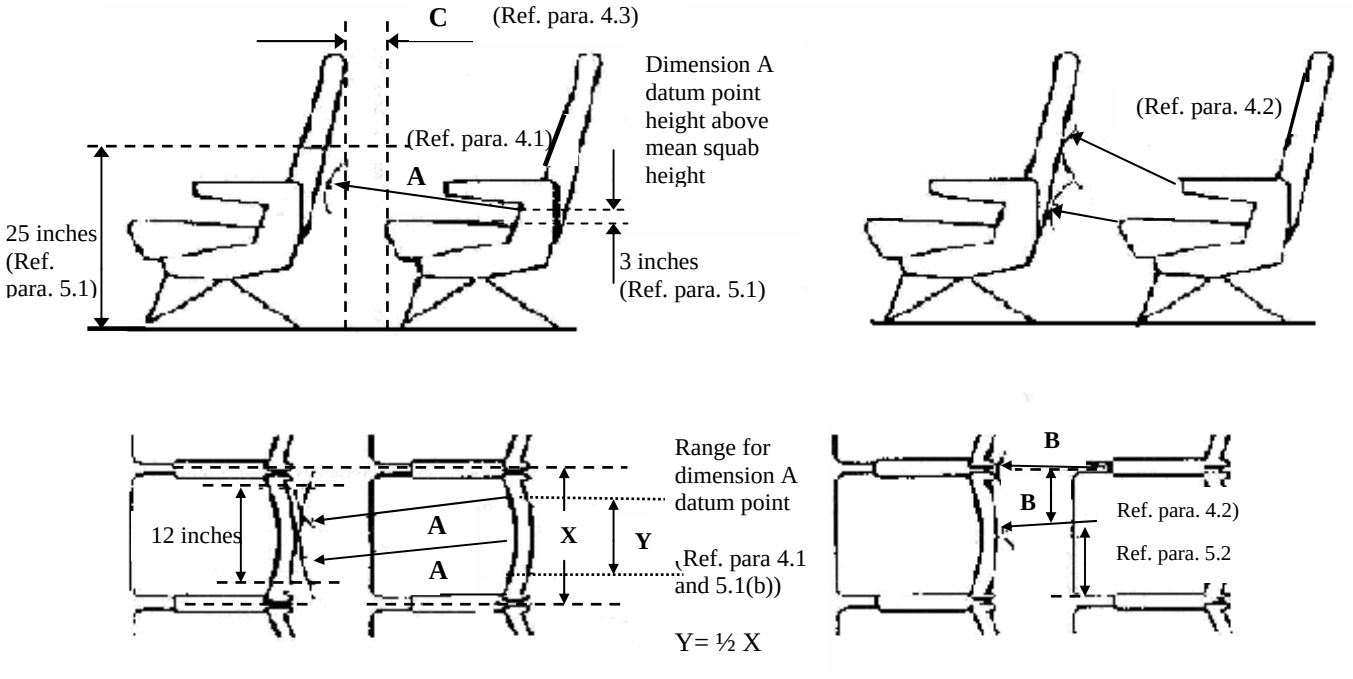

Figure 1Minimum Dimension Required by Paragraphs 4.1, 4.2 and 4.3

5 Additional Information

5.1 The measurements required for the demonstration of compliance with the requirement given in paragraph 4.1 above are as follows:

(a) From a datum point in the centre of the seat back at a height of 3 inches above the mean uncompressed seat squab height to the seat or other fixed structure in front made in both vertical and horizontal arcs up to a limiting height of 25 inches above the carpeted floor level, over the full seat place width 'X'. (See Figure 1).

(b) From any point on the seat back within the centre one half 'Y' of the seat place width at a height of 3 inches above the mean uncompressed seat squab height to the seat or other fixed structure within the central 12 inch region in front made in vertical and horizontal arcs up to a limiting height of 25 inches above the carpeted floor level.

5.2 The full width of the forward edges of the seat squab cushion and the seat armrests shall be used as the datum points for the measurement of the minimum distance required by paragraph 4.2 above. From these points the measurement of the distance shall be made in both horizontal and vertical unlimited arcs.

5.3 The vertically projected distance required by paragraph 4.3 above shall be measured between the forward edge of the seat squab cushion or the most forward extremity of the armrests and the most aft part of the seat or fixed structure in front.

5.4 Where a magazine rack is provided for the normal stowage of the cabin safety leaflet, sick bag and in-flight reading material provided by the operator, such normally provided material shall be in place during the measurements. Similarly, any fold down or other type of meal table attached to either seat or fixed structure should be in its normal stowed (take-off and landing) position for all measurements.

5.5 All measurements shall be made with the seats in the upright (take-off and landing) position, and the armrests shall be down.

5.6 No alleviation to these requirements will be granted on the basis of deformable soft furnishings.

5.7 All modifications to seats, their installation or any modification to adjacent fixed structures, necessary to achieve compliance with the requirements of this Notice shall be approved by the CAAS.

6 Cancellation

This Notice cancels Airworthiness No.C46, Issue 1, dated 1 October 1990, which should be destroyed.

No.C47

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

CLASS C AND D CARGO OR BAGGAGE COMPARTMENT - FIRE CONTAINMENT CAPABILITY

1 Applicability

1.1 This Airworthiness Notice is applicable to all Singapore registered aeroplanes over 5700 kg MTWA certificated in the transport category (passenger or cargo) and fitted with Class C or D cargo or baggage compartment exceeding 200 cubic feet in volume.

2 Introduction

2.1 FAR Part 25 divides cargo or baggage compartments into five classes, namely, A, B, C, D and E. The classification of compartments is based primarily on the ease of access and the capability of the compartment to contain a fire. Class B, C, D and E cargo and baggage compartments are required to have liners in order to protect the structural integrity of the aeroplane from the effects of fire.

2.2 As a consequence of an in-flight fire on a public transport aeroplane, the FAA has conducted a series of tests at their Technical Centre to investigate the capability of three currently used non-metallic liner materials - glass fibre reinforced resin, kevlar and nomex (in monolithic form) - to resist flame penetration under conditions representative of actual cargo or baggage compartment fires. These tests were conducted in simulated Class C and D compartments with bulk-loaded baggage typical of that found in service.

2.3 As a result of these full-scale fire tests, the FAA determined that fire could rapidly burn through monolithic nomex or kevlar while the glass fibre reinforced resin panels proved to be satisfactory. The FAA concluded that improved standards are warranted and has amended FAR Part 25 to require new fire test standard on all newly designed aeroplanes for which an application for a type certificate is made after 16 June 1986. The UK has also adopted such standards through equivalent amendments.

2.4 The improved standard of fire containment testing of cargo or baggage hold liners is contained in Part III of Appendix F to FAR Part 25 and consists of a 5 minute resistance to fire test on a representative specimen of the cargo liner panels and attachments, using a 2 US gallons per hour kerosene burner (identical to that used to show compliance with Airworthiness Notice No. C38).

2.5 For those aeroplanes defined in paragraph 1 already in service and which are not fitted with glass fibre reinforced resin or aluminium alloy liners. The CAAS intends by this Notice to require that such aeroplanes shall be equipped with cargo or baggage compartment liners which comply with FAR 25.855(a-1) and Part III of Appendix F to FAR Part 25.

3 Compliance

3.1 With effect from 1 October 1990, all Class C and D cargo or baggage compartments exceeding 200 cubic feet in volume of aeroplanes defined in paragraph 1 above, shall comply with the requirements of this Notice.

4 Requirements

4.1 In addition to meeting the existing flammability requirements of the SAR the following shall apply.

4.1.1 Class C and D cargo or baggage compartment side wall or ceiling panels shall be constructed of glass fibre reinforced resin or materials which satisfy the requirements of FAR 25.855(a-1) and Part III of Appendix F to FAR Part 25.

4.1.2 For aeroplanes already in service the use of aluminium alloy side walls and ceiling panels will be acceptable. However, new aeroplanes shall meet the requirements of paragraph 4.1.1.

4.2 For compliance with this Notice the term 'liner' includes any design feature, such as a joint or fastener, which would affect the capability of the liner to safely contain a fire.

No.C48

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

PORTABLE OXYGEN EQUIPMENT PRESSURE RELIEF

1 Applicability

This Airworthiness Notice is applicable to all portable oxygen equipment carried in Singapore registered aeroplanes exceeding 5700 kg MTWA.

2 Introduction

2.1 In a recent cabin fire-related accident, there were at least two instances of portable oxygen equipment exploding and forming hazardous projectiles within the cabin as a result of direct involvement in the fire. The CAAS is concerned about any possible risk to the aeroplane occupants or rescue personnel from such hazards.

2.2 The explosive failure of an oxygen cylinder in a fire may be caused by high internal pressure generated by the heating of the oxygen, combined with a weakening of the cylinder material. The incorporation of an overtemperature/ overpressure relief device should reduce the probability of such a dangerous explosion.

2.3 Although protection against rupture is required on the fixed and portable oxygen equipment in all newly designed aeroplanes, it was not a requirement in the 1950's and 1960's when many of the currently used portable oxygen equipment were first approved.

2.4 The purpose of this Notice is to publish a requirement for the provision of an overtemperature/overpressure relief device on portable oxygen equipment.

3 Compliance

3.1 All portable oxygen equipment carried in aeroplanes defined in paragraph 1 above, shall comply with the requirement of this Notice.

4 Requirement

4.1 Portable oxygen equipment shall be equipped with an overtemperature/overpressure relief device in accordance with the requirements of FAR 25.1453 (a) or JAR 25.1453(b)(1) and associated ACJ 25.1453.

5 Additional Information

5.1 Compliance with this requirement would normally be achieved by the provision of a dedicated overtemperature/overpressure relief device. However, such a device may not be necessary if it can be demonstrated by appropriate fire test evidence that the failure of a part of the equipment (e.g. contents gauge) performs a similar function and satisfies the requirement of this Notice.

No.C49

Issue 2

1 July 2003

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

CONTROL OF PRECISION CUTTING TOOLS

1 Recent incidents during airframe manufacture have highlighted the ease with which incorrect countersink angles and knife edge holes may be cut when adequate controls are not in place. In the latest incident, a series of 90^{o} countersinks were cut when 100^{o} 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.

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

3 Incorrectly cut countersinks can cause severe decrease in the strength of a joint leading to a serious reduction in airworthiness and to the need for costly repair or replacement.

No.C52

Issue 3

11 December 2002

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

ENHANCED GROUND PROXIMITY WARNING SYSTEM (EGPWS)

1 Introduction

1.1 The Ground Proximity Warning System (GPWS) was introduced to help reduce the risk of "controlled flight into terrain" (CFIT) accidents, whereby properly functioning aeroplanes were flown into terrain (or water or obstacles).

1.2 The Fifth Schedule of the Singapore Air Navigation Order requires that all aeroplanes exceeding 5,700kg maximum total weight authorised or authorised to carry more than nine passengers to be fitted with the GPWS.

1.3 Investigations into aeroplane accidents have shown that although some aeroplanes were equipped with the GPWS, the GPWS did not provide the warning in time for the pilots to avoid mountainous terrain.

1.4 The Enhanced Ground Proximity Warning System (EGPWS) is an improvement on the current GPWS as it incorporates a forward looking terrain avoidance function. This new function would increase the warning times and situational awareness of the pilots. Another term being used for the EGPWS is Terrain Awareness and Warning System (TAWS).

1.5 The International Civil Aviation Organisation (ICAO) has introduced in Annex 6 the requirements for aeroplanes under different weight categories to be equipped by specified dates with the EGPWS.

2 Applicability

2.1 This Airworthiness Notice applies to aeroplanes operated by a Singapore Air Operator Certificate (AOC) Holder, a Singapore flying club/school or the owner of a Singapore-registered aeroplane.

3 Requirements

3.1 All turbine engine aeroplanes operated by an AOC Holder for the purpose of public transport or aerial work and authorised to carry more than five passengers shall be equipped with EGPWS.

3.2 All turbine engine aeroplanes for which the Certificate of Airworthiness is first issued in Singapore (or elsewhere) on or after 1 January 2004:

(a) not operated for the purpose of public transport or aerial work; and

(b) exceeding 5,700kg maximum total weight authorised or authorised to carry more than nine passengers.

shall be equipped with EGPWS.

3.3 From 1 January 2007, all turbine engine aeorplanes:

(a) not operated for the purpose of public transport or aerial work; and

(b) authorised to carry more than five passengers

shall be equipped with EGPWS.

3.4 From 1 January 2007, all piston engine aeroplanes exceeding 5,700kg maximum total weight authorised or authorised to carry more than nine passengers shall be equipped with Enhanced GPWS.

3.5 Notwithstanding the deadline given in paragraphs 3.3 and 3.4 above, it is recommended that:

(a) all turbine engine aeroplanes authorised to carry more than five passengers; and

(b) all piston engine aeroplanes exceeding 5,700kg maximum total weight authorised or authorised to carry more than nine passengers.

be equipped with EGPWS as soon as is practicable even if not operated for the purpose of public transport or aerial work.

No.C55

Issue 1

1 February 2008

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

ADDITIONAL CABIN SAFETY REQUIREMENTS FOR AIRBUS A380 AIRCRAFT

1 General

1.1 This Airworthiness Notice serves to provide additional requirements on cabin crew and cabin safety for Singapore AOC holder(s) operating the Airbus A380 aircraft. These requirements are meant to supplement the ANO Fifth Schedule.

2 Effectivity

2.1 This Airworthiness Notice comes into effect on 1 February 2008.

3 Instruments and Equipment

3.1 First aid equipment should be located at easily accessible locations on both the upper and main decks of the aircraft. The quantity of first aid equipment should be determined with regard to the number of passengers required in the ANO Fifth Schedule.

3.2 There should be at least one medical kit on each deck of the Airbus A380 aircraft.

3.3 The number of portable fire extinguishers to be placed on the passenger decks should be derived from the following table:

Maximum approved passenger seating configuration (per deck)	Number of extinguishers
7 to 30	1
31 to 60	2
61 to 200	3
201 to 300	4
301 to 400	5
401 to 500	6
501 to 600	7
601 to more	8

3.4 The maximum approved passenger seating configuration is based on the certification provided by Airbus, and this seating configuration might differ from the configuration adopted by the AOC Holders. The upper deck should be treated separately from the main deck when deriving the number of fire extinguishers required.

3.5 Due to the significant seating capacity on the upper deck of the A380 aircraft, the AOC Holder should treat the seating capacities of the upper deck and main deck separately when determining the number of megaphones to be carried as according to the ANO Fifth Schedule Scale V.

No.C56

Issue 1

16 November 2009

Civil Aviation Authority of Singapore

AIRWORTHINESS NOTICE

MEDICAL SUPPLIES REQUIRED ON SINGAPORE REGISTERED AIRCRAFT

1 Applicability

1.1 This Notice is applicable to all Singapore registered aircraft required to comply with the medical equipage prescribed under Scale B while operating under the conditions specified in the Air Navigation Order, Fifth Schedule, Paragraph 4.

2 Effectivity

2.1 This Airworthiness Notice comes into effect on 19 November 2009.

3 Introduction

3.1 ICAO had recently adopted Amendment 33 to Part I of Annex 6 (Operation of Aircraft – International Commercial Air Transport (Aeroplanes)) and Amendment 14 to Part III of Annex 6 (Operation of Aircraft – International Operations (Helicopters)).

3.2 Amendment 33 arises with the assistance of the Medical Provisions Study Group (MPSG), to better reflect current aeromedical risks to flight safety and contains changes to better reflect the contemporary needs for on-board medical supplies.

4 Requirement

4.1 All Singapore registered aircraft to which this Notice is applicable shall comply with the medical equipage requirements specified in Paragraph 5 of this Airworthiness Notice.

5 Aircraft Equipment

5.1 An aeroplane shall be equipped with accessible and adequate medical supplies that include the following:

(a) one or more first aid kits;

(b) for aeroplanes operating for the purpose of public transport and required to carry cabin crew as part of the operating crew, one universal precaution kit (two for aircraft authorised to carry more than 250 passengers) for use by cabin crew members in

managing incidents of ill health associated with a case of suspected communicable disease, or in the case of illness involving contact with body fluids; and

(c) for aeroplanes with a maximum total weight authorised exceeding 5,700 kg used for the public transport of passengers, one medical kit, for the use of medical doctors or other qualified persons in treating in-flight medical emergencies.

5.2 A helicopter shall be equipped with accessible and adequate medical supplies that include the following:

(a) one first aid kit; and

(b) for helicopters operating for the purpose of public transport and required to carry cabin crew as part of the operating crew, one universal precaution kit, for the use of cabin crew members in managing incidents of ill health associated with a case of suspected communicable disease, or in the case of illness involving contact with body fluids; and

5.3 The number of first-aid kits shall be appropriate to the number of passengers which the aeroplane is authorised to carry:

Passenger	*First-aid kits*
0 – 100	1
101 – 200	2
201 – 300	3
301 – 400	4
401 – 500	5
More than 500	6

5.4 First-aid and universal precaution kits shall be distributed as evenly as practicable throughout the passenger cabins. They should be readily accessible to cabin crew members.

5.5 The medical kit, when carried, shall be stored in an appropriate secure location.

5.6 The First aid kit shall include the following:

(a) List of contents (First-aid)

(b) Antiseptic swabs (10/pack)

(c) Bandage: adhesive strips

(d) Bandage: gauze 7.5 cm × 4.5 m

(e) Bandage: triangular; safety pins

(f) Dressing: burn 10 cm × 10 cm

(g) Dressing: compress, sterile 7.5 cm × 12 cm

(h) Dressing: gauze, sterile 10.4 cm × 10.4 cm

(i) Tape: adhesive 2.5 cm (roll)

(j) Steri-strips (or equivalent adhesive strip)

(k) Hand cleanser or cleansing towelettes

(l) Pad with shield, or tape, for eye

(m) Scissors: 10 cm

(n) Tape: Adhesive, surgical 1.2 cm × 4.6 m

(o) Tweezers: splinter

(p) Disposable gloves (multiple pairs)

(q) Thermometers (non-mercury)

(r) Mouth to mouth resuscitation mask with one-way valve

(s) First-aid manual, current edition

(t) Incident record form

(u) Mild to moderate analgesic

(v) Antiemetic

(w) Nasal decongestant

(x) Antacid

(y) Antihistamine

5.7 In addition to the number of universal precaution kits carried in accordance to paragraph 5.1(b) of this Airworthiness Notice, additional kit(s) shall be made available at times of increased public health risk, such as during an outbreak of a serious communicable disease having pandemic potential. Such kits may be used to clean up any potentially infectious body contents such as blood, urine, vomit and faeces and to protect the cabin crew members who are assisting potentially infectious cases of suspected communicable disease. The universal precaution kit shall include the following:

(a) Dry powder that can convert small liquid spill into a sterile granulated gel

(b) Germicidal disinfectant for surface cleaning

(c) Skin wipes

(d) Face/eye mask (separate or combined)

(e) Gloves (disposable)

(f) Protective apron

(g) Large absorbent towel

(h) Pick-up scoop with scraper

(i) Bio-hazard disposal waste bag

(j) Instructions

5.8 The medical kit required in Para 5.1 (c) of this Airworthiness Notice shall include the following medical supplies:

(a) List of contents (Medical kit)

(b) Stethoscope

(c) Sphygmomanometer (electronic preferred)

(d) Airways, oropharyngeal (3 sizes)

(e) Syringes (appropriate range of sizes)

(f) Needles (appropriate range of sizes)

(g) Intravenous catheters (appropriate range of sizes)

(h) Antiseptic wipes

(i) Gloves (disposable)

(j) Needle disposal box

(k) Urinary catheter

(l) System for delivering intravenous fluids

(m) Venous tourniquet

(n) Sponge gauze

(o) Tape – adhesive

(p) Surgical mask

(q) Emergency tracheal catheter (or large gauge intravenous cannula)

(r) Umbilical cord clamp

(s) Thermometers (non mercury)

(t) Basic life support cards

(u) Bag-valve mask

(v) Flashlight and batteries

(w) oral and injectable drugs as follows:

(i) Epinephrine 1:1000
(ii) Antihistamine – injectable
(iii) Dextrose 50% (or equivalent) – injectable: 50ml
(iv) Nitroglycerin tablets, or spray
(v) Major analgesic
(vi) Sedative anticonvulsant – injectable
(vii) Antiemetic – injectable
(viii) Bronchial dilator – inhaler
(ix) Atropine – injectable
(x) Adrenocortical steroid – injectable
(xi) Diuretic – injectable
(xii) Medication for postpartum bleeding
(xiii) Sodium chloride 0.9% (minimum 250 ml)
(xiv) Acetyl salicylic acid (aspirin) for oral use
(xv) Oral beta blocker

(x) If a cardiac monitor is available (with or without an AED) add to the above list:

(i) Epinephrine 1:10000 (can be a dilution of epinephrine 1:1000)